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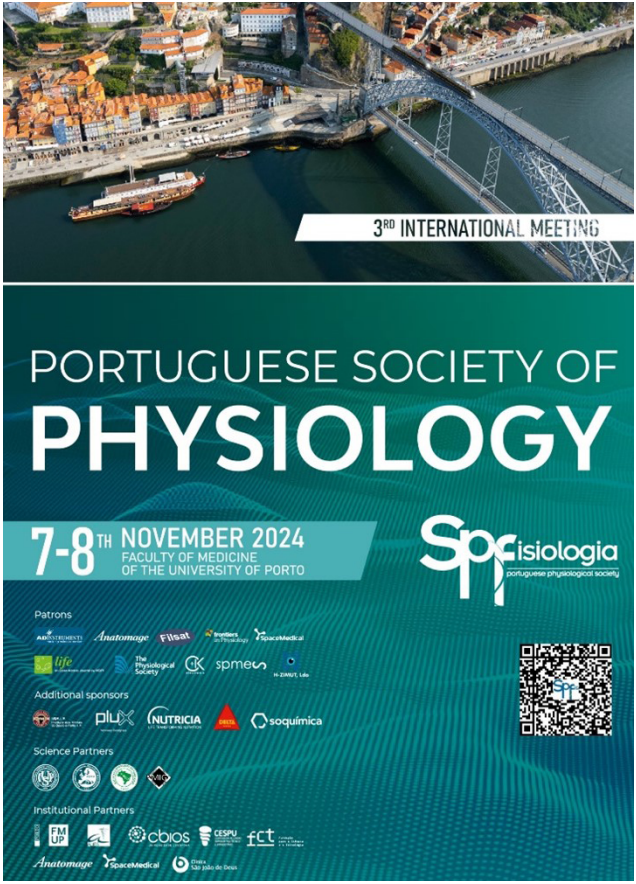

3rd International Meeting of the Portuguese Physiological Society

Porto, Portugal

3rd International Meeting of the Portuguese Physiological Society, Porto, Portugal

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50 OC - (24834) - Significance of perfusion asymmetries in sedentary non-healthy individuals
Margarida Florindo, João Gregório

52 OC - (24860) - Novel web platform for collaborative annotation of point-of-care ultrasound (POCUS) lung images
P.M. Rodrigues-Reis, D. Oliveira-Saraiva, J. Leote, F. Canais, R. Maçorano, F. Gonzalez, H.A. Ferreira

54 OC - (24870) - Sex differences in the oxygen consumption response during an incremental test with high and low blood flow restriction in young adults
Sonia Liliana Rivera Mejía, Manuel Avelino Giráldez García, Iván Nine Sieira, María Alejandra Camacho Villa, Mathías López Córdoba, Guillermo Madruga, Paulo Varela Amboage, Ana Jimena Páez Díaz, Marta Sevilla Sánchez, Eduardo Carballeira Fernández

56 OC - (24893) - Contribution of adenosine and ATP to the carotid body-mediated hypoxic ventilatory responses: a metabolic switch between control and dysmetabolic states
Joana F. Sacramento, Gonçalo M. Melo, Cláudia S. Prego, Silvia V. Conde

Theme: GI, endocrine metabolic and nutrition physiology

58 OC - (24848) - Characterization of the dopaminergic system in human visceral adipose tissue in obesity and type 2 diabetes
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60 OC - (24859) - Oxidative stress and histomorphometric gut remodeling in type 2 diabetic GK rats
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Theme: Other (miscellaneous)

63 OC - (24873) - Body composition, interleukin 6, and vitamin D levels according to different stages of menopause
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66 OC - (24911) - Gut microbiome in stroke patients: potential implications in functional outcomes
Diana Martins

Theme: Comparative physiology

68 OC - (24849) - Maternal aging affects the metabolic profile of the placenta in humans and mice
Ana Rita Pinheiro, Adriana Rodrigues, Liliana Matos, Luís Guedes-Martins, Henrique Almeida, Elisabete Silva

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71 OC - (24847) - Students' perspectives on physiology education in health sciences: first insights from a survey-based observational study
João Gregório, Luís Monteiro Rodrigues

Theme: Environmental and exercise

73 OC - (24701) - Enhancing mountain running performance: the critical role of resistance strength training
Ester Alves, José Fonseca, Mónica Rodrigues

Theme: Nervous system, neuroscience and neurophysiology

75 OC - (24838) - N-acetylaspartylglutamic acid (NAAG): a novel hippocampal compensatory mechanism against glucose intolerance in obesity?
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78 OC - (24839) - The role of adrenaline modulation in age-related contextual fear memory
Rafaela Seixas, João Santos, João Munhoz, Ana Oliveira, Mónica Moreira-Rodrigues

Theme: Other (miscellaneous)

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Theme: Water & electrolyte homeostasis and renal physiology

83 OC - (24869) - Deficiency of Nrf2 expression seems to trigger earlier kidney damage before affecting the skeletal muscle: an insight into the progression of chronic kidney disease?
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89 PO - (24826) - Characteristics of physical exercise programs and their effects on functional capacity in patients with chronic obstructive pulmonary disease: a systematic review
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92 PO - (24831) - Glucagon-like peptide-1 receptor agonists in vascular protection associated with type 2 diabetes
Leandro Mendes, Marcelo Queiroz, Cristina Sena

94 PO - (24835) - Regular physical activity might be a determinant in reducing systolic and mean arterial pressure in older medicated hypertense adults.
Margarida Florindo, Luís Monteiro Rodrigues

96 PO - (24837) - The effect of exercise intensity on runners and swimmers bioenergetical performance
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99 PO - (24840) - Web research tool for predicting the need for ICU admission in COVID-19 patients
Duarte Oliveira-Saraiva, Nuno Cruz Garcia, Hugo Alexandre Ferreira

101 PO - (24843) - Impact of randall foils on cardiorespiratory and metabolic function in rowing: an exploratory study
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103 PO - (24844) - Cooling as a challenge to study in vivo microvascular function
Joana Caetano, Clemente Rocha, Sérgio Fallone Andrade, Luís Monteiro Rodrigues

105 PO - (24845) - Unveiling subclinical microvascular changes associated with regular smoking
Sérgio Fallone Andrade, Barbara Almeida, João Pedro Gregório, Luís Monteiro Rodrigues

107 PO - (24856) - Urocortin-2 as a novel biomarker of clinical deterioration in HFpEF: a prospective cohort study
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112 PO - (24865) - Does inflammatory cytokines contribute to carotid body dysfunction in dysmetabolic states?
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116 PO - (24877) - Effect of localized heat therapy at maximum distance, on muscular oxygen saturation, heart rate and blood pressure during incremental physical exercise in peripheral arterial disease
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119 PO - (24882) - Sex-dependent effects of estrogen on cardiac microvascular endothelial cell function
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121 PO - (24885) - Unveiling urine proteomic signature of heart failure with preserved ejection fraction
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123 PO - (24886) - Effect of hand and non-hand support in treadmill walking on the physiological response in peripheral arterial disease
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125 PO - (24891) - Assessment of left ventricular function in soccer players by myocardial work method
Wendell Arthur Lopes, Suelen Rodrigues Da Luz, Rogério Toshiro Passos Okawa

127 PO - (24892) - The miR-146a role in pulmonary arterial hypertension – pathophysiological and therapeutic implications
Joana Santos-Gomes, Pedro Mendes-Ferreira, Rui Adão, Carolina Maia-Rocha, Beatriz Rego, Frédéric Perros, Fabrice Antigny – Adelino F Leite-Moreira, Carmen Brás-Silva

130 PO - (24903) - Circulating miR-146a associated with myxomatous mitral valve disease in a naturally occurring canine model: a comparison with plasma nt-probnp
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133 PO - (24907) - Protective effect of Losartan against left ventricular hypertrophy in streptozotocin-induced diabetic rats
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139 PO - (24923) - Association of oral nitrate-nitrite reducing bacteria actinomyces is associated with physiological cardiovascular remodeling in pregnancy
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Theme: Cellular and molecular including “omics”

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145 PO - (24836) - The impact of polyphenols on diabetes: mechanisms and therapeutic potential
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147 PO - (24853) - Impact of polyphenol metabolites, under physiologically relevant concentrations, on kidney cell phenotypes related to cancer progression

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150 PO - (24864) - Effect of adipose tissue anatomical location and obesity on the expression of SARS-CoV-2 cell infection mediators ACE2, TMPRSS2, ADAM17, and NRP1: impact on COVID-19
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154 PO - (24896) - New zebrafish models for mitochondrial diseases: functional validation of VUS and therapeutic strategies
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Theme: Education

157 PO - (24846) - From curriculum to research: charting physiology's role in portuguese higher education
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159 PO - (24851) - The HYGIEIA project: advancing education through a european joint master degree in health and wellbeing
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161 Health literacy among individuals with and without chronic diseases: perspectives from a cross-sectional study.
Tiago Camelier, Margarida Andrade, Emilia Borba Alves

163 PO - (24883) - Food and nutritional literacy and emotional hunger in the process of weight management
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165 PO - (24929) - Illuminating the black-box: predicting and promoting academic success via measurable learning activities
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Theme: Environmental and exercise

167 PO - (24825) - Comparing the impact of physical exercise versus physical activity on anthropometrical and skeletal muscle changes in patients with stomach cancer submitted to neoadjuvant chemotherapy with FLOT
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173 PO - (24829) - Distance covered in a functional capacity test as an indicator of cardiorespiratory risk for physical exertion in people with severe obesity in Brazil
Vanessa Tenius, Luciane Pires

175 PO - (24833) - Protect trial: evaluating the impact of structured vs. non-structured home-based prehabilitation in surgical gastric cancer patients undergoing neoadjuvant chemotherapy with FLOT—preliminary insights into postoperative complications
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179 PO - (24866) - Complexity of near-infrared spectroscopy signals in patients with peripheral arterial disease: a pilot study
Daniel Santarém, Irene Pinto, Jacinta Campos, Catarina Abrantes

181 PO - (24867) - Effects of a 12-week multicomponent exercise programme on near-infrared spectroscopy derived-parameters in peripheral arterial disease
Daniel Santarém, Irene Pinto, Jacinta Campos, Catarina Abrantes

183 PO - (24868) - Extracellular mitochondria as novel mediators in exercise-induced health adaptations
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185 PO - (24872) - Blood lipids and fat mass in postmenopausal women: a comparative study across rural, semi-urban, and urban environments
Andreia Teixeira, Catarina Abrantes, Emília Alves, Joana Ferreira, Helena Moreira

188 PO - (24888) - Comparisons and association among body composition, blood and functional fitness measures considering different bmi groups of older women
Rafael Oliveira, César Leão, Ana Filipa Silva, Filipe Manuel Clemente, Carlos Tadeu Santamarinha, Hadi Nobari, João Paulo Reis Gonçalves Moreira De Brito

Theme: GI, endocrine metabolic and nutrition physiology

191 PO - (24824) - Prehabilitation impact on the at of gastric cancer patients undergoing chemotherapy with FLOT
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196 PO - (24827) - The influence of elite European soccer matches on salivary immunoglobulin-A and cortisol. a case study about playing status and match outcome
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204 PO - (24878) - Exploring the anti-diabetic potential of plant extracts in addressing vascular dysfunction linked to type 2 diabetes
Marcelo Queiroz, Artur Figueirinha, Raquel Seiça, Cristina Sena

206 PO - (24884) - Linking maternal obesity to neurodevelopmental and metabolic changes in the offspring
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208 PO - (24887) - Is there a feline metabolic syndrome? investigating the relationship between the nine-point visual body condition score (BCS) scale and cats' body composition
Nuno Rosa

210 PO - (24912) - The constituents of gastroesophageal reflux disease alter the esophageal contractility in rats
Kalinne K. L. Gadelha, Pedro J. C. Magalhaes, Armenio A. Santos, Paulo Correia-De-Sá, Moises T. B. Silva

212 PO - (24915) - Does higher ingestion of vitamin D lead to higher absortion? physiological and eating behavior evidence of people with obesity in brazil
Bernardo Furtado, Jessica Domingos, Angelica Santos, Vanessa Tenius, Luciane Pires

214 PO - (24917) - Metabolic effects of carotid sinus nerve denervation in ovariectomized female rats fed with a high-fat diet
Marcos Vinicius Fernandes, Joana F. Sacramento, José Ponce De Leão, Adriana M Capucho, Gonçalo M. Melo, Fátima O. Martins, Eduardo Colombari, Sílvia V. Conde

216 PO - (24926) - Decreased adiponectin/leptin ratio in fetal blood relates to maternal cardiometabolic phenotype
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Theme: Nervous system, neuroscience and neurophysiology

219 PO - (24820) - Impact of cervical vagus nerve transection on contextual fear memory: the role of catecholamine-mediated baroreceptor signaling
João Munhoz, Ana Oliveira, Márcia Azevedo, Rafaela Seixas, Mónica Moreira-Rodrigues

222 PO - (24861) - Investigating the mechanisms behind the beneficial effects of chronic caffeine consumption on cognitive impairment induced by hypercaloric diet consumption
Adriana Mateus Capucho, José Ponce De Leão, Gonçalo M. Melo, Marcus Vinicius Fernandes, Inês F. Almeida, Joana F. Sacramento, Silvia V. Conde

225 PO - (24894) - Pathophysiology and validity of a zebrafish model of sporadic amyotrophic lateral sclerosis
Nuno A. S. Oliveira, Brígida R. Pinho, José Bessa, Jorge M. A. Oliveira

227 PO - (24895) - Influence of basal phosphorylation status of AMPA receptors and CaMKII on synaptic plasticity and age-associated cognitive decline
Daniela Fernandes, Marta Gil, Diana Cunha-Reis

229 PO - (24913) - Impact of aging on prefrontal cortex neurotransmitter balance and basal phosphorylation of channels and enzymes crucial for synaptic plasticity
Margarida Negalho, Ana Mafalda Alves, Diana Cunha-Reis, Rafael Ajuda

231 PO - (24914) - Sleep evaluation in head and neck cancer patients undergoing radiotherapy
João Casalta-Lopes, Susana Maia, Filipa Martins, Joana Isabel Soares

233 PO - (24916) - Post-therapy epilepsy prevalence in patients with high-grade gliomas: a systematic review and meta-analysis
Marta Pereira Ferreira, Ruben Lopes Carvalho, Daniel Filipe Borges, Joana Isabel Soares, João Casalta-Lopes

236 PO - (24924) - Forecasting brain derived time-series through traditional and ML algorithms
Miguel Barbosa, Hugo Ferreira, David Belo

Theme: Other (miscellaneous)

238 PO - (24852) - Modelling skin barrier function: a new perspective beyond TEWL
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240 PO - (24863) - Synthetic skin models: insights into permeation enhancement mechanisms
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243 PO - (24897) - Impact of ATP synthase mutation on cell bioenergetics and targeting mitochondrial deubiquitinases in mitochondrial diseases
Brígida Pinho, Anitta Chacko, Célia Nogueira, Michael Duchen, Jorge Oliveira

245 PO - (24902) - Microcirculation as a predictor of cardiometabolic risk: a cross-sectional analysis
Regina Menezes, Emília Alves, Andreia Gomes, Mafalda Alves, Joana Chinita, Ângela Rocha, Guilherme Martins, Patrícia Rodrigues, Carolina Pires, Ana Vasconcelos, Clemente Rocha, Luís M. Rodrigues

248 PO - (24908) - Using zebrafish as a model for investigating Wolcott-Rallison Syndrome via PERK inhibition
Liliana Almeida, Leonor Pereira Lima, Nuno Oliveira, Rui Silva, Bruno Sousa, José Bessa, Brígida Pinho, Jorge Oliveira

251 PO - (24909) - Development of a predictive model for simulated 1,000 m kayak ergometer performance in young athletes based on biomechanical and physiological parameters.
André Coelho, Fábio Nakamura, Micaela Morgado, Francisco Alves, Angela Di Baldassarre, Andrew Flatt, Luís Rama

253 PO - (24919) - Brave new sound: applications of handheld ultrasound devices in medicine
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Welcome to the 3rd International Meeting of the Portuguese Physiological Society

The 3rd International Meeting of the Portuguese Society of Physiology was held at the Faculty of Medicine of the University of Porto on November 7–8, 2024. This prestigious event featured an exceptional program with cutting-edge research and insights from a distinguished panel of national and international speakers renowned for their contributions to Physiology.

As a cornerstone of the life sciences, Physiology bridges diverse disciplines, underpinning education and practice in areas such as human and animal health, sports science, biology, biochemistry, bioengineering, and biomedical engineering. Its interdisciplinary nature ensures that advancements in Physiology drive innovation and discovery across multiple fields.

In addition to the plenary sessions, podium sessions and thematic seminars, the meeting offered three hands-on advanced seminars addressing contemporary topics in Physiology. These courses provided participants with practical experience and an in-depth understanding of emerging trends and techniques, enriching their scientific and professional expertise.

This meeting served as a vibrant forum for exchanging ideas, knowledge, and experiences among individuals with diverse backgrounds and interests. It created a unique opportunity to explore groundbreaking research, innovative teaching approaches, and collaborative possibilities.

By gathering leading experts and passionate learners, the event underscored the critical importance of Physiology as a foundational discipline driving progress in science, education, and health. The 3rd International Meeting reaffirmed its commitment to advancing scientific knowledge for the betterment of society.

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This Society is the oldest and largest network of physiologists in Europe, consisting of members from over 60 countries. The Society's membership has included at least 61 Nobel laureates, mostly in Physiology or Medicine (n=55). The Society has been as a major facilitator between scientists and other interested groups. Responsible for the INNOVATIVE RESEARCH AWARD SPF 2024

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PORTUGUESE SOCIETY OF
PHYSIOLOGY
3RD INTERNATIONAL MEETING

7TH NOV
PRECONGRESS

08:30 - 14:00

8:30
VENUE REGISTRATION
Poster + Exhibitors installation

9:30 - 13:30
ADVANCED SEMINARS (AS)
more details at www.sociedadefisiologia.pt

9:15-11:15
SEMINAR 1
Exercise and Aging- “VIVIFRAIL multicomponent exercise program”
Mikel Izquierdo (U Navarra, SP)

SEMINAR 2
Brain vs. Machine “Brain-Computer interfaces hands-on”
Hugo Ferreira (FCUL, IBEB PT)

11:30 – 13:30
SEMINAR 3
Physiology Education - “Maximizing physiology student learning with high structure course design” (hands-on streaming course)
Justin Shaeffer
(Colorado SM-Dep Ch&Biol Eng. USA)

MEETING PROGRAM DAY 1

14:15 - 15:00
WELCOME AND OPENING SESSION
President of the Congress
Adelino Leite-Moreira
Chairman of the SPF
L Monteiro Rodrigues
President of IUPS the International Union of Physiology Societies
Susan Wray
President of FEPS the European FEPS - Federation of European Physiological Societies
Fabio Benfenati
President of the Soc Brasileira de Fisiologia
Marcio Moraes

15:00 - 16:30
THEMATIC SEMINAR ON AGING
Moderators:
Miguel Brito (H&TRC)
Elisabete Silva (FMV, Universidade Lusófona Lisboa)

KN1 Aging and Exercise
Mikel Izquierdo
U Navarra (ORCID: 0000-0003-2695-0779)

L1 Impact of aging on brain neurotransmitter balance and basal phosphorylation of channels and enzymes crucial for synaptic plasticity
Diana Cunha-Reis
U Lisboa (BioISI)

Decoding tissue aging: connecting inflammation with accelerated biological age and chronic diseases
José Pedro Castro
U Porto (I3S)

IC1 A closer look at healthy brain aging: a structural and functional imaging perspective
Helena Rico Pereira
U Lisboa (IBEB)

Q&A

16:30 - 17:15
COFFEE BREAK, EXHIBITION AND POSTER VISIT (MAIN HALL)

17:15 - 18:30
PODIUM SESSION I
Moderators:
David Eisner (U Manchester)
Mónica Rodrigues (Gen Physiology Lab ICBAS UP)

Characterization of the dopaminergic system in human visceral adipose tissue in obesity and type 2 diabetes
Daniela Parente *et al.*
Nova Medical School, Lisboa

Oxidative stress and histomorphometric gut remodeling in type 2 diabetic GK rats
Marisa Esteves-Monteiro *et al.*
LAQV-REQUIMTE, University of Porto

Contribution of adenosine and ATP to the carotid body-mediated hypoxic ventilatory responses: a metabolic switch between control and dysmetabolic states
Joana Sacramento *et al.*
NOVA Medical School, Universidade Nova de Lisboa

Novel web platform for collaborative annotation of Point-of-Care Ultrasound (POCUS) lung images
Pedro Rodrigues-Reis *et al.*
IBEB, FCUL, Lisboa

Body Composition, Interleukin 6 and Vitamin D levels according to different stages of menopause
Andreia Teixeira *et al.*
Dep. Sports Science, Exercise and Health, UTAD, Vila Real

Sex differences in the oxygen consumption response during an incremental test with high and low blood flow restriction in young adults
Sónia Liliana Rivera Mejía *et al.*
Universidade Coruña, ESP

The synchronize response generated by reactive hyperemia might be used as a powerful integrative indicator of cardiovascular health
Lourenço M. Rodrigues *et al.*
Cognitive Systems Lab, University of Bremen, FRG

Significance of perfusion asymmetries in sedentary non-healthy individuals
Margarida Florindo *et al.*
ESSCVP Lisboa

Q&A

19:00
PORT RECEPTION

20:00
CONGRESS DINNER

8TH NOV
MEETING PROGRAM

9:00 - 10:45
THEMATIC SEMINAR ON CARDIOVASCULAR PHYSIOLOGY
Moderators:
Rui Adão (U Complutense Madrid and UnIC, FMUP)
Mário Santos (ICBAS - UMIB)

KN2 Pulmonary hypertension in humans: a pathophysiological perspective
Francisco Perez-Vizcaino
Dep Pharmacology and Toxicology, School of Medicine, University Complutense of Madrid
(ORCID 0000-0001-6309-7418)

L3 Induced animal models of pulmonary hypertension: what have we learned from them so far?
Pedro Mendes Ferreira
FMUP

L4 Spontaneous animal models of pulmonary hypertension: what can we still learn from them?
Elena Carréton
ULas Palmas Gran Canaria, SP
ORCID 0000-0001-6509-910X
(streaming lecture)

IC2 Exercise training in both human and animal pulmonary hypertension: differences and similarities
Daniel Moreira Gonçalves
FADEUP, UP

Q&A

10:45 - 11:45
COFFEE BREAK, EXHIBITION AND POSTER VISIT (MAIN HALL)

11:45 - 13:00
PODIUM SESSION II
Moderators:
J Correia-Pinto (U Minho School of Medicine)
Cristina Sena (Physiology Institute, FMUC)

Maternal aging affects the metabolic profile of the placenta in humans and mice health
Ana Rita Pinheiro *et al.*
UBE-Dep. Biomedicine, FMUP, Porto

N-Acetylaspartylglutamicacid (NAAG): a novel hippocampal compensatory mechanism against glucose intolerance in obesity?
Beatriz Caramelo *et al.*
iCBR and Institute of Physiology, FMUC Coimbra

Student’s Perspectives on Physiology Education in Health Sciences: First Insights from a Survey-Based Observational Study
João Gregório *et al.*
CBIOS – Universidade Lusófona, Lisboa

Enhancing Mountain Running Performance: The Critical Role of Resistance Strength Training
Ester Alves *et al.*
Estádio Clínica & ICBAS Porto

Effect of treadmill, elliptical trainer and cycle ergometer maximal exercise intensity on muscle oxygen saturation and heart rate
Catarina Abrantes *et al.*
Dep. Sports Science, Exercise and Health, UTAD, Vila Real

Deficiency of Nrf2 expression seems to trigger earlier kidney damage before affecting the skeletal muscle. An insight into the progression of chronic kidney disease?
Sara Mendes *et al.*
CIDESD, Universidade da Maia, Maia

The Role of Adrenaline Modulation in Age-Related Contextual Fear Memory
Rafaela Seixas *et al.*
Laboratory of Physiology, ICBAS Porto

Gut microbiome in stroke patients: potential implications in functional outcomes
Diana Martins *et al.*
Cardiovascular R&D Center, UnIC@RISE, Department of Surgery and Physiology, Faculty of Medicine of the University of Porto

Q&A

13:00 - 14:30
WORKING LUNCH, EXHIBITION AND POSTER VISIT (MAIN HALL) GATHERING

13:45
GENERAL ASSEMBLY OF SPFis (ROOM TO BE ANNOUNCED)

14:30 - 15:15
THE LUSO-BRASILIAN PLATFORM FOR PHYSIOLOGY
Márcio Moraes
SBF - SOC BRASILEIRA DE FISIOLOGIA
Monteiro Rodrigues
SPF - SOC PORTUGUESA DE FISIOLOGIA
Moderators:
A. Leite-Moreira (U Porto School of Medicine)

Q&A

15:15 - 16:45
THEMATIC SEMINAR ON PHYSIOLOGY OF THE ADIPOSE TISSUE
Moderators:
Henrique Girão
(ICBN U Coimbra)
Regina Echaniz
(CBIOS ULusofona Lisboa)

KN3 Adipose tissue crosstalk with muscle, [illegible] ne system, and ser[illegible] (stream[illegible] lecture) CANCELED
Jorge Ruas
University of Michigan Medical School
(https://www.ruaslab.science/)

L5 Revisiting catecholamines in adipose tissue function
Sílvia Conde
NOVA Medical School (UNL)

L6 Physiology of perivascular adipose tissue
Cristina Sena
FMUC, U Coimbra

IC3 - A new model of adipose tissue dysfunction in obesity
Daniela Rosendo-Silva
FMUC, U Coimbra

Q&A

16:45 - 17:15
COFFEE BREAK, EXHIBITION AND POSTER VISIT (MAIN HALL)

17:15 - 18:00
CLOSING SESSION
Science and Travel Awards, Wrap-upand Closure
President of the Congress
Chairman of SPFis
and members of the Board

Thematic seminar on aging (Thursday, 7th November – 15:00-16:30) Aging and exercise

Author
Mikel Izquierdo – Public University of Navarra / Navarrabiomed

Citation
Izquierdo, M. Aging and exercise.

Short Bio

Mikel Izquierdo is a Professor at the Public University of Navarre, director of the "Physical Exercise, Health, and Quality of Life E-FIT" research group at the Biomedical Research Center of Navarre (NAVARRABIOMED) and is a researcher at the CIBER on Frailty and Healthy Aging (CIBERFES) of the Carlos III Health Institute. Since 2018, Professor Izquierdo has been an external advisor to the World Health Organization's (WHO) Healthy Aging Consortium, contributing to the implementation of physical exercise programs to prevent frailty and falls on a global scale. His most recent publications can be accessed at the following link:http://goo.gl/zaiGw8.

Abstract

Aging, a universal and unavoidable process, is marked by a gradual accumulation of physiological changes and a decline in function over time, leading to greater susceptibility to disease and, eventually, mortality. Physical activity and exercise play a key role in preventing or mitigating lifestyle-related illnesses, extending the healthy years of life, improving physical performance, and reducing the incidence of non-communicable chronic conditions. Physical activity functions both as preventive care and as a therapeutic intervention in disease states. Inadequate levels of physical

activity are associated with higher rates of disease in aging populations. Therefore, structured exercise regimens should be carefully tailored and monitored, much like any other medical treatment, taking into account the dose-response relationship and the necessary specific adaptations to achieve desired results. Progressive resistance training is particularly crucial for maintaining or enhancing functional abilities in older adults, especially those with frailty, sarcopenia, osteoporosis, or those in hospitals or residential care. Physical activity and exercise exhibit a dose-response relationship that varies between individuals, requiring personalized approaches that address specific medical conditions.

Impact of aging on brain neurotransmitter balance and basal phosphorylation of channels and enzymes crucial for synaptic plasticity

Author
Diana Cunha-Reis – Departamento de Biologia, and 2Biosystems & Integrative Sciences Institute (BioISI), Faculdade de Ciências da Universidade de Lisboa, Lisboa, Portugal.

Citation
Cunha-Reis, D. Impact of aging on brain neurotransmitter balance and basal phosphorylation of channels and enzymes crucial for synaptic plasticity.

Short Bio
Diana Cunha-Reis, PhD in Biomedical Sciences, Neuroscience Specialty at Fac. Medicine, Univ. Lisbon, is a Researcher at Biology Dept. and BioSystems & Integrative Sci. Inst. (BioISI), Fac. Sciences, Univ. Lisbon (FCUL) and was formerly secretary of the Portuguese Physiological Society (2019-2022). DCR was responsible for several Physiology/Human Physiology courses: DQB, FCUL (2019-21); Univ. Lusófona (2012-14) and PI of two FCT research projects. She currently studies synaptic metaplasticity in postweaning brain development, aging and epilepsy and its value as therapeutic target in human aging, neurodevelopmental disorders and mesia temporal lobe epilepsy (MTLE).

Abstract

The hippocampus and the prefrontal cortex are among the most affected brain regions upon aging. Synaptic plasticity mechanisms are essential for hippocampal-dependent learning and memory processes, but also to regulate attention and executive function in the prefrontal cortex. Regulation of synaptic plasticity in both brain regions relies on control of brain neurotransmitter balance[1] as well as of basal phosphorylation levels of both enzymes (CamKII) and ionotropic glutamate receptors (AMPA/NMDA) involved in synaptic plasticity. Maladaptive synaptic plasticity can contribute cognitive decline upon natural aging or in disease processes like epilepsy.

This lecture will focus recent evidence from our Lab on changes in synaptic composition, neurotransmitter balance and basal phosphorylation status of hippocampal and prefrontal cortex synapses upon natural aging and in a rodent model of accelerated aging induced by D-galactose exposure. We will correlate these with behavioural data on cognitive performance in learning and memory tasks, motor performance, impulsivity and decision making and discuss them in the context of the possible limitations generated on synaptic plasticity events like long-term potentiation (LTP) and long-term depression (LTD) and the role of alterations in the brain monoaminergic system in this natural physiological decline.

Reference

1. Gil, M. et al. (2024) Biomolecules 14: 379.

Decoding tissue aging: connecting inflammation with accelerated biological age and chronic diseases

Author
José Pedro Castro – I3S

Citation
Castro, J.P. Decoding tissue aging: connecting inflammation with accelerated biological age and chronic diseases.

Short Bio

José Pedro Castro (JPC) completed his PhD in Biomedicine at the University of Porto (2015) and joined Tilman Grune's lab at the German Institute of Human Nutrition (Berlin, 2015-2018). In 2018, he joined Vadim Gladyshev's lab at Harvard Medical School (Boston, 2018-2021). He's now an Assistant Researcher (CEEC, 2023-2029) at I3S. His work includes publications in *Cell*, *Science Advances*, *Nature Comms, Nature Aging*.JPC has 9 awards, has given >20 talks, and co-founded SPMCLong.

Abstract

Chronic sterile low-grade inflammation, a critical contributor to aging, underlies many leading causes of death, such as heart disease, neurodegeneration and cancer. Understanding the intricate connection between inflammation and accelerated aging is essential for tracking the progression of chronic diseases.

Our study leveraged Tabula Muris mouse data to identify a specific tissue cluster (Heart, Liver, Lung, Kidney) that exhibits accelerated biological aging. This cluster consistently showed signs of accelerated aging across

various transcriptomic aging clocks, including BioAge and InflammationAge. Inflammation was the predominant factor explaining this acceleration, with the Heart displaying the strongest association (R=0.746, FDR=4.32e-07). Interestingly, we observed a consistent upregulation of the Cd74 gene across mouse cell types within this cluster.

To enhance robustness, we derived a gene signature based on module analysis, which outperformed other common inflammatory signatures. Grafting experiments in mice revealed that young hearts grafted into old animals accelerates biological aging and upregulates the Cd74 signature, whereas grafting an old heart into a young animal reduces bio age and Cd74 signature. Using Mendelian Randomization for CD74 eQTLs in blood, we identified a causal role for CD74 in driving human diseases such as chronic kidney disease, chronic heart failure, and chronic obstructive pulmonary disease.. Furthermore, using UK Biobank plasma proteome data, we found positive hazard ratios for the CD74 protein signature in several chronic diseases, e.g. liver disease (HR=1.8, FDR=6.98e-11) and ischemic stroke (HR=1.2, FDR=1.31e-03).

In conclusion, our study has unveiled a novel gene signature that may serve as a biomarker for predicting chronic diseases. Additionally, we have established a solid connection between inflammation and tissue-accelerated aging, providing a deeper understanding of the biology of aging and disease progression.

A current look at healthy brain aging: a normative structural and functional imaging perspective

Author
Helena Rico Pereira – Instituto de Biofísica e Engenharia Biomédica, Faculdade de Ciências da Universidade de Lisboa

Citation
Pereira, H.R. A current look at healthy brain aging: a normative structural and functional imaging perspective.

Short Bio

Helena Rico Pereira holds a master's degree in Biomedical Engineering from FCT NOVA. From 2019 to 2021, she had a fellowship by the Instituto de Biofísica e Engenharia Biomédica at the Universidade de Lisboa, where she focused on studying imaging biomarkers, including brain connectivity measures, to deepen the understanding of how neurodegenerative disorders impact the brain. Following this, she received a fellowship from the Fundação para a Ciência e a Tecnologia (FCT) to pursue a PhD in Biomedical Engineering at FCT NOVA, with a focus on dementia research.

Abstract

Understanding and identifying the core structural and functional features of a healthy brain across the lifespan is crucial to define healthy aging and propel knowledge about brain pathologies. These core features can, for instance, be obtained from magnetic resonance imaging (MRI) brain scans using high-resolution volumetric T1-weighted, diffusion tensor imaging and blood-oxygen level dependent sequences. These sequences provide data than can be used to produce normative models, consisting

of statistical and/or artificial intelligence models that translate the patterns of healthy physiological processes. Therefore, these models promise to support clinicians in identifying age-related changes and how much a patient deviates from what is considered to be "normal" aging. As such, characterizing brain atrophy and functional impairment for each individual person along time will allow for better disease monitoring and precision treatments. In this lecture, using an interactive approach, the applications of brain normative modelling, including models currently used in clinical practice, will be shown. In particular, models developed in our research group using both structural and functional MRI biomarkers of dementia and psychiatric disorders will be described. Finally, the models' roles in defining personalized brain aging trajectories will also be described, considering both their challenges and limitations, and future roadmaps.

Thematic seminar on cardiovascular physiology (Friday, 8th November – 09:00-10:45)
Pulmonary hypertension in humans: a pathophysiological perspective

Author
Francisco Perez-Vizcaino – Universidad Complutese de Madrid and Ciber Enfermedades Respiratorias

Citation
Perez-Vizcaino, F. Pulmonary hypertension in humans: a pathophysiological perspective.

Short Bio
Francisco Perez-Vizcaino is full professor and head of Dept. of Pharmacology and Toxicology at the School of Medicine, Universidad Complutense de Madrid. Has supervised 21 PhD Doctoral Thesis and published more than 200 papers with an h index of 52 (Scopus). His main interest is Vascular Pharmacology and Pathophysiology. He has focused most of his work on the pulmonary circulation and lately also on erectile function. In recent years, he has been working on the impact of vitamin D and potassium channels in pulmonary hypertension and erectile dysfunction.

Abstract

Pulmonary arterial hypertension (PAH) is a heterogeneous pathophysiological condition characterized by progressive pulmonary vascular narrowing that ultimately results in right-sided heart failure and eventually death. The effectiveness of current pharmacological treatments, based on vasodilator mechanisms, is suboptimal and a large proportion of patients still had events or died despite receiving combination therapy. The mechanisms underlying PAH involve a primary dysfunction of the pulmonary endothelium, although it is poorly understood how it is initiated and how it progresses in the different clinical settings. A misbalance between Bone Morphogenetic Protein Receptor II (BMPR2) and Transforming Growth Factor-β (TGF-β) pathways is a hallmark of PAH. Loss of function mutation of BMPR2 gene or downregulated or dysfunctional BMPR2 signaling leads to aberrant PASMC proliferation. Other pathophysiological factors include inflammatory mediators, vasoactive factors (endothelin-1, serotonin, thromboxane A2) and metabolic changes involved. Endothelial dysfunction and ionic remodelling (i.e. downregulation of potassium channels, notably Kv1.5 and TASK1 channels) greatly contribute to the pathophysiology and are considered early and common features in most, if not all, forms of PH. Antiproliferative drugs based on the antagonism of activins are promising novel therapeutic strategies. We have been lately exploring the impact of vitamin D deficiency and vitamin D restoration.

Induced animal models of pulmonary hypertension: what have we learned from them so far?

Author
Pedro Ferreira – Cardiovascular R&D Centre - UnIC@RISE, Department of Surgery and Physiology, Faculty of Medicine of the University of Porto, Porto, Portugal

Citation
Ferreira, P. Induced animal models of pulmonary hypertension: what have we learned from them so far?

Short Bio

Pedro Mendes Ferreira is a Biologist from the University of Porto, working in pulmonary arterial hypertension models for more than 15 years. His main interests are right ventricular function and the development of new animal models. He is currently in charge of the large animal laboratory at the Faculty of Medicine of the University of Porto, where not only research is done, but also medical training and pharma-driven projects are developed.

Abstract

Pulmonary arterial hypertension has been graced with the creation of several animal models of disease, which have allowed the development of several currently approved drugs. From toxin to surgically-induced models, this presentation will describe the different available models, from rodents to large animals, that exist to study this rare, but complex disease.

Spontaneous animal models of pulmonary hypertension: what can we still learn from them?

Author
Elena Carreton – Universidad de Las Palmas de Gran Canaria
Yaiza Falcón-Cordón – Universidad de Las Palmas de Gran Canaria
Noelia Costa-Rodríguez – Universidad de Las Palmas de Gran Canaria
Daniel J Vera-Rodríguez – Universidad de Las Palmas de Gran Canaria
José Alberto Montoya-Alonso – Universidad de Las Palmas de Gran Canaria

Citation
Carreton, E., Falcón-Cordón, Y., Costa-Rodríguez, N., Vera-Rodríguez, D.J., Montoya-Alonso, J.A. Spontaneous animal models of pulmonary hypertension: what can we still learn from them?

Short Bio

She holds a PhD in Veterinary Medicine from the University of Las Palmas de Gran Canaria (ULPGC), Spain, where she is an Associate Professor and works at the Research Institute of Biomedical and Health Sciences and the Veterinary Teaching Hospital. She has served as president of the European Society of Dirofilariosis and Angiostrongylosis (ESDA) and is a member of the American Heartworm Society (AHS). Her research focuses on the pathology and epidemiology of *Dirofilaria immitis*, studying cardiopulmonary biomarkers, pulmonary hypertension, and parasite survival mechanisms. She has published 75 articles, mostly in Q1 journals, and participated in over 200 conferences.

Abstract

Spontaneous animal models of pulmonary hypertension (PH) offer valuable insights into the disease's pathophysiology, diagnosis, and treatment, paralleling findings in human medicine. These models, especially in species like dogs, naturally develop PH due to factors such as parasitic infections (*Dirofilaria immitis*), chronic lung diseases, or left heart failure, mimicking human PH subtypes. Despite advances in understanding PH mechanisms, spontaneous animal models continue to provide critical information on vascular remodeling, right ventricular dysfunction, and pulmonary vascular resistance.

A major advantage of these models is their ability to represent complex, multifactorial etiologies, including genetic predispositions, environmental triggers, and systemic interactions, which may be more difficult to replicate in induced models. These naturally occurring cases help refine diagnostic techniques such as echocardiography and the use of biomarkers, allowing for the study of disease progression in real-time clinical settings.

Furthermore, spontaneous models are invaluable in evaluating therapeutic responses, particularly for drugs like PDE-5 inhibitors, which are used to manage human PH. While these models have advanced the field, there remain gaps in understanding species-specific variations, long-term outcomes, and the underlying genetic mechanisms of PH. Continuing therapeutic targets and enhance translational medicine in PH.

Thematic seminar on physiology of the adipose tissue (Friday, 8th November – 15:15-16:45) Revisiting catecholamines in adipose tissue function

Author
Silvia Conde – iNOVA4Health, NOVA Medical School, Faculdade de Ciências Médicas, Universidade NOVA de Lisboa
Paulo Matafome – Polytechnic University of Coimbra, Coimbra Health School, Coimbra, PortugalUniversity of Coimbra, Institute of Clinical and Biomedical Research (iCBR), Faculty of Medicine and CIBB, Coimbra, Portugal

Citation
Conde, S., Matafome, P. Revisiting catecholamines in adipose tissue function.

Short Bio
Silvia V. Conde (ORCID 0000-0002-5920-5700) is a Professor of Pharmacology and Neuroscience and Principal Investigator at NOVA Medical School (NMS). She pursued her PhD in Pharmacology from the NOVA University of Lisbon (Portugal) and in Biotechnology from the University of Valladolid (Spain) . She has pioneered research into how the CBs controls glucose regulation. Her current focus is on exploring neural regulation of cellular and energy-metabolism, metabolism reprogramming, neuronal protection and periphery-brain/neuro-immune interactions in cells, animals and humans. Her group aims to investigate neural circuits and mechanisms, genetics, and lifestyle (e.g. nutrition) underlying and influencing these functions.

Abstract

Adipose tissue is widely recognized as an endocrine organ, playing an active role in regulating metabolism and energy homeostasis. Adipose tissue dysfunction, characterized by low-grade inflammation, impaired angiogenesis and insulin sensitivity, particularly in the visceral depots, belong to the primary defects in obesity, and are strongly associated with insulin resistance and obesity-related diseases. Catecholamines are physiologically active molecules that act as neurotransmitters and hormones. While the roles of norepinephrine and epinephrine in adipose tissue, especially in relation to their lipolytic effects and their resistance in obesity, have been intensely studied, the dopaminergic system has only recently been recognized as playing a significant role in adipose tissue metabolism, including on the regulation of lipolysis and glucose metabolism. In this symposium we will review in a concise manner the roles of dopamine on the adipose tissue function, with a special focus on obesity and its associated diseases. Moreover, we will show recent findings showing that dopamine receptors are present in macrophages within the adipose tissue and that their levels correlate with adipose tissue inflammation suggesting that dopamine receptors may be involved in the human adipose tissue inflammatory process.

Perivascular adipose tissue: a dynamic mediator of vascular health and inflammation in obesity-related cardiovascular disease

Author
Cristina Sena – Institute of Physiology, Faculty of Medicine, University of Coimbra, Portugal

Citation
Sena, C. Perivascular adipose tissue: a dynamic mediator of vascular health and inflammation in obesity-related cardiovascular disease.

Short Bio

Cristina M Sena is a Professor of Physiology in Faculty of Medicine, University of Coimbra and has Agregação (equivalent to Habilitation). In recent years her research interests have focused to obesity-induced vascular dysfunction and the underlying mechanisms in the vascular wall. She studies the pathophysiology of diabetes and its complications in obesity and diabetes. The main objective is to understand the role played by endothelium, vascular smooth muscle cells and perivascular adipose tissue in vascular disease associated with obesity and diabetes and evaluate oxidative stress and inflammation in this context. Google Scholar: 133 publications, h-index 33, 4169 citations; i10 54

Abstract

Perivascular Adipose Tissue (PVAT) is now recognized as a metabolically active tissue with a significant role in vascular function and cardiovascular health. Previously considered a structural component, PVAT is now known

to contribute to diseases like atherosclerosis, hypertension, and vascular inflammation.

In healthy states, PVAT secretes beneficial adipokines, like adiponectin, with anti-inflammatory and vasodilatory effects that help maintain vascular homeostasis. However, in obesity, PVAT undergoes structural changes and secretes pro-inflammatory adipokines such as TNF-α and IL-6. This leads to chronic inflammation, smooth muscle cell dysfunction, and thickening of vessel walls, contributing to vascular diseases. Additionally, obesity impairs PVAT's ability to release vasodilatory factors, promoting vasoconstriction and hypertension through increased activity of the sympathetic nervous system and vasoconstrictive factors like angiotensin II. This dysfunction exacerbates vascular stiffness, endothelial dysfunction, and thrombosis, driving cardiovascular risks. Emerging therapies targeting PVAT dysfunction, such as anti-inflammatory drugs, lifestyle changes, and adipose tissue transplantation, are showing promise in reversing vascular damage.

In conclusion, PVAT plays a crucial role in linking obesity and cardiovascular disease, making it an important target for therapeutic strategies aimed at reducing obesity-related cardiovascular complications and improving patient outcomes.

Clinical and molecular profiling of human visceral adipose tissue reveals alterations of the vasculature and remodeling as early hallmarks of dysfunction

Author
Daniela Rosendo-Silva – Coimbra Institute for Clinical and Biomedical Research (iCBR), Faculty of Medicine, University of Coimbra.
Pedro Gomes – Surgery Service, Coimbra University Hospital, Coimbra, Portugal
Sofia Viana – Polytechnic University of Coimbra, Coimbra Health School, Coimbra, Portugal and iCBR, Faculty of Medicine, University of Coimbra
Flávio Reis – Coimbra Institute for Clinical and Biomedical Research (iCBR), Faculty of Medicine, University of Coimbra.
Raquel Seiça – Coimbra Institute for Clinical and Biomedical Research (iCBR), Faculty of Medicine, University of Coimbra.
Paulo Matafome – Polytechnic University of Coimbra, Coimbra Health School, Coimbra, Portugal and iCBR, Faculty of Medicine, University of Coimbra

Citation
Rosendo-Silva, D., Gomes, P., Viana, S., Reis, F., Seiça, R., Matafome, P. Clinical and molecular profiling of human visceral adipose tissue reveals alterations of the vasculature and remodeling as early hallmarks of dysfunction.

Short Bio

Daniela Rosendo da Silva is a PhD student in Health Sciences at the Faculty of Medicine in the University of Coimbra, developing her investigation in the Institute for Clinical and Biomedical Research (FMUC). Daniela is also an Invited Assistant Professor at the Coimbra Health School of the Polytechnic

University of Coimbra. She has published 12 papers in relevant journals on the field of obesity and metabolic diseases (Metabolism, Molecular Metabolism and Obesity Reviews), 5 of them as first author.

Abstract

Adipose tissue dysfunction is a hallmark of the metabolic sequelae of obesity (metabolic syndrome and type 2 diabetes). However, the sequential evolution of adipose tissue dysfunction during each stage of metabolic dysregulation remains unknown. Herein, we aimed to unravel and propose a sequential map of adipose tissue dysfunction.

Subjects with obesity (n=92) at distinct stages of metabolic dysregulation, *i.e.*, insulin sensitivity, insulin resistance, pre-diabetes, and type 2 diabetes, were recruited from the Coimbra University Hospital. The expression of several genes involved in adipose tissue function was evaluated by qPCR in the Biomark HD Fluidigm system. Data analysis was done using R v. 4.3.

Insulin resistance was mainly marked by alterations in hypoxia and vasculature-associated genes and a downregulation of mitochondrial transmembrane transport genes. Prediabetes was characterized by a compensatory response of tissue remodeling mechanisms and an increased response to hypoxia. Type 2 diabetes was associated with loss of cellular response to hypoxia, glutathione and glucose import mechanisms, and concomitant upregulation of inflammatory markers. Our findings suggest a putative sequence of dysregulation of biological processes that is not linear and has multiple phases across the metabolic dysregulation process, ultimately culminating in the climax of adipose tissue dysfunction in type 2 diabetes.

Podium session I
Theme: cardiovascular and respiratory physiology
OC - (24832) - The synchronize response generated by reactive hyperemia might be used as a powerful integrative indicator of cardiovascular health

Author
Lourenço Rodrigues – Cognitive Systems Lab, University of Bremen, Bremen, Germany
Joao Gregório – CBIOS – Universidade Lusofona's Research Center for Biosciences & Health Technologies, Av Campo Grande 1749 024 Lisboa, Portugal
Clemente Rocha – CBIOS – Universidade Lusofona's Research Center for Biosciences & Health Technologies, Av Campo Grande 1749 024 Lisboa, Portugal
Sergio F. Andrade – CBIOS – Universidade Lusofona's Research Center for Biosciences & Health Technologies, Av Campo Grande 1749 024 Lisboa, Portugal
Margarida Florindo – CBIOS – Universidade Lusofona's Research Center for Biosciences & Health Technologies, Av Campo Grande 1749 024 Lisboa, Portugal; ESSCVP—Department of Physiotherapy, The Portuguese Red Cross Health School, Av. De Ceuta, 1350-125 Lisbon, Portugal
Luís M. Rodrigues – CBIOS – Universidade Lusofona's Research Center for Biosciences & Health Technologies, Av Campo Grande 1749 024 Lisboa, Portugal

Citation
Rodrigues, L., Gregório, J., Rocha, C., Andrade, S.F., Rodrigues, M.F., L.M. The synchronize response generated by reactive hyperemia might be used as a powerful integrative indicator of cardiovascular health.

Presenting Author Profile
Master in Biomedical Engineering in 2021 from the University of Lisbon (IST) Portugal. Physiological computing specialist and machine learning engineer for CardioID Technologies, (PRT) until 2023. Currently PhD student at the Cognitive Systems Laboratory at the University of Bremen (FRG) specially dedicated to knowledge representation for health data with temporal evolution.

Abstract
Recent research on reactive hyperemia (RH) has demonstrated that RH (a) does not require ischemia occurring with any provoked modification of local perfusion (b) responses, often detected in extremities, are observable in both limbs which means that (c) the involved mechanism is centrally mediated and cannot be regarded as an indicator of endothelial function as once accepted. This reflex evoked by RH in both limbs is an adaptive response involving all elements of cardiovascular homeostasis. Therefore, the respective synchrony might be quantified and used as a measure of the effectiveness of perfusion adaptation. This work tests the potential use of this new indicator of cardiovascular function.

We use data from various cohorts (n=140) from both sex and different age groups submitted to the same experimental protocol four phases: baseline measurement at rest, application of stimulus, immediate recovery after its interruption, and a late recovery. Laser Doppler flowmetry was the reference perfusion assessment technology, using probes placed on both limbs. This adaptive synchrony was computed by subtracting each limb´s signal's baseline value (the mean value registered during the baseline phase), segmenting the period of interest (stimulation and/or recovery), and calculating the normalized correlation between the resulting segments

from both limbs. The closer to „1", the more synchronous, meaning that any reduction in this value will suggest a reduction in this adaptive response.

This variable is insensitive to the absolute scale of measured perfusion levels, depending only on how alterations of perfusion in the ipsilateral limb are simultaneously replicated on the contralateral limb. Unlike blood pressure / mean blood pressure or the Ankle-Brachial Index providing single momentaneous measurements, this adaptive synchrony can be used as a measure of the perfusion adaptation effectiveness in each individual, e.g. an indicator of their global cardiovascular status.

OC - (24834) - Significance of perfusion asymmetries in sedentary non-healthy individuals

Author
Margarida Florindo – Portuguese Red Cross Health School – Lisbon; CBIOS – Universidade Lusofona's Research Center for Biosciences & Health Technologies
João Gregório – CBIOS – Universidade Lusofona's Research Center for Biosciences & Health Technologies; Universidade Lusófona CBIOS - Research Center for Biosciences and Health Technologies

Citation
Florindo, M., Gregório, J. Significance of perfusion asymmetries in sedentary non-healthy individuals.

Presenting Author Profile

Margarida Florindo, Physiotherapist since 1984, specializing in neurological conditions, with ongoing clinical practice. Adjunct Professor in the Department of Physiotherapy at the Portuguese Red Cross Health School-Lisbon, with a master's in social and health management Intervention (2007), a rehabilitation specialist title (2011), and a PhD (2023) from Alcalá University and Lusófona University. CBIOS researcher with special interest in motor control, neurology, and peripheral circulation.

Abstract

Perfusion asymmetries in the lower limbs have been associated with vascular disease, although their full significance is still unclear. Physical activity has been referred to reduce perfusion differences in healthy individuals. Our objective was to investigate the impact of a regular 30-daily physical activity program in older adults with multiple comorbidities. A convenience sample

of ten adults of both sexes (mean age 62.4 ± 5.6 years old) was selected from among the physiotherapy patients from the practice of one of the authors. All procedures respected the critical aspects of good clinical practice. The light physical activity program included simple movements, e.g., walking and step-in-place, and was defined following the FITT principles (Frequency, Intensity, Time/duration, and Type of activity). Perfusion was assessed in the anterior region of both feet using two optical non-invasive technologies with different light frequencies - Laser Doppler Flowmetry (LDF), at the third metatarsophalangeal joint, and Polarized Light Spectroscopy (PSp) in a region of interest on the dorsum of both feet. On D0, all participants had significant perfusion differences between right and left feet ($p=0.005$ with LDF and $p=0.028$ with PSp) at rest. These differences disappeared with the activity and reappeared in recovery. After 30 days of activity, both feet showed significant perfusion increases as assessed with LDF ($p=0.005$) compared to D0, but the perfusion asymmetry observed at rest on D0 was no longer present ($p=0.059$). The superficial perfusion asymmetry assessed by PSp, however, persisted at D30 ($p=0.028$). Perfusion asymmetries observed during recovery (after performing the activity program) at D0 were not present at D30. Data suggest that this physical activity routine positively influenced the lower limb perfusion pattern in both feet, confirming that symmetry-asymmetry might be relevant in the prevention, treatment, and rehabilitation of vascular conditions.

OC - (24860) - Novel web platform for collaborative annotation of point-of-care ultrasound (POCUS) lung images

Author
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Citation
Rodrigues-Reis, P.M., Oliveira-Saraiva, D., Leote, J., Canais, F., Maçorano, R., Gonzalez, F., Ferreira, H.A. Novel web platform for collaborative annotation of point-of-care ultrasound (POCUS) lung images.

Presenting Author Profile
Pedro Miguel Rodrigues Reis is a Telecommunications and Informatics Engineer, from Instituto Superior Técnico, working presently as a system administrator for a Spanish bank. Meanwhile, Pedro was offered to create a web platform that could read lung images captured by a point of care ultrasound, analyze them and save annotations made by signed in users (doctors) on the web platform.

Abstract

The THOR (Thoracic Assessment using Point-of-Care Ultrasound) project was initiated during the COVID-19 pandemic to enhance diagnostic accuracy for patients potentially infected with the virus. The project focuses on lung imaging, specifically on how such images captured using a Point-of-Care Ultrasound (POCUS) device can be analyzed and annotated by doctors globally through a user-friendly web platform.

POCUS, a portable and non-invasive diagnostic tool, allows for rapid disease assessment. Within the THOR project, lung ultrasound images are uploaded to the hospital's server and securely retrieved by the platform. Doctors can then log in to review, annotate, and provide a clinical interpretation of these images.

The platform standardizes the annotation process by focusing on critical features such as lung fields, A-lines, B-lines, pleural membrane characteristics, and the presence of pleural effusion and pneumothorax. Images are randomly and blindly distributed to doctors, ensuring unbiased annotations. Aggregated annotations are then used to achieve statistical consensus, either automatically or semi-automatically, resulting in a final annotation and Lung Ultrasound Score, useful for diagnosis and prognosis of lung diseases, including the need for Intensive Care Unit admission in a COVID-19 disease context.

This platform supports clinical decision-making and the training of junior doctors and other medical professionals in lung ultrasound interpretation. Additionally, it provides a valuable dataset for developing artificial intelligence (AI) algorithms. The THOR platform's potential is believed to be particularly significant in resource-limited settings, such as regions affected by pandemics, natural disasters, war, poverty, and where access to advanced diagnostic tools is limited. By combining the portability of POCUS with the global reach of the web platform, THOR aims to deliver accurate, real-time diagnostic capabilities, improving patient outcomes worldwide.

OC - (24870) - Sex differences in the oxygen consumption response during an incremental test with high and low blood flow restriction in young adults

Author
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Manuel Avelino Giráldez García – Universidade da coruña
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Ana Jimena Páez Díaz – Orpea Residencias. EMEIS Iberia.
Marta Sevilla Sánchez – Universidade da coruña
Eduardo Carballeira Fernández – Universidade da coruña

Citation
Mejía, S.L.R., García, M.A.G., Sieira, I.N., Villa, M.A.C., Córdoba, M.L., Madruga, G., Amboage, P.V., Díaz, A.J.P., Sánchez, M.S., Fernández, E.C. Sex differences in the oxygen consumption response during an incremental test with high and low blood flow restriction in young adults.

Presenting Author Profile
Academic training:
Phyical Therapist (UIS Colombia); Sp.Cardiac and Pulmonary Rehabilitation and Adult Critical Care (UR Colombia);

Master in Physiotherapy (UIS); PhD student of the Official Program in Sports Sciences, Physical Education and Healthy Physical Activity (UDC Spain)

Academic activity: Professor of the Department of Physiotherapy at UIS-UDES Colombia

Subject profile: evaluation and physiotherapy intervention in the cardiovascular-pulmonary area, research methodology

Abstract

Sex differences in responses during exercise are an essential objective for exercise physiology. This study aimed to investigate the oxygen consumption (VO_2) response during an incremental test with different degrees of BFR in healthy young adults. Participants with 18-35 years, performed the Naughton test in three conditions: BFR40 (BFR at 40% of Arterial Occlusion Pressure (AOP)), BFR80 (BFR at 80% of AOP) and CON (without BFR). Peak VO_2 (VO_2 peak) was measured breath by breath with portable indirect calorimetry (CORTEX METAMAX ® 3B). BFR was applied in the inguinal fold of the lower limbs, using nylon flexibles cuffs, with continue pressure (MAD-UP PRO, 2020). AOP was measured in a standing position with the same cuffs and equipment. *T* test or Mann-Whitney U and a linear mixed model analysis were conducted. Ten male (M, 21.0±3.0 years, BMI= 23.7±3.1 kg/m^2) and 10 women (W, 21.0±9.0 years, BMI= 23.6±3.0 kg/m^2] participated, the latter reported a menstrual cycle duration of 32.1±7.3 days, non-use of hormonal contraceptives, and regular menstrual cycles (n:9). Differences between lean mass (W:28.0±6.4% vs. M:40±4%, $p<0.05$), basal metabolic rate (W:1296±170 kcal vs. M: 1779±310 kcal, $p<0.05$) and VO_2 peak in the CON session (W:40±5 kg.ml^{-1}.min^{-1} vs. M:49±3 kg.ml^{-1}.min^{-1}; *p:* 0.004) were found. An interaction was also found between the level of intensity during the incremental test and sex in all conditions (R^2 0.95, $F_{7,347.8}$= 9.212, $p<0.001$). The simple effects analysis, where we examine the effect of intensity level and sex, moderated by condition, revealed that women significantly increased their percentage of VO_2 relative to the first stage (rest) compared to men, starting from stage 5 in CON (9.41, 95% CI [2.59; 16.22]), and from stage 4 in both the BFR40 (8.32, 95% CI [1.50; 15.13,]) and BFR80 (Estimate: 8.18, 95% CI [1.37; 15.00]). These findings reveal a different response of women to endurance exercise with BFR.

OC - (24893) - Contribution of adenosine and ATP to the carotid body-mediated hypoxic ventilatory responses: a metabolic switch between control and dysmetabolic states

Author
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Citation
Sacramento, J.F., Melo, G.M., Prego, C.S., Conde, S.V. Contribution of adenosine and ATP to the carotid body-mediated hypoxic ventilatory responses: a metabolic switch between control and dysmetabolic states.

Presenting Author Profile
I am graduated in Molecular and Cellular Biology and obtained my master's in Biotechnology in 2012. I finished my PhD in Mechanisms of Disease and Regenerative Medicine (NOVA Medical School), on the modulation of carotid body activity as a therapeutic intervention in metabolic diseases in 2019. Currently, I am a Junior Researcher and I am dedicated to the decoding of carotid sinus nerve activity to treat type 2 diabetes.

Abstract

The carotid body (CB) is a metabolic sensor whose dysfunction is implicated in the development of metabolic diseases. Adenosine (Ado) and ATP have a key role in setting CB function in baseline and hypoxic conditions. However, is not clear their role in the CB hypertonicity and hyperchemosensitivity in dysmetabolism. Here we explore the contribution of ATP and Ado to CB hypertonicity and hyperchemosensitivity in dysmetabolic states.

The contribution of Ado and ATP for the CB-evoked responses was studied in Wistar rats fed a standard orhigh fat (HF) diet (21 days) at the level of: ventilation; carotid sinus nerve (CSN) activity; Ado and ATP release and ATP and Ado receptors immunolabelling in the CB. Ventilatory responses and CSN-responses were investigated by using: ZM241385 (300nM; A_2 Ado antagonist), SCH58261 (20nM; A_{2A} Ado antagonist) and AF-353 (1μM; $P2X_3$ ATP antagonist). Experiments were approved by NMS Ethics Committee.

HF animals exhibit an increase in basal CSN activity and ventilation; similar CSN discharges evoked by hypoxia and hypercapnia compared with control animals; no alterations in CB A_{2A} Ado receptor immunoreactivity. SCH58261 and AF353 restored CSN activity, but not basal ventilation. AF353 decreased by 70% and 74% ($p<0.01$) the CSN response to hypoxia (0%O_2) in both group of animals. In contrast, SCH58261 promoted a higher decrease in the CSN activity evoked by 5%O_2 in both control and HF animals. Hypoxia ventilatory response decrease 41% ($p<0.01$) with SCH58261 in control animals, while in HF animals decreased 38% ($p<0.05$) with AF353. CSN resection abolished the hypoxic ventilatory response in all groups.

We conclude that in dysmetabolic states Ado and ATP are involved in the CB hypertonicity and that ATP is mainly involved in CB chemotransduction to intense hypoxia, while Ado is more relevant in moderate hypoxia. Also, CB-mediated hypoxic ventilatory responses modulated by Ado and ATP shifts between control and dysmetabolic states.

Theme: GI, endocrine metabolic and nutrition physiology
OC - (24848) - Characterization of the dopaminergic system in human visceral adipose tissue in obesity and type 2 diabetes

Author
Daniela Parente – Nova Medical School; iNOVA4Health
Ana Francisca Duro – Nova Medical School; iNOVA4Health
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Rodrigo O. Oliveira – Nova Medical School; iNOVA4Health
Fátima O. Martins – Nova Medical School; iNOVA4Health
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Citation
Parente, D., Duro, A.F., Sacramento, J.F., Oliveira, R.O., Martins, F.O., Conde, S.V. Characterization of the dopaminergic system in human visceral adipose tissue in obesity and type 2 diabetes.

Presenting Author Profile
Graduated in Biochemistry at NOVA School of Science and Technology. Currently master student in Biomedical Research at NOVA Medical School.

Abstract

Dysregulation of adipose tissue (AT) metabolism is a core feature behind the development of metabolic diseases. Dysfunctional adipocytes initiates AT inflammation due to secretion of inflammatory adipokines along with infiltration of immune cells. Dopamine, a physiologically active molecule acting as a neurotransmitter, has been posed to have a huge role on AT metabolism, including on the regulation of lipolysis and glucose metabolism. Herein we investigate if dopamine receptors are present in inflammatory cells within the AT and if their levels correlate with inflammatory markers in conditions of obesity and dysmetabolism.

Samples of AT were collected at Hospital da Cruz Vermelha, from obese patients submitted to bariatric surgery and normal weight controls undergoing other types of surgeries. Study was approved by the Hospital da Cruz Vermelha and NOVA Medical School Ethics Committee (NR012/20 and 92/2020/CEFCM) and performed in accordance with the Helsinki Declaration. Stratification of patients was performed based on BMI, HbA1c levels and HOMA-IR. AT samples fixed in paraformaldehyde were used for immunohistochemistry studies to investigate and quantify the levels of dopamine D1, D2 and D4 receptors in adipocytes and macrophages.

We found that dopamine D1, D2 and D4 receptors and macrophages levels in human AT are associated with obesity and type 2 diabetes. Moreover, dopamine receptors co-localize with macrophages in human VAT, being the levels of dopamine receptors and macrophages elevated in obese patients, compared to controls. All the three dopamine receptors analyzed demonstrated to be correlated with F4/80 levels, a with D4R exhibiting the strongest correlation. In conclusion, our findings indicate that dopamine receptors may be involved in the human AT inflammatory process. We suggest that targeting of dopamine receptors may be a therapeutic approach to avoid AT inflammation, and so to decrease the risk of obesity associated cardiometabolic diseases.

OC - (24859) - Oxidative stress and histomorphometric gut remodeling in type 2 diabetic GK rats

Author
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Margarida Duarte-Araújo – LAQV-REQUIMTE, University of Porto, Portugal; Department of Immuno-Physiology and Pharmacology, Institute of Biomedical Sciences Abel Salazar, University of Porto (ICBAS-UP), Portugal

Citation
Esteves-Monteiro, M., Ferreira-Duarte, M., Vitorino-Oliveira, C., Oliveira, S., Matafome, P., Morato, M., Dias-Pereira, P., Costa, V.M., Duarte-Araújo, M. Oxidative stress and histomorphometric gut remodeling in type 2 diabetic GK rats.

Presenting Author Profile

My name is Marisa Monteiro, I have a master's degree in Veterinary Medicine from School of Medicine and Biomedical Sciences, University of Porto (ICBAS-UP) where I am currently pursuing a PhD in Veterinary Sciences. During my PhD, I have delivered seminars on endocrine pancreas physiology to veterinary medicine students and worked with animal models of both type 1 and type 2 diabetes. I have published five papers in indexed journals along with presenting multiple posters and oral presentations.

Abstract

Gastrointestinal (GI) complications of *Diabetes mellitus* (DM) are often overlooked, despite affecting up to 75% of patients. This study explores local glutathione (GSH) levels and morphometric changes in Goto-Kakizaki (GK) rats, a non-obese model of type 2 DM (T2DM). This study involved ~20-week-old male rats: 6 GK and 5 *Wistar Han* rats (used as controls). Segments of the duodenum, jejunum, ileum, cecum, proximal and distal colon were collected for histopathological analysis and for quantifying total GSH (tGSH) and oxidized glutathione (GSSG).

As expected, GK rats were hyperglycemic and displayed classic DM symptoms. Histomorphometric evaluation revealed a significant increase in the total thickness of the intestinal wall in GK rats compared to controls, particularly in the duodenum (1089.02±39.19 vs. 864.19±37.17μm), ileum (726.29±24.75 vs. 498.76±16.86μm), cecum (642.24±34.15 vs. 500.97±28.81μm) and distal colon (1211.81±51.32 vs. 831.71±53.2 μm). Additionally, diabetic rats exhibited thickening of the gut muscular layers in all segments except for the duodenum. The number of smooth muscle cell (SMC) nuclei *per* 100 μm^2 was reduced in all segments of GK rats, except duodenum, indicating SMC hypertrophy. Also, neuronal density in the myenteric plexus (nuclei *per* mm^2) was lower in GK rats, suggesting potential neurological loss. tGSH levels were lower in all intestinal segments of diabetic rats compared to controls, except duodenum. Furthermore, the GSH/GSSG ratio was significantly reduced in GK rats, indicating increased oxidative stress.

Our data shows that intestinal remodeling and myenteric neuronal loss occur in the GK rat model of T2DM, likely driven by increased oxidative stress. These findings may provide valuable insights to better understand GI alterations observed in diabetic patients.

Theme: Other (miscellaneous)
OC - (24873) - Body composition, interleukin 6, and vitamin D levels according to different stages of menopause

Author
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Citation
Teixeira, A., Abrantes, C., Ferreira, L., Santarém, D., Andrade, D., Moreira, H. Body composition, interleukin 6, and vitamin D levels according to different stages of menopause.

Presenting Author Profile

She has a degree in Psychomotor Rehabilitation, a Master's in Gerontology, and a PhD in Sports Science from UTAD. Her research focuses on health benefits of natural environments, particularly in physical activity, sleep, and body composition. Currently, she is a research fellow in A-MoVer project, investigating the integration of biomechanical sensors into ergonomic study to assess driving postures in urban environments, aiming to prevent injuries and enhance human-machine interface performance.

Abstract

Understanding how menopause affects body composition, inflammation, and vitamin D helps identify specific risks and tailor health and prevention strategies. The aim of this study was to compare body composition and levels of IL-6 and vitamin D between women in early (EP) and late (LP) postmenopause. The sample included 114 women, 55 in EP and 59 in LP, with an average age of 58.03 years. Body composition was assessed by octopolar bioimpedance, measuring fat mass (FM), visceral fat level (VFL), and appendicular skeletal muscle mass (ASMM). ASMM was adjusted for body size (ASMMI), with high total and central adiposity defined as FM$\geq$ 35% and VFL> 9 points, respectively, and muscle mass deficit indicated by ASMMI< 15 kg. Bone mineral density (BMD) was measured with a calcaneal ultrasound densitometer. IL-6 and vitamin D levels were evaluated using the Dxl 800 system. Data analysis was conducted using Student's T-test, with significance set at $p \leq 0.05$. Most participants underwent natural menopause (93.9%) and did not use hormone therapy (79.8%). The values of FM and VFL were similar between groups, with the sample showing a high number of women with obesity (75.44%) and excess abdominal adiposity (80.7%). Appendicular skeletal muscle mass (ASMM) was significantly lower in the late postmenopausal group (p=0.01). Mean BMD was 0.46 ± 0.96 g/cm^2 in EP and 0.44 ± 0.10 g/cm^2 in LP (p=0.43), with no differences between stages. Over half of the sample (55.26%) had a deficit of vitamin D levels (< 20 ng/mL), with no significant differences based on menopause stage (18.87 ng/mL in EP and 19.81 ng/mL in LP, p=0.45). Similarly, IL-6 values showed no

significant differences (p=0.26). The lack of differences observed between our variables across menopause stages may be influenced by factors such as sun exposure, diet, and physical activity levels, which should be carefully considered in future research.

Podium session II
Theme: Cardiovascular and respiratory physiology
OC - (24911) - Gut microbiome in stroke patients: potential implications in functional outcomes

Author
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Citation
Martins, D. Gut microbiome in stroke patients: potential implications in functional outcomes.

Presenting Author Profile
Diana Martins is a PhD student in Cardiovascular Sciences at FMUP, researching the microbiome's role in cardiovascular diseases. She holds a biology degree from the Univ. of Aveiro, where she worked on amphibian ecotoxicology. During her master's in Cell & Molecular Biology at FCUP, she focused on medical genetics, with her dissertation on Fabry Disease. She later joined research projects as a fellow. Lately, her scientific production has primarily focused on the cardiovascular field.

Abstract

Stroke is the second leading cause of death worldwide, resulting in significant neurological impairment and long-term disability, thereby imposing substantial health and economic burden. Emerging evidence suggests that the gut microbiome plays a crucial role in the response to stroke. To explore the potential link between the gut microbiome and post-stroke recovery, we conducted a longitudinal study involving 32 stroke patients assessed at two time points: stroke admission (T0) and three months later (T1). Clinical data, as well as faecal and blood samples, were collected. Stroke clinical measurements were evaluated using the National Institute of Health Stroke Scale (NIHSS) for stroke severity and the modified Rankin Scale (mRS) for disability. Faecal microbiome profiling was conducted using 16S rRNA gene amplicon sequencing, while nuclear magnetic resonance was used for metabolomic profiling of plasma samples. As expected, the gut microbiome variation was strongly influenced by inter-individual differences (49%), whereas mRS (1.34%) and antibiotic history (0.87%) contributed to a smaller proportion. Interestingly, stroke patients with higher disability (higher mRS) displayed augmented *Blautia* proportions and decreased plasma metabolites, such as isoleucine and valine. Regarding follow-up, when comparing T0 and T1, there was a higher prevalence of *Prevotella* and a lower prevalence of *Ruminococcus* enterotypes. Additionally, patients exhibited a higher prevalence of the dysbiotic, pro-inflammatory *Bacteroides 2* community type during stroke events than a healthy Western cohort (N=2554). No association was found between NIHSS scores at T0 and mRS scores at T1, indicating that the severity of neurological deficits did not predict functional independence. In conclusion, despite the small sample size and inability to assess causality, our study showed a potential link between gut dysbiosis and stroke severity, offering insights for potential biomarkers related to stroke.

Theme: Comparative physiology OC - (24849) - Maternal aging affects the metabolic profile of the placenta in humans and mice

Author
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Citation
Pinheiro, A.R., Rodrigues, A., Matos, L., Guedes-Martins, L., Almeida, H., Silva, E. Maternal aging affects the metabolic profile of the placenta in humans and mice.

Presenting Author Profile
I graduated with a degree in Genetics and Biotechnology at Trás-Os-Montes e Alto Douro University, and a master's degree in Molecular and Cellular Biology at Aveiro University. In my dissertation project, we observed changes in the expression of nutrient transporters, in placental tissue of different reproductive ages. This dissertation project resulted in a scientific article, which is in the process of publication (major revisions requested), and in oral and poster presentations at events.

Abstract
After the age of 35, during pregnancy, there is an increased risk of impaired placentation. Changes in uterine redox balance seem to play a role in deficient placentation. We hypothesized that this local redox dysregulation has a negative impact on the placenta metabolic profile. Thus, we aimed to study the placenta metabolic profile during reproductive aging and the effect of antioxidant supplementation. Placentas were collected from pregnant women aged between 22 and 41 years, and from mice of different ages (3 or 9 months). Additionally, 9-month-old mice were treated with apocynin (5 mM) in the drinking water (3 weeks prior to and during pregnancy). Semi-quantitative real-time PCR was carried out to assess the expression of glucose and fatty acid transporters. Quantitative results are presented with standard error of the mean (SEM). In the human study, Spearman's

correlation was used for the comparative analysis of the variables studied. In the animal model, Student's t-test was used for comparative analysis of the variables studied. A p-value of less than 0.05 was considered statistically significant. Concerning glucose transport, the results show that the expression of glucose transporter 1 is strongly negatively correlated with maternal age ($r = -0.710$; $p = 0.0121$). Regarding lipid metabolism, there is a strong negative correlation between the fatty acid transporter 4 expression and maternal age ($r = -0.6865$, $p = 0.0233$). In mice, the expression of glucose transporter 1 was also decreased in 9-month-old females ($p = 0.0329$, when compared to the 3-month-old females group). No differences were observed between the reproductively aged females treated with apocynin and the young females ($p = 0.1990$). The results of this study show that reproductive aging is linked with changes in the placenta metabolic profile. In the mice study model, antioxidant supplementation attenuated the changes observed in nutrient transport in the placenta.

Theme: Education
OC - (24847) - Students' perspectives on physiology education in health sciences: first insights from a survey-based observational study

Author
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Citation
Gregório, J., Rodrigues, L.M. Students' perspectives on physiology education in health sciences: first insights from a survey-based observational study.

Presenting Author Profile
João Gregório holds a PhD in International Health from IHMT, NOVA University Lisbon. He is currently an Assistant Researcher at CBIOS, Lusófona University. João's research focuses on data-driven studies exploring the links between blood flow asymmetries and obesity. His work, published in scientific journals, showcases his multidisciplinary skills and expertise in using data science to advance understanding of blood flow asymmetries and obesity-related health issues.

Abstract

Physiology connects theoretical knowledge to practical health applications. Understanding students' perceptions of physiology in their education and careers is crucial for improving curriculum and teaching strategies. This study assesses health sciences students' views on the subject's importance in their academic and professional development. Using a survey-based observational method, the study targeted undergraduate and master's students across multiple universities. The survey was distributed electronically, with voluntary and anonymous participation, and data analyzed in aggregate to maintain confidentiality

Preliminary results from five respondents indicate that students perceive physiology as critical but challenging. Most (60%) noted that it requires integrating knowledge from various courses, emphasizing understanding over memorization. Although all acknowledged the importance of physiology, 80% found the content overwhelming, and 20% felt it required excessive study time. Traditional lectures and labs were frequently used (80%), while didactic games were rarely utilized (60%). All students studied alone, with 60% occasionally studying in groups. Peer summaries were rarely used, with most students relying on instructor-provided materials. The findings suggest that students value physiology but find it challenging due to the need for comprehensive understanding and integration. Extensive content and traditional teaching methods may contribute to this challenge. Moderate application of physiological knowledge in other disciplines highlights gaps in curriculum alignment with interdisciplinary learning.

The study emphasizes using student feedback to improve physiology education. Enhancing teaching methods, reducing content overload, and fostering interdisciplinary applications can boost student engagement and outcomes. These insights will guide strategies to better align education with student needs and health science demands

Theme: Environmental and exercise OC - (24701) - Enhancing mountain running performance: the critical role of resistance strength training

Author
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Citation
Alves, E., Fonseca, J., Rodrigues, M. Enhancing mountain running performance: the critical role of resistance strength training.

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Abstract

Strength is a key attribute that sets a mountain runner apart from a road athlete. Mountain runners face (tackle) continuous inclines, ascents, descents, and uneven terrain, making strength training an essential component of their preparation.

The aim of this study is to evaluate the impact of strength training with maximum and submaximal loads over 4 months on body composition, knee extensor and flexor muscle strength, metabolic capacity, and running biomechanics.

The athletes voluntarily agreed to participate in this study and provided their informed consent. Fifty-six athletes were divided into two groups: the control group, which completed the four-month training without any intervention, and the test group, which undertook a strength training program with maximum and submaximal loads for four months. In the test group, each training session consisted of four different exercises, performed twice a week, with 3 to 4 sets and 4 to 6 repetitions per exercise. Inferential analysis was conducted using SPSS. This software facilitated statistical analysis through both parametric and non-parametric tests, based on data from two evaluation periods.

The control group exhibited no significant changes in most of the analyzed parameters. In contrast, the test group demonstrated significant improvements in body composition, well-being, muscle strength, biomechanics, and metabolic capacity.

In conclusion, resistance strength training positively impacted the physical performance of the test group athletes, enhancing body composition, metabolic capacity, biomechanical efficiency, and muscle strength. Consequently, this protocol significantly boosts performance and refines the specific motor skills required for mountain running. Therefore, strength training should be considered an essential component of physical preparation for mountain runners.

Theme: Nervous system, neuroscience and neurophysiology OC - (24838) - N-acetylaspartylglutamic acid (NAAG): a novel hippocampal compensatory mechanism against glucose intolerance in obesity?

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Citation
Caramelo, B., Mendes, V.M., Cortez, A., Monteiro-Alfredo, T., Sereno, J., Caramelo, J., Castelo-Branco, M., Matafome, P., Manadas, B. N-acetylaspartylglutamic acid (NAAG): a novel hippocampal compensatory mechanism against glucose intolerance in obesity?

Presenting Author Profile

Beatriz Caramelo is a PhD student in the Institute of Clinical and Biomedical Research (iCBR). During her career, she has focused on better understanding the effect of obesity and type 2 diabetes in neurological comorbidities. Recently, she has been focusing her work on the effect of adipose tissue and its inflammatory profile in the previous metabolic syndromes in neurodegenerative diseases.

Abstract

Prolonged high-fat diet (HFD) exposure is suggested to induce synaptic plasticity's disruption. We have recently shown a hippocampal compensatory

mechanism of HFD-fed rats involving NAAG and glutathione upregulation. However, the mechanisms of synaptic and metabolic dysregulation and the temporal evolution of these changes are still unknown. Three groups (male Wistar rats): control (SD, 10weeks); obesity (HFD, 10weeks); T2D (HFD, 10weeks + low STZ dose, 35mg/kg, week4). Then, all rats underwent 1H-MRS to analyse metabolites. The hippocampus was collected for proteomics. Proteins with VIP>0.9 and $p<0.05$ were considered for cluster analysis (Mfuzz package, RStudio). Without glucose dysmetabolism markers, cluster 1 identified upregulated proteins related to elevated calcium in HFD rats which, together with elevated glutamine levels, suggests hyperexcitability. Such is further corroborated by cluster 2 and 3, showing a downregulation of several proteins involved in the GABAergic synapse in the same animals, as well as the control of calcium homeostasis. These alterations are mostly maintained in the T2D group. Besides the enhanced activity of the NAAG, the loss of GABA activity seems to be counteracted by the weakened AMPA receptors' expression in HFD rats. Cluster 3 also shows that a progressively worsened neurogenesis and cell adhesion was present in HFD and HFD+STZ groups, which is concurrent to the potentiated apoptosis, transport and accumulation of beta-amyloid (cluster 4). These clusters also include proteins involved in antioxidant defences, showing that diabetes imposes a prooxidant state in the hippocampus. Obese rats present hippocampal hyperactivity that is accompanied by compensatory mechanisms, revealing synaptic changes prior to glucose dysmetabolism. Mechanisms of neuronal damage are observed only in diabetic rats. Such mechanisms may be useful to understand the early neuronal complications of metabolic diseases.

OC - (24839) - The role of adrenaline modulation in age-related contextual fear memory

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Citation
Seixas, R., Santos, J., Munhoz, J., Oliveira, A., Moreira-Rodrigues, M. The role of adrenaline modulation in age-related contextual fear memory.

Presenting Author Profile
Currently, Rafaela Tavares Seixas is a Neuroscience Ph.D. student at FMUP, with a focus on astrocyte-neuron interactions. She holds a Master's in Neurobiology and a Bachelor's in Biology, with expertise in neuroscience. Rafaela has co-authored six peer-reviewed articles in the area of PTSD and

fear memory and has experience in mentoring. She now aims to contribute to the understanding of astrocyte-neuron interactions and their role in neurodevelopmental disorders.

Abstract

Previous studies have shown age-related differences in fear memory (Moyer et al. 2000, Shoji et al, 2019). Older rats exhibited impairments in fear memory extinction, leading to prolonged freezing behavior. This impairment was associated with decreased neurogenesis and synaptic plasticity in the hippocampus, a region essential for contextual learning and memory. Our aim was to study the influence of adrenaline on age-related changes in contextual fear memory.

An elderly cohort and an adult cohort of male wild-type (WT) and of adrenaline-deficient mice (129x1/SvJ) underwent fear conditioning. On day 1, mice were exposed to 3-foot shocks (2 s, 0.6 mA) followed by contextual reminder exposure on day 2. Response to foot shocks and freezing were evaluated. Results were analyzed by Two-Way ANOVA. $P < 0.05$ was considered a significant difference.

Both OLD and ADULT CONTROL mice showed similar and insignificant freezing in the shock absence. On the fear acquisition day, no differences in vocalization, jumping, or freezing were observed when comparing WT OLD with ADULT mice, indicating similar perception of foot shocks despite age differences. On the context day, an increase in freezing behavior in the WT OLD mice when compared to ADULT counterparts was observed, which may indicate that elderly individuals formed stronger contextual fear memories. However, elderly adrenaline-deficient mice formed similar contextual fear memories compared to ADULT mice.

In conclusion, adrenaline may play a critical role in modulating the formation and consolidation of fear memories in the elderly. The absence of adrenaline appears to reduce the age-related increase of fear memory, suggesting less susceptibility to stress-related memory impairments. Therefore, therapeutic

strategies aimed at reducing adrenaline release during stress may have protective benefits for elderly individuals with psychiatric conditions linked to stress, such as anxiety and post-traumatic stress disorder.

Theme: Other (miscellaneous)
OC - (24854) - Effect of treadmill, elliptical trainer and cycle ergometry maximal exercise intensity on muscle oxygen saturation and heart rate responses

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Citation
Abrantes, C.I.N.G., Machado, I.M., Santarém, D. Effect of treadmill, elliptical trainer and cycle ergometry maximal exercise intensity on muscle oxygen saturation and heart rate responses.

Presenting Author Profile
Catarina Isabel Neto Gavião Abrantes is an Assistant Professor at UTAD, specialising in Exercise Physiology, Exercise Testing and Prescription across bachelor's, master's and doctoral programs. She is a member of

CIDESD and the director of the International Master's in Performance Analysis of Sport. She participates in funded research projects and serves as a scientific supervisor for various research grants. Her research focuses on physiological acute and chronic effects of exercise

Abstract

Maximal exercise is widely used to assess physiological responses. However, the variation in muscle oxygen saturation (SmO2) combined with heart rate (HR) across different exercise modes remains unclear. The aim is to compare the SmO2 in the gastrocnemius medialis (GM) and vastus lateralis (VL), and HR at maximal exercise intensity in three ergometers. Healthy volunteers (n=14; age=34.9±9.1years; height=169.4±8.6cm; weight=69.7±9.8Kg) performed an incremental maximal test on a treadmill, an elliptical trainer, and a cycle ergometer in separate days in a random order. During the incremental tests, the HR (Garmin) and the SmO2 (Moxy 3) of VL and GM were collected. The data from the last level (one-minute duration), was used to determine average HR (HRavg), peak HR (HRpeak), average SmO2 (SmO2avg) and minimum SmO2 (SmO2min). Repeated measures ANOVA revealed a mode effect on HRavg ($F_{2,26}=12.44$, $p=0.001$, $\eta^2=0.150$) and HRpeak ($F_{2,26}=13.15$, $p=0.001$, $\eta^2=0.170$). Higher values were found on HRavg on treadmill and elliptical vs. cycle ($p<0.005$). A similar pattern was found on HRpeak with higher values on treadmill and elliptical vs. cycle (183.9±2.1 and 180.5±2.5 vs. 172.9±3.7 bpm, $p<0.005$). A mode effect on SmO2min of VL ($F_{2,20}=5.24$, $p=0.015$, $\eta^2=0.230$) showed lower values on elliptical vs. cycle (15.0±10.7 vs. 37.6±18.2%, $p=0.035$). GM SmO2avg ($F_{2,24}=27.19$, $p<0.001$, $\eta^2=0.530$) and SmO2min ($F_{2,24}=18.35$, $p<0.001$, $\eta^2=0.450$) were different. Lower values were found on treadmill and elliptical vs. cycle on SmO2avg ($p<0.001$), and, SmO2min was also lower on treadmill and elliptical vs. cycle (21.8±9.0 and 25.3±13.2 vs. 48.3±15.2%, $p<0.002$). The treadmill and the elliptical trainer promoted higher maximal HR, probably due to the amount of active muscle mass and for being body-weight support exercises. The SmO2 shows that the technique and body-position on the elliptical trainer requires more the VL, while the treadmill engages more the GM, crucial information for exercise prescription.

Theme: Water & electrolyte homeostasis and renal physiology OC - (24869) - Deficiency of Nrf2 expression seems to trigger earlier kidney damage before affecting the skeletal muscle: an insight into the progression of chronic kidney disease?

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Citation
Mendes, S., Rodrigues, A., Duarte, T., Leal, D., Almeida, H., Viana, J., Silva, E. Deficiency of Nrf2 expression seems to trigger earlier kidney damage before affecting the skeletal muscle: an insight into the progression of chronic kidney disease?

Presenting Author Profile

Sara Mendes currently is a PhD student in the Department Sport and Physical Education and the Research Center in Sports Sciences, Health Sciences and Human Development (CIDESD), at the University of Maia (UMAIA) and is interested in the mechanisms that drive muscle wasting and cause fatigue, which are common in CKD. Especially the redox imbalance present in CKD patients, and the possible modulation of exercise in this system.

Abstract

Chronic Kidney Disease (CKD) is being seen as a model of accelerated aging, with patients exhibiting low cardiorespiratory and muscular fitness. Alterations in the nuclear factor erythroid 2–related factor 2 (Nrf2) pathway in CKD have been reported to contribute to the disease progression and associated morbidity. Thus, this work aimed at evaluating the role of Nrf2 during renal and skeletal muscle aging. For this, tissue samples from renal and skeletal muscle of wild-type(WT) and Nrf2-KO mice were obtained at the ages of 8-12(young-Y) or 38-42(middle age-Ma) weeks. Tissue sections were stained with hematoxylin & eosin(H&E) and Picrosirius Red(PSR) for morphological examinations and tissue fibrosis quantification, respectively. IgG deposition was evaluated by western blotting. Statistical analysis was performed using a two-way ANOVA followed by Tukey's post hoc test. Results show no changes in the parameters evaluated when comparing the Ygroups(YWT vs. YNrf2-KO). Regarding the area of glomerulus and muscular fibers, significant increases were observed when comparing YWT with MaNrf2-KO(2.04$\pm$0.26 and 1.9$\pm$0.11, respectively), but not with MaWT. The increase in the area of glomerulus was paralleled by a decrease in their number (0.77$\pm$0.07, $p<0.05$). The same was not observed regarding muscular fibers. IgG deposition, a driver of fibrosis, was increased with age. In the kidney, IgGs were more abundant in MaWT(2.78$\pm$0.8) and MaNrf2-

KO(4.00±0.45) groups(in comparison to YWT) and tissue fibrosis was also higher (MaWT–3.35±0.48; MaNrf2-KO–3.93±0.21). However, in the muscle, IgG was only more abundant in MaNrf2-KO group(2.9±0.86, in comparison to YWT) and fibrosis did not differ between groups. In conclusion, markers of tissue aging and dysfunction are more evident in the kidney than in the muscle, being exacerbated by the absence Nrf2 expression. The mechanism underlying the role of the Nrf2 pathway in the protection against renal and kidney damage needs further investigation.

Posters
Theme: Cardiovascular and respiratory physiology
PO - (24720) - Sex differences in cardiorespiratory, hemodynamic and metabolic responses in the CrossFit® Fran workout

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Citation
Rios, M., Cardoso, R., Cardoso, F., Monteiro, S., Reis, V.M., Pyne, D.B., Fernandes, R.J., Gonçalves, D.M. Sex differences in cardiorespiratory, hemodynamic and metabolic responses in the CrossFit® Fran workout.

Presenting Author Profile

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Abstract

The Fran workout is a popular CrossFit® benchmark exercise, consisting of three rounds with a descending 21-15-9 repetition scheme of thrusters (combining front squats and overhead presses, with males use a fixed weight of 43 kg and females a 30 kg weight) and pull-ups. However, sex-related differences in cardiorespiratory, hemodynamic and metabolic responses to this particular workout have not been well characterized, regarding acute physiological responses between sexes. Twenty experienced crossfitters (10 males and 10 females) with age 28.8 $\pm$ 6.0 vs 25.9 $\pm$ 4.0 years old, height 175.6 $\pm$ 6.4 vs 163.1 $\pm$ 4.2 cm, body mass 81.4 $\pm$ 7.6 vs 65.5 $\pm$ 2.8 kg and training experience 5.6 $\pm$ 1.8 vs 5.4 $\pm$ 1.6 years of (respectively), performed Fran workout at maximal exertion. Cardiorespiratory variables were assessed at baseline, during and post-workout, and blood pressure, blood lactate and

glucose concentrations measured at baseline and in the recovery period. An independent samples t-test was used to compare performance and physiological variables between males and females. The males completed Fran session in less time (188 ± 31 vs 194 ± 35 s), resulting in higher peak oxygen uptake (50.6 ± 3.1 vs 47.4 ± 3.0mL·kg–1·min–1), minute ventilation (122.1 ± 21.0 vs 96.6 ± 8.8L·min–1), respiratory frequency (56 ± 9 vs 52 ± 7 b·min–1), carbon dioxide production (3.7 ± 0.4 vs 2.7 ± 0.2L·min–1), heart rate (185 ± 4 vs 181 ± 6b·min–1) and % maximal heart rate (95 ± 3 vs 94 ± 2%) values compared to females. Complementarily, elevated systolic blood pressure (male 154 ± 8 vs females 149 ± 10 mmHg), double product (27,094 ± 840 vs 25,999 ± 2,253mmHg·b·min–1), blood lactate (15.4 ± 1.8 vs 14.6 ± 2.0mmol·L–1) and glucose (135 ± 13 vs 132 ± 14mg·dL–1) values were observed in both sexes post-workout. Considering the sex differences in cardiorespiratory function, the variation in physiological response during an acute Fran workout appears to be influenced by peripheral (physiological) factors.

PO - (24826) - Characteristics of physical exercise programs and their effects on functional capacity in patients with chronic obstructive pulmonary disease: a systematic review

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Citation
Oliveira, R., Brito, J.P., Ceylan, H.İ., Soares, M.D.B., Martins, A.D., Vasconcelos, T., Moutão, J., Alves, S. Characteristics of physical exercise programs and their effects on functional capacity in patients with chronic obstructive pulmonary disease: a systematic review.

Presenting Author Profile
Rafael Oliveira (PhD) is an adjunct professor at the Escola Superior de Desporto de Rio Maior, Instituto Politecnico de Santarém, an integrated member of the Research Center in Sports Sciences, Health, and Human Development, and a collaborator of the Life Quality Research Centre. His research activity has been focusing on exercise physiology, testing, control and prescription, load monitoring/quantification, strength and conditioning, and sports training methodology.

Abstract
People with Chronic Obstructive Pulmonary Disease (COPD) present some degree of intolerance to physical exercise and several limitations in daily activities. The objective was to perform a systematic review on the characteristics (frequency, intensity, time, and type [FITT]) and the effects of exercise programs on functional capacity in people with COPD. Twenty-one studies were systematic reviewed to describe their main findings and training characteristics, since they presented sufficient methodological quality according to the Downs and Black's validated tool. The participants had an age ranging from ~39 to 76 years with mild to very severe COPD stages (clinically determined). From all studies, 11 used cardiorespiratory training

(through walking or cycling), five used strength training (using exercises with elastic bands or traditional resistance training) and five used combined training (both cardiorespiratory and strength exercises). In general, all studies improved aerobic capacity, strength and both capacities combined. Better and more benefits are acquired with combined training which included continuous aerobic exercise (~30 minutes, 40-50% of heart rate reserve) and resistance training for upper and lower limbs performed at 40-75% of 1 repetition maximum, 6-20 repetitions, 1-4 sets. Still, it is relevant to mention there was a very disparate methodologies, involving different types of exercise training protocols with respect to the FITT characteristics. Moreover, future research should conduct studies that assess more spirometry variables such as forced expiratory volume 1 for forced vital capacity since they are used to determine the stage of COPD. Therefore, more, and better methodological quality studies are needed regarding exercise for those with COPD.

PO - (24831) - Glucagon-like peptide-1 receptor agonists in vascular protection associated with type 2 diabetes

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Citation
Mendes, L., Queiroz, M., Sena, C. Glucagon-like peptide-1 receptor agonists in vascular protection associated with type 2 diabetes.

Presenting Author Profile
Leandro Mendes is a Master's Student in Medicinal Chemistry, graduated in Biochemistry. As a research fellow at the Institute of Physiology at FMUC, he worked on two projects: the role of melatonin and the role of GLP-1 RA in vascular protection associated with type 2 diabetes, the latter being part of his master's thesis. These ongoing projects already resulted in the publication of a review in the journal Antioxidants and in the presentation of a poster at the EAS international congress.

Abstract

Glucagon-like peptide 1 receptor agonists may confer cardiovascular benefits beyond their glucose-lowering effects by improving endothelial function, reducing oxidative stress, and modulating inflammatory pathways. The main objective of this study was to evaluate the impact of semaglutide treatment on vascular dysfunction in Goto-Kakizaki (GK) rats, a model of type 2 diabetes, compared to control Wistar rats. Rats were divided into four groups: a healthy control group (WH Control), a diabetic control group (GK Control), a diabetic group treated with semaglutide (GK+SM), and a healthy group treated with semaglutide (WH+SM). Semaglutide treatment had no visible effect on body weight. The diabetic GK control rats exhibited glucose intolerance in an intraperitoneal glucose tolerance test (IPGTT) when compared to WH controls. The glucose area under the curve (AUC) was comparable across GK groups and did not vary with semaglutide. Insulin resistance was evaluated in diabetic GK rats using the insulin tolerance test (ITT). Contrary to expectations, GK+SM rats exhibited greater insulin resistance than GK control rats. In the assessment of vascular function, GK-PVAT and GK+PVAT (PVAT - perivascular adipose tissue), the maximal endothelium-mediated relaxation of the phenylephrine-precontracted rings decreased by 47% and 66%, respectively, in response to acetylcholine. Semaglutide treatment markedly improved endothelium-dependent vascular relaxation in arteries with (+) or without (–) PVAT ($p<0.001$). In GK+SM rats PVAT showed an anti-contractile phenotype. In addition, we also observed significantly lower levels of inflammation in GK+SM rats, when compared to GK control rats. In conclusion, although semaglutide did not have a glycemic control action in our study, it exhibited protective effects on vascular health, namely through the reduction of inflammation. With this study, we were able to better understand the mechanisms associated with the vascular protection of this drug.

PO - (24835) - Regular physical activity might be a determinant in reducing systolic and mean arterial pressure in older medicated hypertense adults.

Author
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Luís Monteiro Rodrigues – CBIOS – Universidade Lusofona's Research Center for Biosciences & Health Technologies; Universidade Lusófona CBIOS - Research Center for Biosciences and Health Technologies

Citation
Florindo, M., Rodrigues, L.M. Regular physical activity might be a determinant in reducing systolic and mean arterial pressure in older medicated hypertense adults.

Presenting Author Profile
Margarida Florindo, Physiotherapist since 1984, specializing in neurological conditions, with ongoing clinical practice. Adjunct Professor in the Department of Physiotherapy at the Portuguese Red Cross Health School-Lisbon, with a master's in social and health management Intervention (2007), a rehabilitation specialist title (2011), and a PhD (2023) from Alcalá University and Lusófona University. CBIOS researcher with special interest in motor control, neurology, and peripheral circulation.

Abstract

Arterial hypertension is a major cardiovascular endpoint in older populations. Physical activity is now at the forefront of prevention, control, and intervention for cardiovascular health. However, cardiovascular patients often refer to multiple limitations in being involved in activity (including rehabilitation) programs. The concept of home-health seems to apply perfectly to this context. Thus, the present study aimed to assess the impact of a light physical activity program based on the FITT principle (Frequency, Intensity, Time/duration, and Type of activity) executed at home for 30 consecutive days by older, sedentary hypertense patients. A convenience sample of six men (mean age of 60.8 $\pm$ 2.8 years old) was selected from among the physiotherapy patients from the practice of one of the authors. Mandatory inclusion criteria were being more than 55 years old, having no significant mobility issues, and suffering from hypertension controlled with medication(s). Basic cardiovascular functional indicators such as blood pressure and pulse rate were measured. Lower limb perfusion was assessed using Laser Doppler Flowmetry (LDF) and Polarised Light Spectroscopy (PSp) in both feet. Data was collected at day zero (D0) and day thirty (D30) by the same investigator. All participants fulfilled the outlined 30-day daily physical activity program maintaining their regular medication regime. At D30, results showed a significant increase of perfusion at rest measured by LDF in both feet, compared with D0. Additionally, systolic pressure (SysP) and mean arterial pressure (MAP) were reduced in all individuals at D30, with a statistically significant decrease in SysP ($p=0.046$). The mean arterial pressure (MAP) decreased by 2.1%, approaching optimal levels (<93.33 mmHg). Thus, this simple, easy-to-perform physical activity routine, even if non-supervised, seems to help to control blood pressure in older hypertense patients.

PO - (24837) - The effect of exercise intensity on runners and swimmers bioenergetical performance

Author
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Citation
Monteiro, A.S., Cardoso, F., Monteiro, M., Cardoso, R., Buzzachera, C.F., Vilas-Boas, J.P., Fernandes, R.J. The effect of exercise intensity on runners and swimmers bioenergetical performance.

Presenting Author Profile

Ana Sofia Monteiro has a Master degree in Sports Training (with a specialisation in High Performance Training) from the Faculty of Sport of the University of Porto and is currently a PhD candidate in the Sports Sciences Doctoral Programme at the same institution. She has authored and co-authored publications in international scientific journals on topics related to exercise physiology and acute responses in different intensity domains, focusing on cyclical sports (running, swimming and cycling).

Abstract

The energy cost (C) of locomotion is given by the amount of energy spent in transporting the body mass to cover a given distance. The bioenergetics of cyclic sports has been frequently studied by determining oxygen uptake (VO_2) but not considering the anaerobic contribution. At higher exercise intensities this is of particular importance since it may underestimate the obtained energy expenditure (E). Ten trained male (five runners and five swimmers) completed an incremental protocol until exhaustion with 30s rest intervals (800 and 200 m steps and 1 $km \cdot h^{-1}$ and 0.05 $m \cdot s^{-1}$ increments, followed by a maximal 400 and 100 m, for runners and swimmers, respectively). VO_2 was continuously measured and blood lactate concentrations ($[La^-]$) were analysed during the intervals in-between steps and at the protocol end. Each step E was determined summing the net VO_2 and net $[La^-]$ (expressed in O_2 equivalents using the proportionality constants of 3 and 2.7 $mL \cdot kg^{-1} \cdot mM^{-1}$ for runners and swimmers) values. C was given as the slope of the regression line between E (using an energetic equivalent of 20.9 $kJ \cdot L^{-1}$) and corresponding velocities. Runners tended to present higher VO_2 mean values than swimmers (but similar $[La^-]$ values) from the first to the maximal step, leading to similar E from steps 1 to 7 (41.6±2.7 vs 37.0±8.7, 49.7±5.4 vs 40.5±9.3, 54.0±5.0 vs 46.1±11.3, 58.1±5.6 vs 52.7±13.5, 68.0±10.6 vs 60.1±11.8, 75.8±12.6 vs 68.1±12.9, 87.4±12.9 vs 76.5±12.5) but higher at the maximal step (103.6±14.7 vs 80.3±7.4 $mL \cdot kg^{-1} \cdot min^{-1}$; $p<0.05$). When comparing C obtained with (i) only submaximal velocities (C_{submax}) and (ii) with all the spectrum (C_{tot}), higher C_{tot}

values were evidenced both for runners and swimmers (9.0 vs 5.9 and 30.9 vs 26.5 $J \cdot kg^{-1} \cdot m^{-1}$; $p<0.05$). When a wider range of velocities is included in C assessment, exercise economy is consistently monitored from low-maximal intensities, allowing to better identify future intervention, improving training prescription.

PO - (24840) - Web research tool for predicting the need for ICU admission in COVID-19 patients

Author
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Nuno Cruz Garcia – LASIGE, Faculdade de Ciências da Universidade de Lisboa
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Citation
Oliveira-Saraiva, D., Garcia, N.C., Ferreira, H.A. Web research tool for predicting the need for ICU admission in COVID-19 patients.

Presenting Author Profile

Duarte Oliveira-Saraiva was born in 1998 and is a PhD student in Biomedical Engineering and Biophysics and a teaching assistant at Faculdade de Ciências da Universidade de Lisboa. Currently, he is working on the use of artificial intelligence methods applied to lung ultrasound videos. His PhD project is part of an FCT funded project: DSAIPA/AI/0083/2020 THOR - Computer Assisted Thoracic Assessment using POCUS.

Abstract

Acute respiratory failure is characterized by a P/F ratio < 300, often requiring intensive care unit (ICU) admission. While P/F helps guiding ICU decisions, no standard criteria exist. Here, we present a web research tool (https://predicticu.streamlit.app/) that employs machine learning (ML) models based

on the P/F ratio, venous blood parameters, and lung ultrasound (LU) to predict ICU admission for COVID-19 patients.

Data from 51 COVID-19 patients included blood gas analysis (BGA), venous blood extraction (VBE), and LU screening. 31 of the patients went to the ICU (≈ 61%). LU scores were computed based on individual LU findings: B-lines; irregular pleura; subpleural, and lobar consolidations. Besides, Mann-Whitney tests were used for feature selection, and support vector machine models were built using significant laboratory variables ($\alpha < 0.05$) and LU scores. The leave-one-out approach and Bayesian optimization were applied for robustness.

The results of the study were deployed into a web research tool. The best models for the different configurations of medical interventions were included: VBE; BGA; LU; VBE + BGA; VBE + LU; LU + BGA; LU + BGA + VBE. Given limited resources, the user can select the types of available clinical data to obtain a prediction. Compared to similar studies, our results are promising (best model with AUC of 95.6%). VBE alone is not a reliable indicator for ICU admission, unlike BGA or LU. The combination of VBE, BGA, and LU provides the best results. Additionally, a model including LU outperforms all models that rely only on BGA and/or VBE, highlighting the importance of LU in this clinical decision-making process.

Overall, this web research tool constitutes a step towards the incorporation of ML models into clinical practice, to aid medical doctors in their diary complex decisions. Moreover, it demonstrates the importance of LU in this clinical decision.

PO - (24843) - Impact of Randall foils on cardiorespiratory and metabolic function in rowing: an exploratory study

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Citation
Rios, R.C., M., Cardoso, F., Monteiro, S., Abraldes, J.A., Gomes, B., Vilas-Boas, J.P., Fernandes, R.J. Impact of Randall foils on cardiorespiratory and metabolic function in rowing: an exploratory study.

Presenting Author Profile

Abstract

Cardiorespiratory and metabolic functions during maximal rowing efforts are difficult to study on-water. Moreover, the effects of different paddle designs (including the use of plastic strips known as Randall foils) on rowing performance remain understudied. The aim of the current study was to analyze the effect of using Big blades without and with Randall foils in rowing on-water performance. An experienced rower with age 31 years old, height 177.1 cm, body mass 81.9 kg and body mass index 26.1 $kg \cdot m^{-2}$ performed two 500 m on-water rowing trials (without and with Randall foils) at maximal exertion. Most common cardiorespiratory variables were continuously assessed breath-by-breath (K5, Cosmed, Rome, Italy) and capillary blood lactate concentrations (Lactate Pro 2, Arkray, Kyoto, Japan) were measured at baseline and at the recovery period). Performance time was ~1% higher with Big blades without Randall foils (109.7 vs 108.2 s), resulting in higher peak oxygen uptake (57.6 vs 56.4 $mL \cdot kg^{-1} \cdot min^{-1}$), minute ventilation (161.1 vs 159.1 $L \cdot min^{-1}$), respiratory frequency (65.5 vs 59.7 $b \cdot min^{-1}$), tidal volume (2.5 vs 2.7 L), heart rate (182 vs 181 $b \cdot min^{-1}$). However, higher blood lactate values were observed with Big blades without compared to with Randall foils (16.4 vs 12.6 $mmol \cdot L^{-1}$). In addition, similar values were observed for oxidative phosphorylation (50.5 vs 49.9%), glycolytic (30.5 vs 30.9%) and phosphagen (19.0 vs 19.2 %) pathways when using Big blades without and with Randall foils (respectively). Randall foils marginally improved rowing performance in a 500 m on-water rowing trial. The addition of Randall foils may enhance performance without changing energy production mechanisms during rowing maximal efforts.

PO - (24844) - Cooling as a challenge to study in vivo microvascular function

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Citation
Caetano, J., Rodrigues, C.R., S.F.A., L.M. Cooling as a challenge to study in vivo microvascular function.

Presenting Author Profile

Abstract
Several strategies have been used to investigate microcirculatory function, such as the post-occlusive reactive hyperemia (PORH). This well-known methodology still needs clarification regarding the mechanisms involved and, from the patient's perspective, is somewhat uncomfortable due to the high pressure applied in the cuff. Alternative strategies have been proposed and explored. In this study, we study the relationship between cold and hyperemia in ten healthy female, 27.3±7.9 y.o, previously selected. All principles of good clinical practice were followed. After stabilization, participants were submitted to two protocols applied to a randomly selected arm. The first protocol was a classical PORH evoked with a pressure cuff,

while the second consisted of the cooling of one hand, with the palmar side placed in contact with a frozen surface covered by a paper sheet. Blood perfusion was measured by laser Doppler flowmetry (LDF) in both hands and was continuously registered, along with temperature, before, during, and after the challenge for both protocols. The LDF signal amplitude was dramatically reduced during cuff insufflation (200 mmHg) in PORH, and significant hyperemia registered after cuff deflation. With the cooling protocol, a significant decrease in skin temperature accompanied by a decrease in perfusion was observed, followed by recovery after cessation of contact with the iced surface. Similar responses were observed in the contralateral limb in both protocols. In conclusion, this study suggests that the cold as a challenger is an effective method for eliciting a reactive hyperemia in both limbs, and offers a novel approach for the in vivo study of microcirculation. Furthermore, in the study of vascular pathologies such as Raynaud's phenomenon, this protocol is less invasive than the full immersion of both hands in cold water, which is used as the gold standard.

PO - (24845) - Unveiling subclinical microvascular changes associated with regular smoking

Author
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Citation
Andrade, S.F., Almeida, B., Rodrigues, J.P.G., L.M. Unveiling subclinical microvascular changes associated with regular smoking.

Presenting Author Profile

Abstract

Cigarette smoking is a well-known risk factor for cardiovascular disease. Nevertheless, early signs of cardiovascular damage associated with smoking are still poorly identified, especially in young (apparently) healthy smokers. Thus, we examined the adaptive circulatory responses in young smokers (average age 20.8 $\pm$ 2.8 years, both sexes) during a Reactive Hyperaemia (RH) test and compared the response to non-smokers. All principles of good clinical practice were followed. The study was carried out with 72 healthy participants (34 smokers and 38 non-smokers, of both sexes) with similar physical characteristics, differing only in smoking habits. The Smoker Index was used to quantify the intensity of smoking habits. Perfusion

was measured with Laser Doppler Flowmetry (LDF), whose sensors were placed on the ventral side of the second finger on both hands. The Post-Occlusive Reactive Hyperaemia (PORH) manoeuvre was performed on a randomly chosen upper limb in each participant, using a cuff inflated to 200 mmHg to occlude the brachial artery for 2 minutes. Blood pressure was measured with a sphygmomanometer before, immediately after, and 10 minutes after the PORH manoeuvre. The Mean Arterial Pressure (MAP) was calculated. No significant differences were found in anthropometric data, blood pressure, or MAP between the groups. However, perfusion recovery after occlusion was significantly faster in non-smokers (***$p<0.001$) compared to smokers. This trend was also observed in the contralateral arm, though to a lesser extent. These findings indicate that microcirculatory adaptation following the PORH manoeuvre differs in young smokers with no evidence of disease, meaning that early microcirculatory changes associated with smoking are already present. Furthermore, it suggests that these subclinical impacts of smoking on cardiovascular physiology are of interest for further investigation.

PO - (24856) - Urocortin-2 as a novel biomarker of clinical deterioration in HFpEF: a prospective cohort study

Author
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Citation
Vasconcelos, I., Adão, R., Vaques-Nóvoa, F., Leite-Moreira, A., Barros, A.S., Brás-Silva, C. Urocortin-2 as a novel biomarker of clinical deterioration in HFpEF: a prospective cohort study.

Presenting Author Profile
Inês Vasconcelos completed a Bachelors and Masters degree in Biochemistry by the Faculty of Sciences of the Universidade of Porto. Currently attends the Masters degree in Medicine by the School of Medicine of the University of Minho and the Doctoral program in Cardiovascular Sciences of the Faculty of Medicine of the University of Porto. Published 4 articles in journals. Has 1 section(s) of books. Has received 1 award. Works in the area of Basic

and Clinical Medicine with an emphasis on Physiology and Cardiac and Cardiovascular Systems.

Abstract

Although circulating urocortin levels in healthy humans are low, serum urocortin-2 levels have been found to be elevated in heart failure patients with reduced ejection fraction and have been positively correlated with left ventricular hypertrophy, suggesting a potential value of urocortin-2 concentration in heart failure with preserved ejection fraction (HFpEF). In this work we aimed to characterize urocortin-2 circulating levels in a population of chronic HFpEF patients and its association with disease severity and long-term prognosis.

Urocortin-2 serum levels were measured in 101 serum samples from patients with chronic HFpEF in a prospective cohort study (NETDiamond). Clinical and imaging data were compared for a urocortin-2 cutoff value of 1203 pg/mL. The primary outcome was set as a composite of the time to cardiovascular death or HF hospitalization. A univariable Cox regression model was utilized to explore the relationship between urocortin-2 and various clinical characteristics.

Higher urocortin-2 levels were associated with an increased risk of primary outcome. Echocardiographic parameters such as left atrial diameter and E/e' ratio were positively associated with urocortin-2 serum levels (HR = 1.10, 95%CI 1.01-1.19, p = 0.024 and HR = 1.36, 95%CI 1.14-1.64, p < 0.001, respectively). Additionally, urocortin-2 concentration was positively associated with clinical congestive signs, such as bibasilar pulmonary congestion (HR = 3.59, 95%CI 1.2–10.7, p = 0.022), peripheral edema, particularly if present above the knee (HR = 30.3, 95%CI 1.89-486, p = 0.016), and increased jugular venous pressure (HR = 4.74, 95%CI 1.11-20.3, p = 0.036). In patients with HFpEF, serum urocortin-2 levels were correlated with left chamber remodeling and adverse prognosis, particularly with clinical signs of congestion. These findings suggest a pathophysiological role of this peptide in HFpEF and its usefulness as a circulating biomarker.

PO - (24858) - Mandibular forward repositioning effect on breathing pattern during running at maximal oxygen uptake intensity

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Citation
Cardoso, F., Maligno, F., Monteiro, R.C., A.S., Rios, M., Vilas-Boas, J.P., Pinho, J.C., Pyne, D.B., Fernandes, R.J. Mandibular forward repositioning effect on breathing pattern during running at maximal oxygen uptake intensity.

Presenting Author Profile

Ana Sofia Monteiro has a Master degree in Sports Training (with a specialisation in High Performance Training) from the Faculty of Sport of the University of Porto and is currently a PhD candidate in the Sports Sciences Doctoral Programme at the same institution. She has authored and co-authored publications in international scientific journals on topics related to exercise physiology and acute responses in different intensity domains, focusing on cyclical sports (running, swimming and cycling).

Abstract

Recent studies suggest that mandibular forward repositioning splints enlarge the upper airway, improving ventilation and reducing mouth airflow resistance, thereby lowering respiratory effort and perceived exertion during exercise. The aim of our study was to analyze the mandibular forward repositioning effect on breathing pattern during running at maximal oxygen uptake intensity. A group of 13 trained male runners (29.5 $\pm$ 7.6 years, 69.4 $\pm$ 10.5 kg body mass and 176.9 $\pm$ 8.8 cm height) voluntarily performed until exhaustion a square wave transition exercise at their minimum velocity corresponding to maximal oxygen uptake, counterbalanced and randomized wearing two different intraoral splints (mandibular forward repositioning vs. placebo). Maximal oxygen uptake, ventilation, respiratory frequency, tidal volume, end-tidal partial pressure of oxygen and carbon dioxide, and inspiratory and expiratory times were recorded breath-by-breath. Mean values of ventilation (147 $\pm$ 22 vs. 143 $\pm$ 22 L·min^{-1}, p = 0.04), respiratory frequency (57 $\pm$ 9 vs. 55 $\pm$ 9 b·min^{-1}, p = 0.008) and end-tidal partial pressure of oxygen (115.2 $\pm$ 3.5 vs. 113.6 $\pm$ 3.5 mmHg, p < 0.001) were higher, while end-tidal partial pressure of carbon dioxide (35.5 $\pm$ 3.0 vs. 36.2 $\pm$ 2.8 mmHg, p = 0.04), inspiratory (0.54 $\pm$ 0.09 vs.0.55 $\pm$ 0.09 s, p = 0.019) and expiratory (0.55 $\pm$ 0.08 vs.0.56 $\pm$ 0.09 s, p = 0.012) times were lower for the mandibular forward repositioning splint compared with the placebo condition. It appears

that mandibular forward repositioning changes the breathing pattern during running until exhaustion at the maximal oxygen uptake intensity. Future studies should explore these effects to assess potential benefits for enhancing maximal aerobic performance in running.

PO - (24865) - Does inflammatory cytokines contribute to carotid body dysfunction in dysmetabolic states?

Author
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Citation
Melo, G., Sacramento, J., Andrzejewski, K., Capucho, A., Kaczyńska, K., Conde, S. Does inflammatory cytokines contribute to carotid body dysfunction in dysmetabolic states?

Presenting Author Profile
Currently I am a PhD student of the International Doctorate in Health Sciences at NOVA Medical School in Portugal in the field of neuroscience and metabolism. I hold a Master's in Cognitive and Behavioural Neuroscience with a focus on Neurobiology and a bachelor's in biology from ISPA. My research experience includes scientific work at Instituto Gulbenkian de Ciência, Fundação Champalimaud, and Universidade Nova de Lisboa. Additionally, I have also worked as a secondary school teacher.

Abstract

The carotid bodies (CBs) are metabolic sensors whose dysfunction is involved in the genesis of metabolic diseases. Inflammatory cytokines may contribute to CB dysfunction in dysmetabolic states, as these cytokines and their receptors are present in the CB. Here we aim to elucidate TNF-α contribution to CB dysfunction. Additionally, we examine whether reducing inflammation can prevent dysmetabolism and CB dysfunction. Male and female Wistar rats were divided into 2 groups: a control group (CTL) receiving a standard diet and a group fed with a 60% lipid-rich diet (HF) for 3 weeks. At a terminal procedure, ventilation and blood pressure were measured before and after TNF-α administration (0.5 and 5ng/ml) in both groups, with and without acute carotid sinus nerve (CSN) resection. Also, TNF-α levels and their receptors were evaluated in the CBs. Another set of male Wistar rats on HF diet received ibuprofen (0, 20, and 40mg/kg) for 28 days, and weight gain, insulin sensitivity, glucose tolerance, CSN activity and CB morphology were evaluated. Statistical analysis was done using ANOVA with Dunnett's and Student's t-test. The study was approved by NMS ethic committee (36/2024/CEFCM). In male CTL rats, TNF-α increased minute ventilation by 26.5% and 52.0% ($p<0.001$) at 0.5 and 5 ng/ml, respectively, with effect attenuated with CSN resection and absent in HF animals. TNF-α also reduced mean arterial pressure by 8.0% and 13.7% ($p<0.01$) in male CTL rats, with no change with CSN resection. No sexual dimorphism was observed in the ventilatory responses to TNF-α in CTL and HF animals. CBs of HF rats had 46% higher TNF-α levels compared to CTLs ($p<0.01$), with no changes in TNF-α receptor levels. Ibuprofen reduced weight gain by 16%, prevented insulin resistance, and increased CSN activity in HF animals. In conclusion, TNF-α activates the CB and contributes to its dysfunction. Prevention of inflammation attenuates dysmetabolism and the heightened CSN tonicity induced by hypercaloric diets.

PO - (24874) - Brachial artery suprasystolic occlusion (PORH) evokes significant perfusion changes in the contralateral arm as in both lower limbs

Author
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Citation
Nicolai, M., Andrade, S.F., Caetano, J., Rocha, C., Gregório, J., Rodrigues, L.M. Brachial artery suprasystolic occlusion (PORH) evokes significant perfusion changes in the contralateral arm as in both lower limbs.

Presenting Author Profile
I hold a degree in Chemistry, a master's in Teaching Physics and Chemistry, and a PhD in Chemistry. As an Assistant Professor at Universidade Lusófona, I've published extensively, reviewed over fifty papers, and guest-edited a special issue. I've supervised master's and PhD students, participated in academic juries, and served on both the Scientific and Pedagogical Councils. My recent research focuses on health sciences.

Abstract

The adaptive reperfusion following reactive hyperemia (RH) extends beyond the local response, also occurring in the contralateral limb. Our group has been studying RH as a tool to explore human microcirculation in vivo. We have shown that (a) this reperfusion hyperemia does not need ischemia to be evoked, being (b) proportional (in intensity and duration) to the stimulus and (c) observable in the contralateral limb, meaning that (d) it is produced by a centrally mediated reflex rather than (simply) a local response. However, many of these findings still need to be better understood. The present study is focused on the impact of a post-occlusive reactive hyperemia (PORH) performed in one arm, in all extremities (upper and lower limbs). A convenience sample of sixteen healthy participants aged 18 to 72 years old, was selected and categorized into three groups according to their age and level of physical activity as regular exercisers, and irregular exercisers. Procedures respected all principles of good clinical practice. A PORH maneuver was performed in the left arm, and perfusion monitored by laser Doppler flowmetry (LDF) using four measuring probes applied in the palmar and plantar aspects of all limbs. Results showed a consistent RH in the contralateral arm and in both lower limbs across all groups. Differences are particularly significant between the irregular and regular exercisers, no matter their age. These findings confirm our previous understanding of this perfusion adaptation following RH. A more detailed identification of the sensors and effectors involved in this process will expand our understanding of these mechanisms, potentially leading to the discovery of other markers with clinical applications.

PO - (24877) - Effect of localized heat therapy at maximum distance, on muscular oxygen saturation, heart rate and blood pressure during incremental physical exercise in peripheral arterial disease

Author
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Citation
Mendes, L., Pinto, I., Santarém, D., Ornelas, W., Campos, J., Magalhães, C., Abrantes, C. Effect of localized heat therapy at maximum distance, on muscular oxygen saturation, heart rate and blood pressure during incremental physical exercise in peripheral arterial disease.

Presenting Author Profile

Libânia Mendes holds a B.Sc. in Psychomotor Rehabilitation (2022) and is currently pursuing an M.Sc. in Gerontology at the University of Trás-os-Montes e Alto Douro (UTAD). She is currently a research fellow at UTAD, engaged in research activities as part of the *A-MoVeR* project. Previously, she was involved in research for her dissertation, conducted as part of the *Passus Saudáveis 2.0* project, a collaborative initiative between UTAD and the Local Health Unit of Trás-os-Montes e Alto Douro.

Abstract

Peripheral arterial disease (PAD) impairs perfusions due to atherosclerosis, leading to a variety of presentations from intermittent claudication to critical ischemia[1]. Heat therapy (HT) uses an external heat source to raise limb and body temperature, emerging as a potential strategy for PAD, by increasing blood flow[2]. This study aimed to evaluate the impact of HT in pain-free walking time (PFWT), maximal walking time (MWT), muscle oxygen saturation (SmO_2), heart rate (HR), Perceived exertion (RPE) and blood pressure (BP) during a treadmill incremental protocol.

The study included 5 participants with stage II PAD (age: 64.7±6.2years; ankle-brachial index: 0.64±0.1; skinfold less than or equal to 15mm). Participants rested supine for 20 min, then were randomly assigned to HT (parafango body wrap at ~43.5ºC on thigh and calf) or no HT, in separate sessions at least 72 hours apart. The Gardner-Skinner protocol was performed until MWT or 30 min maximum, with PFWT recorded.

The SmO_2 changes from baseline ($SmO_{2\,\Delta deoxy}$) and time to recover 50% of baseline ($tSmO_{2\,50\%reoxy}$) were assessed using two Moxy 5 near-infrared spectroscopy sensors in the *vastus lateralis* (VL) and *gastrocnemius*

medialis (GM) muscles. HR was continuously monitored, and BP and RPE were measured post-exercise.

A paired sample t-test showed no significant differences in rest (before and during HT) neither exercise in SmO_2parameters with HT ($p \geq 0.05$). $SmO_{2\ \Delta deoxy}$ in the VL was 11.9±7.4% with HT and 17.1±14.1% without and recovery $tSmO_{2\ 50\%reoxy}$ was 111.3s faster with HT. In the GM, $SmO_{2\ \Delta deoxy}$ was 50.6±11.5% with HT and 48.6±5.6% without, with a 9.8s increase in $tSmO_{2\ 50\%reoxy}$. HT was linked to higher RPE ($p=0.035$), no differences in BP or HR and to shorter PFWT (101.5±112.9m), suggesting earlier pain onset.

These preliminary results indicate that thigh and calf HT may hasten the onset of PFWT and increase RPE. Larger sample sizes and more studies are needed to understand the potential of HT in PAD.

PO - (24882) - Sex-dependent effects of estrogen on cardiac microvascular endothelial cell function

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Citation
Fernandes, C., Grego, A., Fonseca, I., Ferreira, R., Leite-Moreira, A., Dias-Neto, M., Oliveira, S.M., Nogueira-Ferreira, R. Sex-dependent effects of estrogen on cardiac microvascular endothelial cell function.

Presenting Author Profile

Biochemistry graduate with a Bachelor's degree focused on the ecotoxicity of molybdenum disulfide nanoparticles, resulting in a published scientific paper. Currently completing a Master's thesis on the impact of estrogen on cardiac microvascular endothelial cells in heart failure with preserved ejection fraction. Recognized with an honorable mention for a theoretical poster presentation on the existing literature related to my thesis research.

Abstract

Endothelial dysfunction plays a central role in the development of several disorders, such as heart failure with preserved ejection fraction (HFpEF). Coronary microvascular endothelial dysfunction has been suggested as the driving force for the structural remodeling of the heart in this syndrome. HFpEF affects predominantly post-menopausal women, but it is unknown if estrogen can have a role in its pathophysiology. We started by investigating the role of β-estradiol (E2) in human microvascular endothelial cardiac cells (HMVECs) from both sexes, focusing on cell proliferation (BrdU assay) and the nitric oxide (NO) pathway. Commercially obtained HMVECs were treated with different concentrations of E2 (nM: 0, 0.01, 0.1, 1 and 10). Results showed that E2 increased proliferation in male HMVECs ($p<0.05$, E2 1nM vs 0nM) while inhibiting it in female cells ($p<0.05$, E2 0.01nM vs 0nM). Nitrite levels measured in the culture medium appear to increase in male HMVECs, suggesting that E2 promoted NO production in these cells. Further, E2 treatment appears to increase the p-eNOS/eNOS ratio in female HMVECs compared to male cells. Estrogen receptor-α levels did not differ significantly between sexes with E2 treatment, suggesting this receptor is not involved in the observed results. E2 treatment did not alter NOX4 levels, but GPx1 levels appear to be higher in male HMVECs regardless of E2 concentration. These findings suggest that E2's effects on HMVECs are sex-dependent. Future studies on the involvement of other estrogen receptors and using HFpEF serum-treated HMVECs could contribute to a better understanding of cardiac microvascular endothelial dysfunction in HFpEF.

PO - (24885) - Unveiling urine proteomic signature of heart failure with preserved ejection fraction

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Citation
Fonseca, I., Vasques-Nóvoa, F., Aveiro, S., Diaz, S., Barros, A., Vitorino, R., Leite-Moreira, A., Ferreira, R., Amado, F., Nogueira-Ferreira, R. Unveiling urine proteomic signature of heart failure with preserved ejection fraction.

Presenting Author Profile

Ivo Fonseca is a 5th year medical student pursuing an Integrated Master's in Medicine at Faculty of Medicine of the University of Porto. He serves as a Student Cardiovascular Research Assistant in the Department of Surgery and Physiology and has presented research through oral and poster communications at conferences such as the 18th YES Meeting and IJUP. He has also completed internships in Plastic Surgery and Neurological Surgery. He volunteers as a First Aid Instructor with VO.U. SOCORRER.

Abstract

Heart failure with preserved ejection fraction (HFpEF) accounts for nearly half of HF cases and is associated with a high mortality rate. Its prevalence is increasing due to population aging and comorbidities like obesity, diabetes, and hypertension. Key factors in its pathophysiology include low-grade systemic inflammation, endothelial dysfunction, oxidative stress, and fibrosis. Identifying novel, non-invasive, and cost-effective biomarkers is essential for improving diagnosis and understanding HFpEF. We aimed to identify a urine signature associated with HFpEF by using a liquid chromatography-tandem mass spectrometry (LC-MS/MS) methodology. Urine samples were collected from individuals with HFpEF and control individuals without HF and matched for body mass index, diabetes mellitus and dyslipidemia, for proteome characterization. Urine proteomics allowed the identification of 808 distinct proteins, mainly associated with immunity and metabolic processes. Five proteins (AMBP (alpha-1-microglobulin/bikunin precursor), RBP4 (retinol-binding protein 4), SERPINA1 (alpha-1-antitrypsin), SERPINA3 (alpha-1-antichymotrypsin), and GSN (gelsolin)), present in all samples, and found in higher levels in HFpEF patients in comparison with control individuals, were selected to validation by western- and slot-blot (based on the association with HF and the location in a protein-protein interactions network). Immunoblotting analysis confirmed the elevated levels of SERPINA1 (protease inhibitor) and RBP4 (adipokine) in HFpEF urine samples. Also, SERPINA1 and RBP4 urine levels were found to be positively correlated with BNP levels and age. These findings support the relevant role of these proteins in HFpEF pathophysiology.

PO - (24886) - Effect of hand and non-hand support in treadmill walking on the physiological response in peripheral arterial disease

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Citation
Ornelas, W., Santarém, D., Mendes, L., Pinto, I., Campos, J., Abrantes, C. Effect of hand and non-hand support in treadmill walking on the physiological response in peripheral arterial disease.

Presenting Author Profile
William Ornelas has a B.Sc. in Sport Sciences (2022) and is a M.Sc. student in Gerontology: Physical activity and health in the elderly at the University of Trás-os-Montes and Alto Douro (Vila Real, Portugal). His M.Sc. project focuses on the effect that the hand support in treadmill walking has on

patients with peripheral arterial disease as part of Passus Saudáveis 2.0 project in the Local Health Unit of Trás-os-Montes and Alto Douro.

Abstract

Supervised exercise therapy is considered the first line of treatment for enhancing walking capacity in peripheral arterial disease (PAD) patients with intermittent claudication[1]. This study aimed to compare the effect of hand support (HS) and non-hand support (NHS) treadmill walking on heart rate (HR), muscle oxygen saturation (SmO2), systolic blood pressure (SBP), and diastolic blood pressure (DBP) in participants enrolled in a supervised exercise programme for PAD. Six participants diagnosed with PAD at stage II of Fontaine classification (age=63.3±3.8yrs; ankle brachial index=0.66±0.10) who achieved a comparable walking workload in the exercise programme, were included in this study. The HS and NHS protocols were 8-min of treadmill walking at 3.6km/h and 2% slope. The protocols were randomly assigned and performed in the same session with 15-min rest between them. Gastrocnemius Medialis (GM) SmO2 was measured with near-infrared spectroscopy, HR with a Polar band, and BP with a sphygmomanometer. Paired sample t-test or Wilcoxon test showed differences and higher response in the mean HR (p=0.017), in the HR of the last min of exercise (p=0.020), and in the delta HR, the baseline and peak HR difference (p=0.027) in NHS treadmill walking. DBP was significantly higher (p=0.035) in NHS compared to HS, and no differences were found in SBP. No differences were observed in SmO2 studied parameters, despite the HS revealing a mean SmO2 value of 32.2% and NHS of 22.6% and the time to recover the baseline SmO2 was 51.8s in HS and 74.0s in NHS, indicating greater SmO2 reduction during exercise and longer recovery time to baseline in NHS. These results may indicate that NHS is associated with higher HR, higher DBP and similar SmO2, with slightly lower SmO2 in NHS revealing a higher GM muscle demand that should be considered. Further research and more participants are needed to better understand the effect of this exercise manipulation in PAD.

Reference

[1]*Jansen et al., CDSR, 2020*

PO - (24891) - Assessment of left ventricular function in soccer players by myocardial work method

Author
Wendell Arthur Lopes – Department of Physical Education, State University of Maringa
Suelen Rodrigues Da Luz – Department of Physical Education, State University of Maringa
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Citation
Lopes, W.A., Luz, S.R.D., Okawa, R.T.P. Assessment of left ventricular function in soccer players by myocardial work method.

Presenting Author Profile
Wendell Arthur Lopes is a Brazilian researcher with a Ph.D. in Physical Education and a postdoctoral student at the Faculty of Sport, University of Porto (FADEUP). He is an Associate Professor at the State University of Maringá (UEM) and a faculty member of the Graduate Program in Physical Education UEM/UEL. He leads GPHARV, focusing on hypertension and vascular resistance, and his work includes physical activity epidemiology, cardiovascular diseases, and clinical exercise physiology.

Abstract
Myocardial Work (MW) has brought new insights into cardiovascular evaluation in athletes, providing a more comprehensive assessment of left ventricular (LV) function. In soccer players, lower MW values have been observed compared to control individuals. However, the relationship

between MW and cardiorespiratory and performance parameters remains unclear. This study aimed to evaluate LV function through MW and investigate a potential correlation between MW indices and cardiopulmonary and performance parameters in professional soccer players. For this, 75 professional soccer athletes at a sub-elite level (PA) (≥ 10 hours of weekly training) and 23 recreational athletes (RA) (≤ 3 hours weekly), between 18 and 35 years, underwent echocardiography and hemodynamic assessments. The MW indices were obtained using specific software from pressure-deformation loops, constructed from noninvasive LV pressure curves. Moreover, 30 of these athletes (20 PA and 10 RA) performed a treadmill cardiopulmonary test. The oxygen consumption (VO_2) and speed (S) reached at the first ventilatory threshold (VT1) and the highest values (peak) reached in the test were analyzed. Diastolic and mean arterial blood pressure were lower in PA (p=0.006; p=0.011, respectively). There was no statistical difference in systolic blood pressure (p = 0.155). The global work index (GWI) was lower in PA (p = 0.005). Global constructive work (GCW), global wasted work (GWW) and global work efficiency (GWE) showed no difference between groups. The PA presented higher VO_{2VT1} (p=0.015), higher speed S_{peak} and S_{VT1} (p=0.000 and p=0.000, respectively) compared to RA. No correlation was found between MW indices and the cardiopulmonary or performance parameters. In conclusion, the data indicate normal LV function, based on preserved GWE. The reduction in GWI appears to be related to the cardiovascular adaptations associated with the athlete's heart, without impacting the aerobic capacity or athletic performance.

PO - (24892) - The miR-146a role in pulmonary arterial hypertension – pathophysiological and therapeutic implications

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Citation
Santos-Gomes, J., Mendes-Ferreira, P., Adão, R., Maia-Rocha, C., Rego, B., Perros, F., Antigny, F., Leite-Moreira, A.F., Brás-Silva, C. The miR-146a role in pulmonary arterial hypertension – pathophysiological and therapeutic implications.

Presenting Author Profile

Joana dos Santos Peixoto Gomes is a PhD student in Cardiovascular Sciences at UnIC@RISE, Department of Surgery and Physiology, FMUP. With a solid academic background in Biochemistry (BSc) and Applied Biochemistry (MSc) specializing in Biomedicine, Joana's research focuses on the molecular mechanisms underlying pulmonary arterial hypertension (PAH). She investigates the role of miR-146a in PAH pathophysiology, with an emphasis on therapeutic strategies.

Abstract

Pulmonary arterial hypertension (PAH) is a chronic disorder characterized by excessive pulmonary vascular remodelling, resulting in elevated pulmonary vascular resistance and right ventricle (RV) overload and failure. PAH remains incurable, and new therapeutic approaches are required. MicroRNA-146a (miR-146a) promotes vascular smooth muscle cell proliferation and vascular neointimal hyperplasia, both important hallmarks of PAH.

This study aims to investigate miR-146a role in the pathophysiology of PAH and RV failure.

Sprague Dawley rats received a subcutaneous injection of monocrotaline (MCT group, 4mg/kg) or vehicle (CTRL group). After 14 days they were treated, by nebulization, with anti-miR-146a (2,5 nmol in 100µl of sterile water), forming 3 groups: CTRL-untreated (n=8), MCT-treated (n=14), and MCT-untreated (n=15). Twenty-seven days after the MCT injection, echocardiographic and invasive hemodynamic evaluations were performed in all groups. Also, wild-type (WT) and miR-146a knock-out (KO) mice were submitted to either 3 weeks of chronic hypoxia-induced PAH with weekly Sugen 5416 administration (SuHx), forming 3 distinct groups: CTRL (n=7), WT-SuHx (n=4), and KO-SuHx (n=4).

Compared to MCT-untreated rats, MCT-treated rats showed decreased RV systolic and diastolic pressures (70.82 vs 55.51 mmHg and 3.59 vs 2.44 mmHg, respectively), improvement in RV cardiomyocyte hypertrophy, measured by cardiomyocyte cross-sectional area (434.71 vs 374.42 μm^2)

and improvement in exercise tolerance, measured by the maximal oxygen consumption during endurance test (22.58 vs 29.13 mL/min/$Kg^{0,75}$ and -40.58 vs -26.6% to basal, respectively). When compared to WT-SuHx mice, KO-SuHx mice showed decreased RV systolic pressures (32.91 vs 37.35 mmHg) and decreased RV cardiomyocyte hypertrophy (404.2 vs 463.32 μm^2).

Our findings show that miR-146a pharmacological or genetic inhibition improves RV function. Thus, miR-146a could represent a promising therapeutic target in PAH.

PO - (24903) - Circulating miR-146a associated with myxomatous mitral valve disease in a naturally occurring canine model: a comparison with plasma NT-proBNP

Author
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Citation
Reis-Ferreira, A., Lobo, L., Santos-Gomes, J., Neto-Mendes, J., Fernandes, J.M., Brás-Silva, C., Fontes-Sousa, A.P. Circulating miR-146a associated with myxomatous mitral valve disease in a naturally occurring canine model: a comparison with plasma NT-proBNP.

Presenting Author Profile

Ana Reis holds an integrated master's degree in Veterinary Medicine, completed in 2016 at the University of Trás-os-Montes e Alto Douro (UTAD). Since then, she has been working at the Hospital Veterinário do Porto, with a special interest in veterinary cardiology. In 2021, she began her PhD studies in Veterinary Sciences at the Instituto de Ciências Biomédicas Abel Salazar (ICBAS), where her research focuses on "Novel insights in myxomatous mitral valvular disease in dogs".

Abstract

Circulating microRNAs (miRNAs) are emerging as valuable biomarkers of cardiovascular diseases. Studies have highlighted miR-146a's essential role in the pathogenesis of various heart failure types and its involvement in cardiac hypertrophy, positioning it as a promising target in cardiovascular research. Myxomatous mitral valve disease (MMVD) is the most prevalent acquired cardiac condition in dogs. This study evaluated plasma miR-146a levels in both healthy dogs and those with MMVD and explored its relationship with the cardiac biomarker amino-terminal pro-brain natriuretic peptide (NT-proBNP).

Ten healthy dogs and 50 with MMVD were prospectively recruited. Plasma miR-146a, NT-proBNP levels, echocardiographic parameters, and clinical characteristics were assessed. Dogs were classified using the ACVIM staging system (control, B1, B2, C) and further categorized by the presence of left atrial (LA) and/or left ventricular (LV) remodelling.

The study groups were matched for age and body weight, with a mean age of 11.42 years and median weight of 9.10 Kg. Plasma NT-proBNP and miR-146a levels were significantly higher in dogs with congestive heart failure (stage C) compared to stage B1 ($p = 0.045$ and $p = 0.003$). MiR-146a was also elevated in symptomatic (stage C) versus asymptomatic dogs (stages B1 and B2) ($p = 0.005$) and in those with left atrial and/or left ventricular enlargement. NT-proBNP and miR-146a levels significantly correlated with echocardiographic indicators of cardiac remodelling (left atrial-to-

aorta diameter ratio and the left ventricular internal diameter in diastole, normalized to BW).

Circulating miR-146a and NT-proBNP both show significant associations with cardiac remodelling in canine MMVD, suggesting that miR-146a could serve as a complementary biomarker to NT-proBNP, particularly for monitoring disease progression. Larger-scale clinical trials are needed to further assess the diagnostic value and clinical potential of miR-146a.

PO - (24907) - Protective effect of Losartan against left ventricular hypertrophy in streptozotocin-induced diabetic rats

Author
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Citation
Cardoso-Coutinho, D., Esteves-Monteiro, M., Almeida-Ribeiro, C., Dias-Pereira, P., Morato, M., Fontes-Sousa, A.P., Duarte-Araújo, M. Protective effect of Losartan against left ventricular hypertrophy in streptozotocin-induced diabetic rats.

Presenting Author Profile

My name is Diogo Cardoso Coutinho and I am a Veterinary Medicine Student, currently in the third year. My main interests are veterinary surgery, teaching, and scientific research.This participation in the SPFI congress comes after having joined a research group at the university I attend about a year ago. I have already been present in other congresses (IJUP, CVMontenegro, YESMeeting), presenting posters developed with this investigation group.

Abstract

Diabetes mellitus (DM) is considered a global health emergency, with cardiovascular diseases being the leading cause of death among adults with DM. So, we aimed to investigate the potential protective effects of Losartan (LOS, an angiotensin II (Ang II) type 1 receptor (AT_1R) antagonist) in preventing cardiac alterations in a streptozotocin (STZ)-induced rat model of DM.

Eight male Wistar rats became diabetic after a single STZ injection (IP, 55mg/Kg). Half of them were treated with LOS (10mg/kg/day, PO – STZ+LOS), while the remaining served as diabetic controls (STZ). Non-diabetic littermates were used as controls (CTRL). Two weeks after DM induction, blood and heart samples were collected and processed. The cross-sectional area of cardiomyocytes in the left (LV) and right ventricles (RV) was measured. Additionally, serum ACE activity was quantified using a fluorometric assay (substrates: Z-FHL and h-HL).

All diabetic animals exhibited typical DM signs and were hyperglycemic compared to CTRL, including those treated with LOS (STZ: 584.75$\pm$15.25mg/dL, STZ+LOS:548.5$\pm$25.75mg/dL and CTRL:117.2$\pm$4.06mg/dL; $p<0.05$). Serum ACE activity was elevated in the STZ group compared to CTRL, with no significant change following LOS treatment. Histopathological analysis revealed significant hypertrophy of LV cardiomyocytes in the STZ group

(STZ:483.44±23.38μm^2 *vs.* CTRL:306.22±18.82μm^2; $p<0.05$). Notably, LOS treatment prevented this increase in LV cardiomyocyte area (STZ+LOS: 358.54±14.01 μm^2, $p>0.05$ compared to CTRL). There were no significant differences in RV cardiomyocyte area among the three groups.

These findings suggest that DM increases systemic ACE activity and Ang II formation, leading to AT_1R activation, which contributes to LV cardiomyocyte hypertrophy. However, LOS effectively prevented cardiac hypertrophy, highlighting its potential to mitigate diabetic cardiomyopathy.

PO - (24921) - Gender differences in long-term survival after coronary artery bypass surgery

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Citation
Diaz, S., Cerqueira, R., Ferreira, A.F., Amorim, M.J., Pinho, P., Lourenço, A.P., Barros, A.S., Leite-Moreira, A., Saraiva, I.S., F. Gender differences in long-term survival after coronary artery bypass surgery.

Presenting Author Profile

Inês Sousa holds a Bachelor's degree in Clinical Physiology from ESS-IPP (2021) and a Master's in Cardiovascular Pathophysiology (2023). Currently pursuing a PhD in Cardiovascular and Respiratory Sciences at FMUP, her research focuses on Coronary Artery Bypass Grafting (CABG), exploring sex differences and real-world data analysis.

Abstract

Introduction: Cardiovascular healthcare for women is influenced by several factors. This group often has a worse prognosis after coronary artery bypass grafting (CABG). **Aims:** To evaluate the impact of gender on long-term survival after CABG and the potential effect of age on this association. Additionally, to compare the survival of these patients with that of the general national population.

Methods

Longitudinal, retrospective, single-center study was conducted with consecutive patients who underwent isolated primary CABG. Patients were divided into age subgroups: $\leq$60, 60-70, and $\geq$70 years. All-cause mortality was evaluated in February-2023, with time-to-event analyses performed using Kaplan-Meier curves, Log-Rank tests, and multivariable Cox regressions. Kaplan-Meier curves for the general population were compared to the surgical cohort with one-sample Log-Rank tests. Standardized mortality ratios (SMR) were calculated, with an average follow-up time of 11 years and a maximum of 19 years.

Results

Out of 3978 patients, 21% were women(W). Women were older (67$\pm$9 vs 63$\pm$10 years, p<0.001), had more cardiovascular risk factors, and more chronic kidney disease compared to men(M). Men more often had peripheral arterial disease and smoking habits. Although three-vessel disease was similar between sexes (p=0.111), women were less frequently implanted with $\geq$3 grafts(p<0.001). Gender was not an independent predictor of survival in any age subgroup. However, in patients over 70 years, women had a higher risk after 10 years (HR:0.7[0.5-0.9], p=0.03). Men matched mortality risk with

the general population (SMR=1.1;95%CI:0.9-1.1), but women showed higher mortality risk (SMR=1.6;95%CI:1.3-1.8).

Conclusion

Women undergoing isolated primary CABG at an age >70 years, with longest periods follow-up, exhibited poorer long-term survival than men of the same age. Women demonstrated inferior survival outcomes compared to the general population.

PO - (24923) - Association of oral nitrate-nitrite reducing bacteria actinomyces is associated with physiological cardiovascular remodeling in pregnancy

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Citation
Morais, J., Ferreira, A.F., Azevedo, M.J., Saraiva, F., Leite-Moreira, A., Ramalho, C., Sampaio-Maia, B., Falcão-Pires, I. Association of oral nitrate-nitrite reducing bacteria actinomyces is associated with physiological cardiovascular remodeling in pregnancy.

Presenting Author Profile

Juliana Morais completed her degree in Nutrition Sciences at the Faculty of Food Sciences of the University of Porto. Due to her interest in translational research, she pursued a master's in Biomedical Research at the NOVA Medical School, Universidade Nova de Lisboa, which she completed in 2019. She is currently a PhD student in Metabolism – Clinical and Experimental at the FMUP and a researcher at CINTESIS, focusing on nutrition, metabolism, microbiota, and maternal-fetal health.

Abstract

The oral microbiota can influence cardiovascular health by producing nitric oxide, a key vasodilator for endothelial function regulation. This study, approved by the Ethics Committee of São João Hospital (ID201/18), explores the association between oral microbiota and the cardiovascular reverse remodeling process from the 3rd trimester (3T) to 6 months postpartum (6MP), in accordance with the Declaration of Helsinki.

Sixty-three women were included in the PERIMYR-OralBioBorn cohort after providing informed consent. Saliva samples were collected for 16SrRNA gene sequencing. Cardiovascular and endothelial function assessments, including the Reactive Hyperemia Index (RHI) measured using the EndoPAT™ system, were performed. No significant differences were observed between oral microbiota composition and cardiac reverse remodeling parameters (% mass regression, Δcardiac mass, Δrelative wall thickness, and ΔE/e).

Interestingly, a positive correlation was found between the relative abundance of Actinomyces and the RHI at 3T and 6MP. Women with an RHI below 1.67, indicating endothelial dysfunction, had significantly lower levels of Actinomyces at 3T (0.034 ± 0.019 vs. 0.508 ± 0.028, $p=0.026$) and

6MP (0.032±0.026 vs. 0.043±0.023, p=0.025). These differences remained significant after adjusting for maternal age, pre-pregnancy BMI, and hypertension at 3T (OR[95%CI]=5.69[0.50–10.88], p=0.032), but not at 6MP (OR[95%CI]=3.87[-1.09–8.83], p=0.123).

Our findings suggest a potential association between specific bacteria—particularly those involved in converting oral nitrate into nitrite and nitric oxide—and endothelial function. This highlights the potential for future interventions targeting oral bacteria, including dietary changes, to impact cardiovascular health in women during this unique phase of life.

Theme: Cellular and molecular including “omics”
PO - (24810) - Uncovering the contribution of uterine senescence to age-related female fertility loss

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Citation
Formoso, I., Guedes-Martins, L., Almeida, H., Silva, E., Matos, L. Uncovering the contribution of uterine senescence to age-related female fertility loss.

Presenting Author Profile

Inês Formoso graduated in Biochemistry from the Faculty of Sciences at University of Porto in July 2023. Is currently a MSc student in Molecular Medicine and Oncology at the Faculty of Medicine at University of Porto.

Abstract

As a consequence of postponing childbearing, women are facing lower fertility rates and increased pregnancy complications. Uterine function is pivotal for a successful pregnancy, so the occurrence of age-related uterine alterations will certainly impact female fertility. During ageing, senescent cells tend to accumulate in different tissues *in vivo*, but there is no data regarding the human uterus. Such cells are characterized by a stable cell growth arrest and a pro-inflammatory phenotype, impacting tissue function. There is already evidence showing uterine alterations in reproductively aged mice. Also, an age-related increase in albumin carbonylation and changes in the oxidative status of extracellular matrix proteins were reported in human uterine samples. We believe that uterine alterations caused by cellular senescence affect uterine function, contributing to age-related female fertility loss.

In this study, uterine samples collected from term pregnant women aged between 18 and 45 were used. Paraffin-embedded uterine samples were processed for staining with Haematoxylin/Eosin (H&E), Picro Sirius Red (PSR), and Sudan Black B (SBB), and vimentin immunodetection. Western Blotting or qPCR techniques were applied to evaluate the expression of senescence-associated proteins and genes, respectively.

No alterations were found on collagen deposition and lipofuscin accumulation within the uterus with ageing. A significant positive correlation with women´s age was found for Lamin B1 and pH2AX nuclear proteins and IL1β pro-inflammatory protein, while no significant age-related variations were detected on the protein levels of IL6, MCP1, MMP3 and PAI-1.

During reproductive ageing, the uterus suffers senescence-associated molecular changes compatible with the occurrence of nuclear damage and a switch to a pro-inflammatory uterine environment. Further studies will clarify the impact of such alterations on uterine function.

PO - (24836) - The impact of polyphenols on diabetes: mechanisms and therapeutic potential

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Citation
Farrim, M.I., Menezes, A.G., R., Milenkovic, D. The impact of polyphenols on diabetes: mechanisms and therapeutic potential.

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RM holds a PhD in Biological Sciences - Genetics from the Federal University of Rio de Janeiro and Heinrich-Heine University of Dusseldorf. Currently an Assistant Professor at ECTS and Assistant Researcher at CBIOS (U. Lusófona) her research interests include the pathological role of Islet Amyloid Polypeptide (IAPP) proteotoxicity in diabetes, pancreatic cells plasticity, and the modulation of these processes by dietary (poly)phenols.

Abstract
Diabetes is a chronic metabolic disorder marked by progressive loss of β-cell mass and function with subsequent insulin deficiency. The beneficial effect of (poly)phenols against pathological processes associated with diabetes has gained increased interest, yet the precise

molecular mechanisms underlying (poly)phenols action remain largely elusive. Understanding how these compounds interact with cellular pathways and molecular targets may illuminate their potential role in diabetes management. This study used bioinformatic tools to search for the multigenomic effects of (poly)phenols, and (poly)phenol metabolites produced during digestion and by the action of colonic microbiota, to identify modulatory networks and cellular pathways associated with diabetes. Bioinformatic evaluation of published data on gene expression alterations in diabetes models, modulated by phenolic compounds or extracts rich in (poly) phenols, allowed the identification of potential regulatory factors. Functional analyses indicated that the differentially expressed genes play important roles in cellular functions such as cell signaling, endocrine resistance, immune system and inflammation pathways, apoptosis, and cellular senescence. Several transcription factors have emerged as potential regulators of the observed genomic changes, including PPARG and SIRT1. Notably, in-silico 3D docking analyses suggested that specific (poly)phenol metabolites, such as apigenin, luteolin, and naringenin glucuronides, have a high binding affinity for SIRT1, indicating potential molecular interactions that might affect the progression of the disease. Integrative analysis of (poly)phenol metabolites data shows the potential of these molecules for nutraceutical/ pharmaceutical development for diabetes control.

PO - (24853) - Impact of polyphenol metabolites, under physiologically relevant concentrations, on kidney cell phenotypes related to cancer progression

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Citation
Guerreiro, Í., Carregosa, D., Saraiva, N., Oliveira, N.G., Costa, J.G., Fernandes, C.N.D.S., A.S. Impact of polyphenol metabolites, under physiologically relevant concentrations, on kidney cell phenotypes related to cancer progression.

Presenting Author Profile

Ana S. Fernandes graduated in Pharmaceutical Sciences (2004), has a PhD in Pharmacy (specialty of Toxicology, 2010, U. Lisboa), and is a European Registered Toxicologist (2018). Associate Professor at U. Lusófona, she coordinates the Integrated Master in Pharmaceutical Sciences and co-coordinates the Hygieia Erasmus Mundus Joint Master. She leads the Models & Molecular Mechanisms Lab of CBIOS. Her main research interest is to explore the impact of redox modulators on cancer progression.

Abstract

Polyphenols, abundant plant-derived compounds in the human diet, have been recognized for their protective effects against various diseases, including renal cancer. However, typical in vitro studies often overlook the extensive biotransformation of dietary polyphenols in vivo and their physiological concentrations.

This study explores the role of polyphenol metabolites (PMs) in modulating phenotypes associated with cancer development in human normal-like (HK-2) and tumor (786-O) kidney cell models. We used four phenolic acid metabolites—phenylacetic, protocatechuic, homovanillic, and dihydrocaffeic acids—previously detected in human urine after polyphenol-rich food intake, at physiologically relevant concentrations.

Cell viability, assessed via crystal violet assay, was unaffected by PM treatment in both cell lines. However, dihydrocaffeic acid notably altered the migration dynamics of tumor cells, particularly reducing cell velocity in 0.5 $\pm$ 0,15 µm/s. Additionally, protocatechuic and homovanillic acids protected non-tumor kidney cells from cisplatin-induced DNA damage, as indicated by reduced γ-H2AX foci in 22 % $\pm$ 9 % and 43 % $\pm$ 8,5 %, respectively.

These results highlight the potential of PMs to counteract key tumor cell behaviors that influence cancer initiation and progression, underscoring the importance of considering physiological relevance in cancer research.

Acknowledgements
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PO - (24864) - Effect of adipose tissue anatomical location and obesity on the expression of SARS-CoV-2 cell infection mediators ACE2, TMPRSS2, ADAM17 and NRP1: impact on COVID-19

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Citation
Salazar, M., Ferreira, M., Oliveira, S.M., Saraiva, F., Pinho, C., Jarnalo, M., Correia-Sá, I., Falcão-Pires, I., Leite-Moreira, A., Neves, D., Almeida, H., Rodrigues, A., Gouveia, A. Effect of adipose tissue anatomical location and obesity on the expression of SARS-CoV-2 cell infection mediators ACE2, TMPRSS2, ADAM17 and NRP1: impact on COVID-19.

Presenting Author Profile

Maria Salazar graduated in Microbiology at the Faculty of Biotechnology of the Catholic University of Portugal. Then, she pursued her studies and obtained the MSc degree in Molecular Oncology and Medicine at the Faculty of Medicine of the University of Porto (FMUP). Currently, she is a PhD student at FMUP in the Biomedicine doctoral program.

Abstract

Obesity contributes to COVID-19 severity that occurs by SARS-CoV-2 cell infection, mainly conveyed by ACE2 receptor. Additional proteins, TMPRSS2, ADAM17 and NRP1, also facilitate virus cell entry. This study aims to investigate how the expression of these proteins in adipose tissue (AT) is differently regulated by its anatomical location and obesity.

AT samples from subcutaneous abdominal superior (AS), abdominal inferior (AI), thigh(T) and visceral epiploon(E) were collected from non-obese patients (BMI 19.9–29.5kg/m^2). Additionally, subcutaneous AT was obtained from individuals with previous obesity (BMI 22–27.2kg/m^2; before:33.5–52.6kg/m^2) and currently with obesity (BMI 30.4–35.5kg/m^2). Samples were collected at CHUSJ and IPO-Porto, after approval by Ethic Committee and informed consent from patients. Expression of ACE2, TMPRSS2, ADAM17 and NRP1 was assessed by qPCR and western blot.

Protein levels were higher in visceral E compared to subcutaneous (AS, AI, and T) AT. ACE2 mRNA was elevated in E relative to AI, while NRP1 decreased in E compared to T, and ADAM17 remained unchanged across all fat compartments.

Individuals with obesity presented higher protein levels of all SARS-CoV-2 entry mediators than controls. In agreement, ACE2, TMPRSS2 and NRP1 protein levels positively correlated with BMI in AS and/or E depots. Conversely, ACE2 mRNA in E decreased with increasing BMI.

Upon weight loss, TMPRSS2 and ADAM17 protein levels remained similar to those in individuals with obesity; however, ACE2 and NRP1 decreased. Unexpectedly, ADAM17 mRNA decreased in patients with previous and current obesity compared to controls. No differences were observed in ACE2 and NRP1 mRNA levels.

Overall, visceral AT and obesity associate with higher expression of ACE2, TMPRSS2, ADAM17 and NRP1, potentially increasing COVID-19 severity. Weight loss may be beneficial to prevent severe COVID-19, since levels of ACE2 and NRP1, to which SARS-CoV-2 binds directly, are decreased in this condition.

PO - (24896) - New zebrafish models for mitochondrial diseases: functional validation of VUS and therapeutic strategies

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Citation
Laranjeira, M., Oliveira, J.M.A., Santorelli, F.M., Nogueira, C. New zebrafish models for mitochondrial diseases: functional validation of VUS and therapeutic strategies.

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Mateus Laranjeira is a PhD student at the Faculty of Pharmacy of the University of Porto. He completed his Master's degree in Molecular and Cellular Biology in 2022 from the Faculty of Sciences of the University of Porto and the Degree in Biomedical Laboratory Sciences in 2020 from the

School of Allied Health Siences of Porto. Since his master's degree, he has dedicated his professional career to the diagnosis of metabolic diseases and mitochondrial cytopathies.

Abstract

Mitochondrial diseases (MD) are a group of genetic disorders characterized by impaired mitochondrial function. Despite advancements in Next-Generation Sequencing technologies, the interpretation of variants of unknown significance (VUS) remains a challenge[1]. Functional studies in model organisms have become essential to delineate the physiological consequences of these VUS and *Danio rerio*, with its conserved cellular physiology and genetic similarities to humans, is a great model for studying MD at the cellular and molecular level[2].

This study aims to investigate the functional consequence of six VUS in the genes *ACAD9* (p.Lys51Ile, p.Leu362Phe), *TSFM* (p.Arg8Arg, p.Arg275Cys), and *NDUFS8* (p.Arg66*, p.Arg96His), using zebrafish as an *in vivo* model.

Splicing blocking morpholino oligonucleotides (MO) will be designed to induce knockdowns of the zebrafish orthologs *acad9*, *tsfm*, and *ndufs8*. MO concentrations will be optimized by titration to avoid off-target effects and a scrambled MO will be used to assess specificity. The efficiency of gene knockdown will be validated through RT-qPCR. Functional rescue experiments will follow, where co-injection of human wild-type or mutant cRNA, alongside with the MO, will assess phenotypic restoration. Furthermore, we will expose these knockdown models to mitochondria-targeted drugs to evaluate potential therapeutic responses.

With this work, we anticipate the generation of zebrafish models exhibiting MD. The physiological relevance of each VUS will be confirmed if the phenotype from genetic knockdown is not reversed by the mutated transcripts but is reversed by the wild-type transcripts. The response of these

models to mitochondrial drugs will also provide valuable insights into their potential as therapeutic candidates.

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Theme: Education
PO - (24846) - From curriculum to research: charting physiology's role in Portuguese higher education

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Citation
Rodrigues, L.M., Guerreiro, Í., Isca, V.M., Gregório, J. From curriculum to research: charting physiology's role in Portuguese higher education.

Presenting Author Profile
João Gregório holds a PhD in International Health from IHMT-NOVA University Lisbon. He is currently an Assistant Researcher at CBIOS, Lusófona University. João's research focuses on data-driven studies exploring the links between blood flow asymmetries and obesity. His work, published in scientific journals, showcases his multidisciplinary skills and expertise in using data science to advance understanding of blood flow asymmetries and obesity-related health issues.

Abstract

The trajectory of Physiology education and research frequently dominates discussions within global Physiology circles. The European Higher Education Area (EHEA) has significantly altered the educational landscape in Europe, setting it apart from the educational models in the USA and UK. This paper delves into the current practices in Physiology education in Portugal, an EHEA and EU member.

This study uses a mixed-methods approach to map institutions offering Physiology courses in Portugal and assess faculty research impact. Data from the Portuguese Directorate-General for Higher Education (DGES), collected from September to November 2022, identified these institutions and their Physiology programs. Additional information on teaching methods, hours, and course credits was gathered from institutional websites, creating a database of 365 courses and 764 Physiology CU/D. A bibliometric analysis of faculty research from 2017 to 2022 was conducted using VOSviewer to identify research trends and themes.

The study revealed distinct differences between university and technical college programs. Technical colleges mainly offer Physiology in the first year, while universities integrate it throughout, reflecting a tiered approach to complexity. These differences likely stem from varying organizational structures and resources. The bibliometric analysis showed significant research disparities, with university faculty being more productive, especially in Medical and Lifestyle Physiology. Research areas included biomedical innovations, cardiovascular health, sports performance, and wellness. Although specific to the EHEA and Portugal, the findings emphasize Physiology's essential role in health education and research, highlighting its importance in addressing key health challenges.

PO - (24851) - The HYGIEIA project: advancing education through a European joint master degree in health and wellbeing

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Citation
Fernandes, A.S., Gregório, J., Mourato, A.C., Vidovic, B., Savic, S., Sobajic, S., Sureda, A., Bouzas, C., Tur, J., Rosado, C. The HYGIEIA project: advancing education through a European joint master degree in health and wellbeing.

Presenting Author Profile
Ana S. Fernandes graduated in Pharmaceutical Sciences (2004), has a PhD in Pharmacy (specialty of Toxicology, 2010, U. Lisboa), and is a European Registered Toxicologist (2018). Associate Professor at U. Lusófona, she coordinates the Integrated Master in Pharmaceutical Sciences and co-

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Abstract

The HYGIEIA European Master's program addresses the need for a comprehensive educational program that provides integrated knowledge in the most crucial areas of health and well-being (H&W). Recognizing the importance of physiology in developing effective H&W-promoting strategies, the program incorporates domains such as nutrition, lifestyle interventions, and non-drug approaches (cosmetics, food supplements, digital tools). These elements are all grounded in rigorous scientific knowledge and evidence-based practices, ensuring a holistic and impactful approach to H&W promotion.

A co-creation model was employed in the development of the HYGIEIA program. An online survey targeting potential students was conducted in 10 countries (n=298) to assess interest and gather feedback. Additionally, three Focus Group meetings were organized in Lisbon, Mallorca, and Belgrade to capture the perspectives of potential employers, students, and other relevant stakeholders.

The survey showed that 84% of the participants would consider enrolling a master's in H&W and 95% were interested in a program involving mobility. The areas of the curriculum were rated as "interesting/very interesting" by the majority of the respondents. The Focus Groups raised the following priorities in H&W training: health needs of the aging population; burden of chronic diseases in modern societies; environmental and social determinants of H&W; sustainable H&W strategies; personalized non-drug products; health systems in health promotion; communication; health literacy. The global HYGIEIA consortium involves other academic partners, companies, healthcare providers, medical/scientific societies, and professional organizations.

The co-creation model provided an innovative approach to higher education. The program will prepare graduates to apply fundamental physiology knowledge in developing sustainable H&W promotion strategies.

Health literacy among individuals with and without chronic diseases: perspectives from a cross-sectional study.

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Abstract

Health literacy (HL) is vital for positive health outcomes, enabling effective management of health information and decision-making. For individuals with chronic diseases (CD), HL is critical for managing their conditions, while in healthy individuals, it encourages preventive behaviors. Despite Portugal's high prevalence of CDs and related healthcare challenges, knowledge about HL remains limited, it has been increasingly recognized as crucial. This study aimed to assess HL in volunteers with CD and without CD (WCD). A cross-sectional design study was conducted from January to March 2024. Study was approved by local ethics committee (CE.ECTS/P30-23). All participants gave their informed consent. 72 volunteers, mean age 49.9 (15.8) years old, 23 male and 49 female, were recruited by convenience at community pharmacies. 51.4% (n= 37) had one or more CD and 48.6% (n=35) were WCD. HL was evaluated using the Health Literacy Europe Questionnaire, Portuguese version (HLEU-PT). 70% of CD and 58% of WCD presented a problematic global HL level (p=0.416). Within the 3 domains of the HL (Health Care (HC), Disease Prevention (DP) and Health Promotion (HP)), CD showed 51% of sufficient HC level, 62% of problematic DP level and 84% problematic HP level. WCD group, 71% had sufficient HC level, 54% sufficient DP level and 74% problematic HP level. A negative association was found between CD and the global HL level (OR=0.93, p=0.044), the same trend was found at HP domain (OR=0.94, p=0.043) and HC domain (OR=0.92, p=0.045). This study highlights the role of HL in managing health outcomes, showing that those with CD are less likely to have adequate HL levels, especially in the domains of HP and DP. Given these findings, it is imperative to implement tailored HL programs, to contribute significantly to reducing health disparities, improving quality of life, and decreasing healthcare costs by empowering individuals to manage their health proactively and effectively.

PO - (24883) - Food and nutritional literacy and emotional hunger in the process of weight management

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Citation
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Abstract
Weight management is a complex challenge influenced by various factors, namely nutritional literacy and emotional eating. This study aimed to explore this interaction and impact on weight management processes. A cross-sectional study was conducted between March and May 2024. Study was approved by local ethics committee (CE.ECTS/P13-24). All participants gave their informed consent. 36 adult women, mean age 49.6 (9.28) years, were

recruited at a clinical nutrition office. Food and nutrition literacy (FNL) was assessed by Short Food Literacy Questionnaire, with levels categorized into: 'Inadequate-Limited' for scores below 31 and 'Adequate-Excellent' for scores equal to or above 31. Emotional Eating (EE) was assessed using The Emotional Eater Questionnaire (EEQ). Participants were categorized into 4 levels: "No Emotional Eater" for a score from 0 to 5, "Low Emotional Eater" for score from 6 to 10, "Emotional Eater" for score from 11 to 20, and "High Emotional Eater" for a score from 21 to 30. The sample had an average BMI of 27.5 (5.68) kg/m2. 2.8 % of the volunteers were underweight, 33.3 % were normal weight, 30.6 % were overweight, 33.3 % had obesity (p=0.003). Inadequate/limited FNL was more common among overweight and obese participants (p=0.282). This pattern suggests that FNL can positively influence weight control. As for EE, 44.4 % were Emotional Eaters and 16.7 % High Emotional Eaters, this category being predominant in obesity (66.7 %) (p=0.117). The study's findings reveal that higher levels of FNL are associated with healthier food choices and better weight management. Conversely, EE contributes to less healthy food choices and weight management challenges. Enhancing FNL and providing tools to manage emotional eating could effectively promote healthier eating behaviors and obesity prevention.

PO - (24929) - Illuminating the black-box: predicting and promoting academic success via measurable learning activities

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Citation
Oliveira, J. Illuminating the black-box: predicting and promoting academic success via measurable learning activities.

Presenting Author Profile
Jorge Ascenção Oliveira is an Associate Professor at the University of Porto. He coordinates the Human Physiology and the Neuroscience Units in the Integrated Master in Pharmaceutical Sciences, and he is the President of the Pedagogical Council from the Faculty of Pharmacy. Jorge is a Group leader and a Lab leader at UCIBIO – Applied Molecular Biosciences Unit. He coordinates the Observatory for Academic Success from the University of Porto.

Abstract
Human physiology is a cornerstone of health sciences courses, providing the essential foundation for understanding diseases and treatments. Success in mastering physiology can significantly impact overall course performance. However, the factors influencing academic success in a curricular unit often remain opaque, akin to a 'black-box.' This opacity is particularly evident when unit assessments rely solely on a single exam and teaching methods are predominantly expository, with limited student-

centred approaches. In this study, we developed a learning environment that included synchronous lecture attendance and online activities, such as recorded lectures and formative tests. We measured student participation in these activities and correlated it with exam scores to derive predictive analytics. Our findings revealed that attendance at synchronous lectures or viewing recorded lectures explained only 20% and 17% of the variability in exam scores, respectively. However, a machine learning model combining the number of formative tests taken and their mean grade predicted 67% of the variability in exam scores, and predicted exam failure with 90% accuracy. Thus, engagement in active learning (formative tests) is a better predictor of success than passive learning (lecture attendance or viewing). Also, for students with intermediate lecture attendance, higher visualization of recordings correlated with higher exam scores, supporting the value of recordings. We also used confidence-based assessments to measure students' self-awareness, finding higher levels of under- and over-confidence in students with a procrastinator phenotype (low participation in formative tests and lecture viewing). Together, these data illuminate the learning black-box, showing that regular participation in active learning opportunities, such as formative tests, best predicts and promotes academic success, not only in exams but also in cognitive skills like metacognitive self-awareness.

Theme: Environmental and exercise PO - (24825) - Comparing the impact of physical exercise versus physical activity on anthropometrical and skeletal muscle changes in patients with stomach cancer submitted to neoadjuvant chemotherapy with FLOT

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Citation
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Presenting Author Profile

Mafalda (MBP) completed the master's degree in Biochemistry with specialization in Clinic Biochemistry (2022) by the University of Aveiro. MBP developed her master thesis work at IPO-Porto in the scope of FCT-funded project "PROTECT" and become a research fellow of that project later in 2023. MBP is the author of one review paper published in a Q1 medicine research journal and is currently taking her PhD in Physical Activity and Health focusing on the interplay between exercise and mitochondria.

Abstract

Gastric cancer (GC) was one of the most incident and mortal types worldwide in 2020. Standard therapy for patients with locally advanced adenocarcinoma includes neoadjuvant chemotherapy (NAC) with Docetaxel, oxaliplatin, leucovorin, and 5-fluorouracil (FLOT). Despite its effectiveness in survival and disease-free survival, this regimen has similar side effects to other chemotherapy regimens and may also exacerbate skeletal muscle (SkM) loss observed in cancer patients, affecting their treatment tolerance, and increasing cancer recurrence and risk of mortality. The goal of the present work was to compare the impact of physical exercise versus physical activity recommendations, on top of usual care, on anthropometrical and SkM functional, histological and molecular changes in GC patients submitted to FLOT. This work was developed in the scope of the PROTECT project (PTDC/SAU-DES/7945/2020), a randomized controlled trial for patients with locally advanced adenocarcinoma of the stomach who were submitted to NAC with FLOT. Patients were allocated to a physical activity group (P1) or structured exercise group (P2). All patients had access to the standard care. Clinicopathological data, anthropometric data, blood data and handgrip

values from 8 patients (P1=4; P2=4), as well as SkM biopsies (abdominal rectus), were collected at baseline and after finishing NAC. In comparison to baseline values, patients from the P1 group showed a significant decrease of calf circumference. Patients from the P2 group had a significant increase in glucose levels. At the SkM level, no molecular (atrogin1, MuRF1, pFOXO3, total AKT and pAKT) nor histological (hypertrophy and fibrosis) qualitative changes were noted in any group nor between groups. These conclusions are preliminary and limited by the small sample size. Future studies should focus on the in-depth characterization of the molecular mechanisms underlying chemotherapy-induced SkM remodeling and how exercise impacts them.

PO - (24829) - Distance covered in a functional capacity test as an indicator of cardiorespiratory risk for physical exertion in people with severe obesity in Brazil

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Citation
Tenius, V., Pires, L. Distance covered in a functional capacity test as an indicator of cardiorespiratory risk for physical exertion in people with severe obesity in Brazil.

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Abstract

Introduction: The 6-minute walk test (6MWT) is a useful eligibility tool (distance covered <400m) for lung transplantation. Excessive adiposity impairs cardiorespiratory function, as does chronic obstructive pulmonary disease (COPD).

Objective

To identify the influence of body mass index (BMI) on the distance covered in a functional capacity test by people with different levels of obesity severity.

Method: Cross-sectional study, with adults of both sexes divided after body composition assessment into 4 groups: 1- BMI≥35Kg/m^2; 2- BMI≥40Kg/m^2; 3- BMI≥50Kg/m^2; 4- BMI≥60Kg/m^2, for subsequent application of the 6MWT (healthy adult reference: women 538±95m and men 566±87m; risk reference: cutoff point for COPD suggestive of transplantation ≤400m). We used the Kolmogorov-Smirnov test, Pearson's correlation, 1-factor ANOVA with Tukey's post-hoc test and a significance level of P≤0.05.

Results

130 adults were assessed, with a mean age of 40.6 ± 10.1 years, BMI of 44.8 ± 7.69 Kg/m^2 and a minimum 6MWT distance of 363m and a maximum of 556m (women 447±92 and men 500±99m). We found a negative correlation between the 6MWT and BMI in the general population evaluated, regardless of gender (-0.616 p ≤ 0.01). When stratifying the population according to the severity of obesity, we found that 38 people had severe obesity (group 1), 69 had morbid obesity (group 2), 17 had super obesity (group3) and 6 had super-super obesity (group 4). The difference in the distance covered between groups were: 1 and 2 (p=0.004) and between groups 1 and 3, 1 and 4, 2 and 4 and 3 and 4 (p<0.001); only between groups 2 and 3 did we find no difference in the distance covered (p=0.205).

Conclusion

People with severe obesity have a distance traveled at risk that is progressively greater as the level of obesity increases, regardless of gender.

PO - (24833) - Protect trial: evaluating the impact of structured vs. non-structured home-based prehabilitation in surgical gastric cancer patients undergoing neoadjuvant chemotherapy with FLOT—preliminary insights into postoperative complications

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Citation
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Abstract

Prehabilitation has emerged as a promising approach to optimize surgical outcomes in cancer patients. This study aimed to analyze tolerance to neoadjuvant chemotherapy (NAC) with FLOT, changes in physical fitness, and postoperative complications in patients with locally advanced gastric adenocarcinoma. Patients were randomly assigned to either a non-structured (P1) or structured (P2) prehabilitation program in a 1:1 ratio. While P1 received standard care along with written activity goals, P2 was provided with standard care plus specific instructions for aerobic, strength, and inspiratory muscle training. Outcomes were assessed at three key points: before NAC, before surgery, and 30 days post-discharge, focusing on postoperative complications, changes in physical fitness, and tolerance to NAC. The final analysis included 39 patients, with 17 in P1 and 22 in P2. Postoperative complications were observed in 9 patients (23.1%), with major complications occurring in 10.5% (2 patients in each group). Both prehabilitation methods effectively reduced overall complications by 30% and major complications by 10% when compared to historical data. Although no significant differences were noted in physical fitness between the groups, chemotherapy delays were notably lower in P2, with 67% of P1 and only 22% of P2 patients needing to delay two or more chemotherapy cycles ($P<0.05$). Additionally, P2 patients experienced fewer grade III-IV hematologic side effects ($P<0.05$ compared to P1). These preliminary findings suggest that both structured and unstructured home prehabilitation approaches are

effective in reducing postoperative complications and maintaining physical fitness, with the structured program offering added benefits in improving tolerance to FLOT chemotherapy. Thus, prehabilitation should be considered an integral component of perioperative care in this patient population.

PO - (24866) - Complexity of near-infrared spectroscopy signals in patients with peripheral arterial disease: a pilot study

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Daniel Santarém is a doctoral research fellow in Sport Sciences in the University of Trás-os-Montes and Alto Douro (Vila Real, Portugal), with a grant funded by the Foundation for Science and Technology (2023.05145.BDANA). This project is being developed in partnership with the Local Health Unit of Trás-os-Montes and Alto Douro (Vila Real, Portugal) and focuses on the personalisation of dose-response during exercise in patients with peripheral arterial disease using a multicomponent approach.

Abstract

The application of non-linear methods to examine the variability of physiological time series has increased substantially. In peripheral arterial disease (PAD), near-infrared spectroscopy technology (NIRS) has been used to monitor patients' local physiological responses to exercise (1). The purpose of this pilot study was to analyse the effect of a supervised exercise programme on muscle oxygen saturation (SmO_2) and total hemoglobin (tHb) sample entropy (SampEn) in PAD patients during a graded treadmill test. Ten symptomatic male patients were allocated to a supervised exercise training (SET, n=7) or usual care (UC, n=3). The SET included three weekly sessions, combining treadmill walking and lower-limb resistance training. The UC was advised to walk without further supervision. SmO_2 and tHb were assessed using NIRS in the most affected leg during the first-load of the Gardner-Skinner test at baseline and after 12-week. Data was processed in R project software for time series to determine SampEn. A two-way repeated measures ANOVA was used to compare changes in SmO_2SampEn and in tHbSampEn. There were no statistically significant interactions between the effects of group and time on SmO_2SampEn ($F(1,7)=0.142$, $p=0.718$, $\eta^2=0.001$) and on tHbSampEn ($F(1,6)=3.864$, $p=0.097$, $\eta^2=0.392$). In SmO_2SampEn, the time effect caused a lower decrease in SET compared to UC (Mean difference, -0.006 and -0.012, respectively). Furthermore, while SET showed a decrease in tHbSampEn after the 12-week (-0.162, $p=0.352$), UC exhibited a slight increase (+0.061, $p=1.000$). By identifying the complexity of the global physiological processes of NIRS, it was possible to observe that there was a lower decrease in SmO_2SampEn in SET, which may be explained by a higher variability of the response due to chronic adaptations. However, this pattern was not manifested in the tHbSampEn of the UC, which showed greater variability.

Reference

1) Cornelis et al., EJVES, 2021

PO - (24867) - Effects of a 12-week multicomponent exercise programme on near-infrared spectroscopy derived-parameters in peripheral arterial disease

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Citation
Santarém, D., Pinto, I., Campos, J., Abrantes, C. Effects of a 12-week multicomponent exercise programme on near-infrared spectroscopy derived-parameters in peripheral arterial disease.

Presenting Author Profile
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on the personalisation of dose-response during exercise in patients with peripheral arterial disease using a multicomponent approach.

Abstract

Wearable devices that enable real-time exercise monitoring in peripheral arterial disease (PAD) have been gaining prominence over the last decade. With PAD being characterised by insufficient blood flow, near-infrared spectroscopy (NIRS) derived-parameters such as muscle oxygen saturation (SmO_2), total hemoglobin (tHb), oxy-hemoglobin (O_2Hb) and deoxy-hemoglobin (HHb) can be used to provide real-time measurement of the microcirculation (1). This study aimed to analyse the effect of a 12-week multicomponent exercise programme on SmO_2, tHb, O_2Hb and HHb in PAD patients. Men with symptomatic PAD completed a 12-week multicomponent supervised exercise training (SET, n=8, age=66.5±6.7 yrs) or usual care (UC, n=4, age=62.8±7.3 yrs). The SET consisted of three exercise sessions per week, with treadmill walking and lower-limb resistance training. The UC was advised to walk without further supervision. NIRS was used to assess SmO_2, tHb, O_2Hb and HHb during a graded treadmill protocol. The average values of the first stage of the protocol were calculated. Endpoints were percentage change (%change=(final-initial/initial)x100) from baseline to 12-week, and differences were assessed with independent *t*-test. All data are presented as %change±standard deviation. After the 12-week, despite no statistical significance in the studied variables, SET showed a higher increase in SmO_2 compared to UC (50.7±44.3 vs 29.3±51.6%, p=0.471). tHb presented a decrease in SET (-0.4±.1.3%) and an increase in UC (0.7±1.0%). While O_2Hb exhibited a superior increase in SET compared to UC (50.2±43.5 vs 30.3±52.4%), HHb exhibited a superior decrease in SET compared to UC (-11.1±11.9 vs -4.1±17.3%). This higher increase in SmO_2 and O_2Hb and the decrease in HHb in SET may suggest a more optimised balance between oxygen supply and consumption, and provide important insights into the efficiency of muscle consumption due to the chronic adaptations induced by exercise.

Reference

1) Gardner et al., J Vasc Surg, 2020

PO - (24868) - Extracellular mitochondria as novel mediators in exercise-induced health adaptations

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Citation
Pedrosa, M., Santos, L.L., Ferreira, R., Magalhães, J. Extracellular mitochondria as novel mediators in exercise-induced health adaptations.

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Mafalda (MBP) completed the master's degree in Biochemistry with specialization in Clinic Biochemistry (2022) by the University of Aveiro. MBP developed her master thesis work at IPO-Porto in the scope of FCT-funded project "PROTECT" and become a research fellow of that project later in 2023. MBP is the author of one review paper published in a Q1 medicine research journal and is currently taking her PhD in Physical Activity and Health focusing on the interplay between exercise and mitochondria.

Abstract

Physical exercise has been studied as a nonpharmacological treatment for multiple diseases including noncommunicable ones. However, the molecular mechanisms underlying these benefits remain unknown. In the past years, myokines, exerkines and miRs have been pointed as mediators of exercise-induced health benefits; yet recent studies suggest that extracellular mitochondria (extMit) may also play a role in mediating exercise effects. ExtMit can be found in circulation through different forms as they can be free, enclosed in vesicle or platelets, and as mitochondrial components, namely cfc-mtDNA, either in an active or inactive state, harmed or fragmented, possibly having different roles. Therefore, in this work we aim to explore the role of the different types of extMit as mediators of the exercise-induced benefits. Firstly, we analyzed bibliometric networks considering the keywords "extracellular mitochondria" or "mitochondria" and "exercise" using Vosviewer software. Results demonstrated a strong relationship among mitochondria and exercise mostly in skeletal muscle; however, there was no association between extMit and exercise, reflecting the originality of this topic. Indeed, the impact of exercise on circulating extMit is limited, with most studies analyzing cfc-mtDNA levels or skeletal muscle-derived extracellular vesicles. Furthermore, different cell types can secrete extMit so, beside the role of each form of extMit in mediating the protective effects associated with exercise in health and disease, the origin of exercise-induced circulating extMit also remains unclear. This literature survey highlights the need for future research on the impact of exercise on circulating extMit content and profile and its health effects.

PO - (24872) - Blood lipids and fat mass in postmenopausal women: a comparative study across rural, semi-urban, and urban environments

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Citation
Teixeira, A., Abrantes, C., Alves, E., Ferreira, J., Moreira, H. Blood lipids and fat mass in postmenopausal women: a comparative study across rural, semi-urban, and urban environments.

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She has a degree in Psychomotor Rehabilitation, a Master's in Gerontology, and a PhD in Sports Science from UTAD. Her research focuses on health benefits of natural environments, particularly in physical activity, sleep, and body composition. Currently, she is a research fellow in A-MoVer project, investigating the integration of biomechanical sensors into ergonomic study to assess driving postures in urban environments, aiming to prevent injuries and enhance human-machine interface performance.

Abstract

Menopause leads to estrogen depletion, increasing total and central adiposity and altering lipid profiles. The residential environment can also influence these changes (Groot et al., 2019), however additional research is required. This study tested the effect of residence area on adiposity levels and lipid profiles among postmenopausal women. A total of 104 participants were categorized into three groups: rural (<2000 inhabitants, n=25), semi-urban (≥2000 and <5000 inhabitants, n=28), and urban area (≥5000 inhabitants, n=51). The variables analyzed included fat mass (FM), visceral fat level (VFL), waist circumference (WC), triglyceride levels (TG), and total, low-density lipoprotein (LDL) and high-density lipoprotein (HDL) cholesterol. Data were analyzed using a One-Way Anova or Kruskal-Wallis test for non-parametric data (p<0.05). The sample showed high total and central adiposity levels, with no significant differences among groups [FM $\chi^2(2)=.242$, $p=.785$; WC $\chi^2(2)=.583$, $p=.560$; VFL $\chi^2(2)=.859$, $p=.651$]. Regarding total cholesterol, 60% of the women in rural area had normal levels (<200 mg/dL), in contrast to 25% in semi-urban area and 41.2% in urban area, with no statistical differences. We also identified no differences in the other lipid profile variables. The mean LDL cholesterol levels were identical across residence area (rural=119.44 mg/dL; semi-urban=122.57 mg/dL; and urban areas= 124.47 mg/dL; p=.802). The values of HDL (rural=64.56 mg/dL; semi-urban=67.29 mg/dL; and urban areas=65.96; p=.671), and triglyceride levels were (rural=102.28 mg/dL; semi-urban=99.32 mg/dL; and urban areas=100.31 mg/dL; p=.943) were also similar between groups. These findings suggest that residence area, defined by population density, may not significantly affect fat mass and lipid profile in postmenopausal

women. Further research is needed to investigate additional factors that may interact with the residential environment and affect metabolic health in this population.

PO - (24888) - Comparisons and association among body composition, blood and functional fitness measures considering different BMI groups of older women

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Citation
Oliveira, R., Leão, C., Silva, A.F., Clemente, F.M., Santamarinha, C.T., Brito, H.N., J.P.R.G.M.D. Comparisons and association among body composition, blood and functional fitness measures considering different BMI groups of older women.

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Abstract

This study compared body composition, blood and functional fitness measures considering different Body Mass Index (BMI) groups of older women and analysed the relationships between Phase Angle (PhA) with blood and functional fitness variables. Forty-six independent older women were divided into four groups: Group 1 (G1, BMI <25 kg/m2); Group 2 (G2, BMI >25–30 kg/m2); Group 3 (G3, BMI >30–35 kg/m2); Group 4 (G4, BMI >35 kg/m2). In addition to the BMI, other body composition variables were collected: fat mass (FM), fat-free mass, intracellular water (ICW), extracellular water (ECW), total body water (TBW) and PhA (50 kHz). Blood measures consisted in: systolic blood and diastolic blood pressure, total cholesterol, high-density lipoprotein, low-density lipoprotein, glucose and Triglycerides, hemodynamic and blood test composite score. Functional fitness tests were applied through the Fullerton battery of tests: arm-curl; chair-stand; 6 min walking test (6MWT); time up-and-go test (TUG); standing on one leg (SOOL) and 10 foot-lines (10FL). The main results showed differences between groups in: 6MWT, SOOL and 10FL between G1 vs. G3 and G2 vs. G3 (p

<0.05); ACT, AIC and AEC between G1 vs. G4 ($p < 0.05$); FM among all groups ($p < 0.05$). Negative correlations were found between PhA and the agility test in G1 ($r = -0.848$; $p = 0.008$) and G4 ($r = -0.909$; $p = 0.005$); PhA and chair-stand in G3 ($r = 0.527$; $p = 0.044$); PhA and arm-curl in G3 ($r = 0.641$; $p = 0.010$) and G4 ($r = 0.943$; $p = 0.001$); PhA and 6MWT in G4 ($r = 0.771$; $p = 0.042$). In conclusion, better functional fitness capacities are associated with better body composition parameters. For instance, different functional tests were related with PhA, which reveals the importance of this variable as a marker of health status.

Theme: GI, endocrine metabolic and nutrition physiology
PO - (24824) - Prehabilitation impact on the AT of gastric cancer patients undergoing chemotherapy with FLOT

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Citation
Barbosa, S., Pedrosa, M., Antunes, J., Jorge, N., Castro, C., Araújo, L., Pinhal, C., Fernandes, F., Caneppele, C., Oliveira, C., Cabral, S., Romano, O., Fonseca, S., Teixeira, F., Braga, S.P., Martins, P., Ferreira, R., Gonçalves, D., Santos, L. Prehabilitation impact on the AT of gastric cancer patients undergoing chemotherapy with FLOT.

Presenting Author Profile

Samuel Silva Barbosa holds a bachelor's degree in biochemistry and a master's degree in clinical biochemistry. He did a curricular internship in IPO-Porto to elaborate his master's thesis. Participated in the OncoFit congress with a poster, the abstract was published in the journal Motricidade. Currently, he continues in the same project as a Phd student. Further, he is an author of a review article in the Biochimie journal to add to the one he has already co-authored in the Biomedicines journal.

Abstract

Prehabilitation programmes, especially those based on physical exercise, implemented during the preoperative period, have been increasingly explored in terms of their influence on the outcomes of cancer patients. However, there is no evidence in the literature of the role of prehabilitation in body composition and adipose tissue (AT) remodelling during chemotherapy. To fill this gap, a prehabilitation programme was developed in IPO-Porto and assessments were made before and after FLOT chemotherapy (CT) in gastric cancer patients. The patients were divided into 3 groups: i) usual care (UC); ii) WHO recommendations for physical activity (P1+ UC); and iii) aerobic+resistance+inspiratory muscle training (P2+ UC). AT samples were collected at laparoscopy (before CT) and at gastrectomy (after CT) and prepared for histological and biochemical analysis. Of 40 patients (16 in P2; 18 in P1 and 6 in UC) no statistical differences were found either between pre- and post-CT or between groups in anthropometric measures (percentage of body fat mass, body weight, body mass index) and in circulating CRP, triglyceride and glucose levels. Of these 40 patients only 12 (4 from each group) were included in biochemical and histological analysis. As for HSL, ATGL, and UCP-1 levels in AT, there were no alterations

after CT. Although no statistically significant differences were found in the content of PGC-1α, it increased by 36% in P2. Further, a tendency towards a negative correlation was noticed between the variation of BMI and UCP-1 during CT. These results suggest that patients submitted to a prehabilitation programme have no alterations in HSL and ATGL levels which agree with the unchanged fat mass during CT. Moreover, data suggests that FLOT chemotherapy increases thermogenesis and, consequently, leads to the loss of BMI. The trend towards increased PGC-1α levels in AT suggests enhanced mitochondrial biogenesis.

PO - (24827) - The influence of elite European soccer matches on salivary immunoglobulin-A and cortisol: a case study about playing status and match outcome

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Citation
Oliveira, R., Morgans, R., Rhodes, D., Orme, P., Ceylan, H.I., Bezuglov, E., González-Fernández, F.T., Liñán-González, A., Moreira, A. The influence of elite European soccer matches on salivary immunoglobulin-A and cortisol: a case study about playing status and match outcome.

Presenting Author Profile

Rafael Oliveira (PhD) is an adjunct professor at the Escola Superior de Desporto de Rio Maior, Instituto Politecnico de Santarém, an integrated member of the Research Center in Sports Sciences, Health, and Human Development, and a collaborator of the Life Quality Research Centre. His research activity has been focusing on exercise physiology, testing, control and prescription, load monitoring/quantification, strength and conditioning, and sports training methodology.

Abstract

The aim of this study was to analyse the influence of nine soccer matches and their outcome (successful and unsuccessful) on salivary immunoglobulin A (s-IgA) and cortisol (s-Cort) with respect to the playing status. Saliva from 19 male players (10 starters and 9 non-starters) from an elite professional soccer team (mean±SD, age 26±4 years; weight 80.5±8.1 kg; height 1.83±0.07 m; body-fat 10.8±0.7 %) was collected on the day before each match (MD-1), 60-minutes before kick-off (MDpre), 30-minutes post-match (MDpost), and 72-hours post-match (MD+3). There were five wins, one draw and three losses. The mean s-IgA value was found to be lower at MD+3 compared to MDpre and MDpost ($p<0.001$). s-Cort was higher at MDpost compared to MD-1 and at MDpost compared to MDpre ($p<0.001$). When compared to MDpre, a decrease in s-Cort was observed at MD+3 compared to MDpost ($p<0.001$). s-IgA values of starting and non-starting players from successful and unsuccessful matches did not reveal a significant difference between groups. However, s-Cort in matches won, showed a difference between starters and non-starters in MDpre ($p=0.02$). s-IgA values were higher in MDpre and MDpost in starters in unsuccessful matches than starters in successful matches ($p < 0.01$). Furthermore, s-Cort values were higher in MD+3 in starters in unsuccessful matches than starters in successful matches

(p=0.05). The present study suggests that in elite level soccer players, both playing status and match outcome influence s-IgA and s-Cort responses, specially for starters. Specifically, s-IgA was lower for starters before and after the match following successful outcomes. Moreover, higher s-Cort values were found before the match while lower values occurred after the match for starters in successful matches.

PO - (24830) - Exploring the protective effects of grape pomace flour on kidney health in a dyslipidemia rat model

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Citation
Nicolai, M., Piccoli, R.C., Pereira, P., Palma, M.L., Stefanello, F.M., Spanevello, R.M., Tavares, R.G. Exploring the protective effects of grape pomace flour on kidney health in a dyslipidemia rat model.

Presenting Author Profile
Marisa Nicolai[a], Raphaela Cassol Piccoli[b], Paula Pereira[a,c,d], Maria Lídia Palma[a], Francieli Moro Stefanello[b], Roselia Maria Spanevello[b], Rejane Giacomelli Tavares[a,e,f]*

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Abstract
Byproducts from the wine-making industry are substantial and can be repurposed in functional foods. This helps lessen environmental damage and could aid in managing metabolic disorders such as dyslipidemia (DYS). DYS, characterized by lipid irregularities and oxidative stress, poses a notable risk to kidney health. In this regard, grape pomace flour (GPF) has been investigated for its potential health benefits. This study aimed to evaluate the effects of GPF from Arinto and Touriga Nacional grape varieties on oxidative stress parameters in the kidneys of rats submitted to a model of DYS. Kidney tissue samples were obtained from adult male Wistar rats housed at the Central Vivarium of the Federal University of Pelotas (CEUA 033578/2022-14). Dyslipidemia was induced on the 89th day using a single injection of Tyloxapol (300 mg/kg, i.p.). The rats were divided into five groups (n=6): Control (CT), DYS, DYS with Orlistat (50 mg/kg, i.g.) (DYS+ORL), DYS with 10% Arinto GPF (DYS+WGPF), and DYS with 10% Touriga Nacional GPF (DYS+RGPF). On the 90th day, the rats were euthanized, and kidney samples were collected. Renal homogenates were analyzed for total thiol content, thiobarbituric acid reactive substances (TBARS), reactive oxygen species (ROS), nitrite levels, and the activities of superoxide dismutase (SOD) and catalase (CAT) enzymes. Experimental DYS did not significantly affect total thiol content, ROS, nitrite levels, or SOD activity ($P>0.05$). However, Tyloxapol administration significantly increased TBARS levels ($P<0.01$). Pretreatment with Orlistat, WGPF, and RGPF significantly protected against lipid peroxidation ($P<0.05$, $P<0.01$, and $P<0.05$, respectively). Additionally, both RGPF and WGPF significantly enhanced CAT enzyme activity ($P<0.01$ for both). These findings suggest that GPF may serve as an adjunctive therapy for DYS by positively modulating the renal antioxidant profile.

PO - (24862) - Losartan prevents diabetic remodeling in the colon of streptozotocin induced rats without altering ACE activity

Author
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Citation
Esteves-Monteiro, M., Ferreira-Duarte, M., Oliveira, L.C.G., Casarini, D.E., Dias-Pereira, P., Morato, M., Duarte-Araújo, M. Losartan prevents diabetic remodeling in the colon of streptozotocin induced rats without altering ACE activity.

Presenting Author Profile

My name is Marisa Monteiro, I have a master's degree in Veterinary Medicine from School of Medicine and Biomedical Sciences, University of Porto (ICBAS-UP) where I am currently pursuing a PhD in Veterinary Sciences. During my PhD, I have delivered seminars on endocrine pancreas physiology to veterinary medicine students and worked with animal models of both type 1 and type 2 diabetes. I have published five papers in indexed journals along with presenting multiple posters and oral presentations.

Abstract

Gastrointestinal complications cause significant morbidity in diabetic patients, but local renin-angiotensin-aldosterone system (RAAS) gut remodeling contribution remains unclear. So, in this study we aimed to evaluate structural changes, angiotensin-converting enzyme (ACE) activity and the preventive effect of the angiotensin II (Ang II) type 1 receptor (AT_1R) antagonist, losartan, in the colon of in streptozotocin (STZ)-induced diabetic rats.

Type 1 *Diabetes mellitus* was induced in adult male *Wistar* rats by a single IP injection of STZ (55mg/kg, n=8). A group of diabetic rats was daily treated with losartan (10mg/kg, PO; STZ-LOS, n=4) since the day of induction. Non-injected rats were used as controls (CTRL, n=4). After 14 days, animals were sacrificed, and segments of the colon were collected and processed for histological analysis and ACE activity quantification. ACE activity was quantified by a fluorometric assay that measured the activity of ACE N- and C- catalytic domains.

STZ induced hyperglycemia was not altered by LOS (584.75$\pm$15.25mg/dL and 548.5$\pm$25.75mg/dL, respectively; p<0.05 *vs* controls: 117.2$\pm$4.06mg/dL). Colonic mucosa (M) and muscular layer (ML) were significantly

thicker in STZ (M=786.13±25.80μm and ML=325.72±26.68μm) compared to CTRL (M=655.32±45.45μm and ML=217.93±21.45μm, $p<0.05$ for both), an alteration that was prevented by LOS (M=684.34±8.07μm and ML=206.63±3.49μm, $p<0.05$). Colonic ACE Z-FHL and h-HL activities were higher in STZ rats and were not altered by AT_1R blockade. The ACE Z-FHL/h-HL ratio was higher than 1, but similar among experimental groups.

Our results reveal that diabetic rats have an increased colonic ACE activity, suggesting a higher Ang II formation and subsequent AT_1R activating. This mechanism seems to be implicated in colonic structural changes observed, but more studies are needed to explore underlying RAAS-associated mechanisms.

PO - (24878) - Exploring the anti-diabetic potential of plant extracts in addressing vascular dysfunction linked to type 2 diabetes

Author
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Citation
Queiroz, M., Figueirinha, A., Seiça, R., Sena, C. Exploring the anti-diabetic potential of plant extracts in addressing vascular dysfunction linked to type 2 diabetes.

Presenting Author Profile
Marcelo Queiroz is a PhD candidate of the Doctoral Program in Health Sciences of the Faculty of Medicine from the University of Coimbra. His academic background is in Biochemistry having complete the bachelor's and master's degrees in the University of Trás-os-Montes e Alto Douro. Currently the focus of his investigation is the treatment and prevention of type-2 diabetes and the cardiovascular complications that are commonly associated with it, by using compounds from natural sources.

Abstract

Prevalence of type-2 diabetes is increasing annually worldwide. This upward trend underscores the urgent requirement for innovative treatments and therapeutic strategies to combat the disease and its associated complications. With that in mind, we evaluated the potential application of extracts from *P. tridentatum*, *C. citratus* and *A.eupatoria*, plants typically associated with traditional uses as anti-diabetic treatment, and access if there is a potential and safe use for them as a treatment of vascular dysfunction associated with type 2 diabetes.

We started by studying the impact of the extracts on endothelial and perivascular function in non-obese type 2 diabetic Goto-Kakizaki (GK) rats through *ex-vivo* experiments. These experiments involved assessing the effects of cumulative doses of the different extracts and pre-incubation at a fixed concentration, on endothelial function in aortas with perivascular adipose tissue (PVAT)(+) and without PVAT(-). Following, an *in vivo* investigation was conducted using GK rats to evaluate the effect of the extracts. Rats divided into control group and treatment groups and extracts were orally fed to them for 16 weeks (175 mg/kg/day). During the treatment we measure glucose and insulin tolerance levels. At the end, several *in vivo* parameters and endothelial function were assessed.

Overall, treatment with the extracts resulted in an 5% reduction of body weight. *P. tridentatum* treatment led to a reduction of adipose tissue index by 30%. *A. eupatoria* exhibited the greatest impact on fasting glucose, reducing it by 15%. In vivo studies revealed that *P. tridentatum* improved glucose tolerance, endothelial dysfunction, and restored the vasodilatory function of perivascular adipose tissue. *C. citratus* enhanced insulin resistance, glucose tolerance, and endothelial function. *A. eupatoria* also showed improvement in endothelial dysfunction.

In summary, all extracts revealed beneficial effects improving vascular dysfunction in type 2 diabetes.

PO - (24884) - Linking maternal obesity to neurodevelopmental and metabolic changes in the offspring

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Citation
Amaro, A., Baptista, F.I., Castelo-Branco, M., Matafome, P. Linking maternal obesity to neurodevelopmental and metabolic changes in the offspring.

Presenting Author Profile
Andreia Amaro is a Ph.D. student at the Coimbra Institute of Clinical and Biomedical Research (iCBR), Faculty of Medicine. Andreia research centers on exploring the effects of early-life insults on offspring metabolism and

behaviour. Currently, she focuses on deciphering the relationship between neurodevelopmental disorders and energy balance mechanisms in the offspring under maternal obesity and diabetes, aiming to shed light on how nutritional disturbances influence long-term health outcomes.

Abstract

Maternal nutrition and metabolic state are key drivers in determining the healthy growth of the offspring during pregnancy and lactation. Nutritional disturbances during these periods can predispose the offspring to metabolic and neurodevelopmental alterations. We aimed to characterize offspring neurodevelopment and metabolism from obese mothers throughout life, considering sex-specificities. To do so, two experimental groups were studied: 1) female Wistar rats fed with a control standard diet during pregnancy and lactation and 2) females submitted with a 60% high-fat diet (HFD) during these periods. Dam's body weight and food intake were weekly evaluated and metabolic parameters such as glycemia and insulin tolerance test (ITT) were also assessed. After birth, male and female offspring from both groups were subjected to neurodevelopment tests. From birth until postnatal day (P) 90, offspring's body weight and food intake were weekly monitored. Additionally, at P21 and P90 metabolic parameters such as glycemia and ITT were assessed.

Dams from HFD group presented increased body weight gain without changes in food consumption. After 4 weeks of HFD consumption, increased glycemia levels were noted together with a significant reduction of glucose decay rate over time during ITT compared with the control group. Male and female offspring from HFD group presented a significant neurodevelopmental delay namely regarding olfactive and vestibular system development, eye opening and auditory ability. Additionally, male offspring presented impaired locomotor ability. Regarding metabolic profile, offspring of both sexes presented an increased body weight gain during lactation until adulthood (P90). Moreover, increased glycemia levels were observed at P21 together with a reduction in insulin response during ITT.

Maternal obesity leads to significant metabolic and neurodevelopment disturbances from early life throughout adulthood.

PO - (24887) - Is there a feline metabolic syndrome? Investigating the relationship between the nine-point visual body condition score (BCS) scale and cats' body composition

Author
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Citation
Rosa, N. Is there a feline metabolic syndrome? Investigating the relationship between the nine-point visual body condition score (BCS) scale and cats' body composition.

Presenting Author Profile
Nuno Oliveira Rosa, graduated from FMV UL in 1995. One Health Postgraduate Course, Faculty of Medicine UL in 2022. Since 2003, guest professor at Universidade Lusófona, FCTS in the Degree in Pharmaceutical Sciences and at FMV in the Degree in Veterinary Medicine. For 17 years worked as Veterinary Medical Director in a veterinary pharmaceutical company. Qualified Person responsible for Veterinary Pharmacovigilance. Clinical Expert responsible for executing clinical, efficacy and safety reports.

Abstract
Diabetes (mellitus) is a fast growing disease, also in felines. The survival rate of feline patients after diagnosis is very low (less than three years for 75% of cases), emphasizing the importance of an early diagnosis. Disease confirmation is primarily clinical and commonly supported by significant

metabolic alterations and changes in the body condition detected with the 9-point visual body condition score (BCS) scale. In this study we compare the results of the 9-point BCS scoring with the body composition determined by DEXA of a domestic feline population in Portugal. The study focuses on a population of outdoor cats (n=20) (10 males, 10 females). All cats were previously weighed and examined by a vet to confirm a healthy condition. The body condition score, sex, reproductive status, age, and breed were also registered. Animals were sedated to determine the body composition (ventral decubitus) with the DEXA system. All procedures respected all principles of good clinical practice and submitted to the institutional Ethical Commission. Chosen variables were body mass, lean body mass, adipose mass, bone mineral density, and muscular mass. A correlation between the percentage of body fat measured and the BCS was noted. The mean percentage of body fat for cats with a BCS of 5 was 20%, and a mean increase of 5% body fat for each added unit of BCS was detected. No differences between sexes, reproductive status, age, or breed were noted. These results suggest that DEXA might be a valuable instrument to accurately characterise feline body composition and, by extension, composition changes related to diabetes progression and treatment. The results also indicate that the 9-point BCS scale is a valid method to estimate the body fat percentage in these populations. Further studies are needed to support these preliminary findings.

PO - (24912) - The constituents of gastroesophageal reflux disease alter the esophageal contractility in rats

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Citation
Gadelha, K.K.L., Magalhaes, P.J.C., Santos, A.A., De-Sá, P.C.-., Silva, M.T.B. The constituents of gastroesophageal reflux disease alter the esophageal contractility in rats.

Presenting Author Profile
Kalinne Gadelha holds a degree in Pharmacy, a Master's degree and a PhD in Pharmacology from the UFederal University of Ceara, Brazil. Currently doing postdoctoral research at the Abel Salazar Institute of Biomedical Sciences (ICBAS), at the University of Porto - Portugal. She has experience in research laboratories in the areas of Physiology and Pharmacology, with an emphasis on in vitro contractility and smooth muscle methodologies.

Abstract

In gastroesophageal reflux disease (GERD), there is increased contact between the esophageal mucosa and gastric acid and other substances such as bile acids and pepsin present in these GI segments. Failures in esophageal motility contribute to increased exposure, which favors the development of the disease, although there is still no explanation for this. The aim of this study was to evaluate the effects of exposing the esophagus of rats to contents that simulate GERD in isolated esophagus and stomach preparations. The rats were divided into control and GERD groups. After sacrifice, the esophagus and stomach were removed together. Next, the pylorus was closed and the esophagus and stomach were filled with different constituents (Pepsin, TDCA, and DCA). After 30-min of luminal exposure, strips of the esophageal tissues (circular or longitudinal) were mounted for the in vitro study. Next, the cumulative curves of KCl (1–160 mM) or CCh (0.01–100 μM) were made. We did not observe differences between tissues exposed to the control solution (pH 7.4) and acid solution (pH 1) in both muscle orientations. The addition of pepsin (1 mg/mL), was also unable to alter the curves' responses *vs*. the control group, except for the circular layer. Contractile responsiveness to KCl and CCh only decreased ($P<0.05$) when the solution was enriched with the bile acids TDCA (2 mM) and DCA (2 mM) in circular and longitudinal muscles. The addition of DCA and TDCA directly into the system also impaired the contractile response of esophageal strips in a time-dependent manner. To investigate this action, we previously added triamterene (100 μM), a compound recently investigated as an inhibitor of the G-protein-coupled bile acid receptor (GPBAR/TGR5), which attenuated the inhibitory influence caused by DCA and TDCA against a single carbachol stimulation. The esophageal dysmotility is related to the action of bile acids. We suggest further investigations to understand the pathophysiology of GERD.

PO - (24915) - Does higher ingestion of vitamin D lead to higher absortion? physiological and eating behavior evidence of people with obesity in Brazil

Author
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Jessica Domingos – Rio de Janeiro State University (UERJ)
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Citation
Furtado, B., Santos, J.D., A., Tenius, V., Pires, L. Does higher ingestion of vitamin D lead to higher absortion? physiological and eating behavior evidence of people with obesity in Brazil.

Presenting Author Profile
My name is Angelica Santos, I`m a Nutritionist and researcher, working with obesity and its comorbidities in Obesity Assistance Laboratory (LAçO) from Rio de Janeiro State University (UERJ). We work through interdisciplinary treatment with obese individuals, including nutrition, physical education and psychology, aiming new ways to understand and treat obesity inside brazilian public health care system.

Abstract

Obesity induces dysfunctions in the hepatic metabolism of vitamin D through decreased expression of the CYP2R1 enzyme, leading to a reduction in serum 25(OH)Vitamin D, which may negatively influence neurotransmitters involved in eating behavior. The aim of the study was to evaluate the association between intake and serum levels of vitamin D in obese individuals. The study had a cross-sectional design in which individuals of both genders, aged between 23 and 64 years and body mass index (BMI) $\geq$ 30 kg/m^2, were referred to the Obesity Assistance Laboratory (LAçO) of Rio de Janeiro State University (UERJ), from January 2022 to July 2024. Body mass (kg) and height (m) were used to measure BMI (kg/m^2). Average dietary intake of vitamin D was reported in R24h (DRI Reference, 2006, of 15 mcg/day), serum levels obtained through the ELISA technique and eating behavior defined by the Eating Attitudes Test (EAT-26, cut-off point 21) (Bighetti et al., 2004). Analysis of the data was performed using the Kolmogorov-Smirnov test for normality and Pearson correlation test with Excel and Jamovi softwares. A total of 64 individuals were evaluated, 9 men and 55 women. The mean BMI of the sample was estimated at 42.23 $\pm$ 7.00 kg/m^2, dietary intake of vitamin at D 2.42 $\pm$ 1.81 ng/dL and serum levels of 25(OH)vitamin D at 26.43 $\pm$ 8.29 ng/dL, with 90% of the sample presenting inadequate levels (<30 ng/dL). The mean EAT-26 score was evaluated at 25.10 $\pm$ 10.94 points, with 70.8% of the sample at risk of developing eating disorder (ED). Results unveiled the following trends between BMI and serum 25(OH)Vitamin D, p=0.002, R=-0.397; dietary intake of vitamin D and BMI, p=0.006, R=0.428; and EAT-26 score and serum 25(OH)Vitamin D, p=0.045, R=-0.294. We found a negative correlation between serum levels of 25(OH)Vitamin D and BMI, although a positive correlation between dietary intake of Vitamin D and BMI. The risk of developing ED and serum 25(OH)Vitamin D levels also had a negative correlation.

PO - (24917) - Metabolic effects of carotid sinus nerve denervation in ovariectomized female rats fed with a high-fat diet

Author
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Citation
Fernandes, M.V., Sacramento, J.F., Leão, J.P.D., Capucho, A.M., Melo, G.M., Martins, F.O., Colombari, E., Conde, S.V. Metabolic effects of carotid sinus nerve denervation in ovariectomized female rats fed with a high-fat diet.

Presenting Author Profile
I hold a Master's and a PhD in Pharmacology from the Federal University of São Paulo, Brazil. In my PhD, I evaluated the effects of estradiol (E2) replacement on cardiometabolic and intracranial alterations in ovariectomized rats fed a high-fat diet (HFD). I am currently a postdoctoral fellow at NOVA Medical Research in Lisbon, exploring new approaches to menopausal health problems, specifically the effects of E2 intervention and carotid sinus nerve denervation on HFD-induced dysmetabolism.

Abstract

Introduction: Although hormone replacement therapy with estradiol improves metabolic changes in menopause, its use is associated with important adverse effects. Carotid bodies (CBs) denervation reverses high-fat diet (HFD)-induced dysmetabolism, however the functional role of CBs in menopausal dysmetabolism is not established. **Aim:** Compare the effects of carotid sinus nerve (CSN) denervation and of estradiol on the metabolic parameters of bilaterally ovariectomized (OVX) females fed a HFD.

Methods

Female Wistar rats (3 months old) OVX fed a control (CTL) or HFD for 8 weeks. In the 4 th week of diet, half of the animals underwent CSN resection (DESN) or Sham surgery. Weight, fat mass, fasting glycemia, insulin sensitivity, glucose tolerance was evaluated. Experimental protocols were approved by NMS ethics committee (194/2021/CEFCM) and DGAV (0421/000/000/2021).

Results

HFD OVX-SHAM group showed higher body weight gain (Δ: 70.4 ± 8.2 vs. Δ HFD SAM-SHAM: 32.1 ± 8.3 g; $p<0.01$), white adipose tissue (WAT) total (91.3 ± 7.5 vs. HFD SHAM-SHAM: 65.5 ± 5.1 and CTL OVX-SHAM: 58.4 ± 4.7 g/kg; $p<0.05$ e $p<0.001$, respectively), elevated fasting glycaemia (103 ± 6.0 vs. CTL OVX-SHAM: 79.5 ± 4.1 mg/dl; $p<0.01$) and glucose intolerance (25282 ± 803.0 vs. CTL OVX-SHAM: 19048 ± 691.1 mg/dl*min; $p<0.0001$). In HFD OVX-DESN group, CSN denervation reduced WAT total (71.1 ± 5.7 g/kg), fasting glycaemia (90.8 ± 2.3 mg/dl) and improved insulin sensitivity (KITT: 3.0 ± 0.3%/min) compared to HFD OVX-SHAM group. However, in HFD OVX-DESN females, CSN denervation did not produced significant changes in body weight (Δ: 65.0 ± 4.0g) or in glucose tolerance (25527 ± 1048 mg/dl*min).

Conclusion

CSN denervation reduces fat mass and improves insulin sensitivity in menopausal obese females. Modulation of CBs can be a therapeutic target for postmenopausal dysmetabolism. Financial Support: Fundação para a Ciência e a Tecnologia; CNPq (200971/2024-7).

PO - (24926) - Decreased adiponectin/leptin ratio in fetal blood relates to maternal cardiometabolic phenotype

Author
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Citation
Coutinho, D., Morais, J., Ferreira, A.F., Miranda, J., Falcão-Pires, I., Leite-Moreira, A. Decreased adiponectin/leptin ratio in fetal blood relates to maternal cardiometabolic phenotype.

Presenting Author Profile
Débora Veiga Coutinho is a medical doctor with specialization in Pediatrics and Pediatric Cardiology, and a Master's in Cardiovascular Pathophysiology from the University of Porto. Her research centers on cardiovascular

changes in infants born to mothers with cardiovascular risk factors, analyzed through biomarkers. Currently, she is pursuing a PhD in Cardiovascular and Respiratory Sciences at the Faculty of Medicine, University of Porto.

Abstract

Adiponectin and leptin are adipokines involved in fetal and neonatal growth, with the adiponectin-leptin ratio (Adipo/Lep) being suggested as a promising biomarker of metabolic risk. This study aims to explore the association between Adipo/Lep quantified in fetal blood and the maternal cardiometabolic phenotype.

A total of 29 mother-neonate pairs were recruited at a tertiary centre between September 2022 and April 2023. Blood and umbilical cord samples were collected by the obstetric team at the time of delivery. Adiponectin and leptin levels were assessed in umbilical cord plasma using an ELISA immunoassay kit. Transthoracic echocardiography was performed on the offspring at 4±1 months post-delivery.

The CHUSJ Ethics Committee approved the study protocol on 15 February 2022, proved through an addendum to the Cardiac Remodelling and "Recovery" in Pregnancy as a Model to Understand the Mechanisms of Cardiovascular Disease (CES nº 201/18).

Adipo/Lep levels in fetal blood of mothers with pregestational obesity (22.99 (13.32;38.95)) were lower than those with normal weight (47.79 (29.81;57.77), p=0.015) and overweight (52.66 (29.25;64.34), p=0.004). The ratio negatively correlated with pregestational weight (ρ=-0.3734, p=0.046) but showed no correlation with gestational weight gain. Regarding offspring outcomes, a significant association was found between Adipo/Lep and weight-for-length z-score (ρ=0.558, p=0.002) and BMI-for-age z-score at birth (ρ=0.605, p=0.005). Additionally, during echocardiographic evaluation, the offspring's mitral A-wave velocity positively correlated with Adipo/Lep (ρ=0.422, p=0.023), as did the left ventricular isovolumetric relaxation time (ρ=0.369, p=0.049).

In conclusion, this study is the first to describe significant associations between Adipo/Lep in umbilical cord plasma, validating its potential as a biomarker for offspring cardiometabolic health.

Theme: Nervous system, neuroscience and neurophysiology PO - (24820) - Impact of cervical vagus nerve transection on contextual fear memory: the role of catecholamine-mediated baroreceptor signaling

Author
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Citation
Munhoz, J., Oliveira, A., Azevedo, M., Seixas, R., Moreira-Rodrigues, M. Impact of cervical vagus nerve transection on contextual fear memory: the role of catecholamine-mediated baroreceptor signalling.

Presenting Author Profile
Completed the Master's Degree in Oncology in 2021/12/13 from the Institute of Biomedical Sciences Abel Salazar of the University of Porto, Degree in Biochemistry in 2019/07/23 from the Faculty of Sciences of the University of Porto and the Institute of Biomedical Sciences Abel Salazar of the University of Porto. Currently a Trainee Researcher at the Laboratory of Physiology, ICBAS – School of Medicine and Biomedical Sciences.

Abstract
The catecholamines, in particular adrenaline, are important hormones in the consolidation of contextual fear memories acting on peripheral β-adrenergic receptors. The vagus nerve may have a role in the transmission of this information to the brain. Moreover, cardiovascular alterations in response to stress contribute to contextual adaptive behaviour. We aimed to evaluate the role of the vagus nerve in the consolidation of contextual fear memory.

Bilateral subdiaphragmatic vagotomy, right or left cervical unilateral vagotomy, and sham surgeries were performed on wild type (129x1/SvJ) mice. After seven days of recovery, the mice were exposed to the fear conditioning paradigm. On day 1, mice were exposed to 3-foot shocks (2 s, 0.6 mA) followed by contextual reminder exposure on day 2. The response to the foot shocks, freezing percentage, and weight variation of the mice was evaluated. Results were analyzed by Two-Way ANOVA and Students´ t-test. $P < 0.05$ was assumed to represent a significant difference.

Animals that underwent vagotomy lost weight when compared to sham for subdiaphragmatic, and right and left cervical surgeries was observed. In subdiaphragmatic vagotomy mice, there was an absence of differences in freezing behaviour compared with sham mice in both training and context day. Although in left and right cervical vagotomy compared to sham mice

no differences were observed on training day, on context day a decrease in freezing behaviour was observed.

In conclusion, cutting the vagus nerve at a cervical level decreases contextual fear memory, contrary to subdiaphragmatic level, possibly due to the decrease of information transmitted to the brain by vagus nerve. Catecholamines released after stress may increase blood systolic pressure, which is sensed by baroreceptors in the aortic arch and transmitted through the vagus nerve to the brainstem, and then activating the amygdala and hippocampus, and possibly leading to contextual fear memory consolidation.

PO - (24861) - Investigating the mechanisms behind the beneficial effects of chronic caffeine consumption on cognitive impairment induced by hypercaloric diet consumption

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Citation
Capucho, A.M., Leão, J.P.D., Melo, G.M., Fernandes, M.V., Almeida, I.F., Sacramento, J.F., Conde, S.V. Investigating the mechanisms behind the beneficial effects of chronic caffeine consumption on cognitive impairment induced by hypercaloric diet consumption.

Presenting Author Profile

I am a PhD student working in 2 different projects, my PhD project where I study the role of carotid body in controlling satiety pathways, and at the same time I am investigating the impact of chronic caffeine consumption in memory decline in dysmetabolism. At the time I published 6 papers, 3 as first author, I participated in more than 20 both national and international congresses and I was awarded 12 times in poster and oral communication formats, and projects funded by the congresses.

Abstract

Metabolic diseases are associated with increased risk of dementia. Studies on T2D genetic models showed a decrease in synaptic function and cognitive decline, effects prevented by chronic caffeine consumption. We investigate the impact of chronic caffeine consumption on cognitive impairment induced by hypercaloric diets.

Three groups of male Wistar rats, 10 weeks old, were used: a control group (CTL) submitted to diet for 25 weeks; a high-fat high sucrose diet group (HFHSu - 60%lipids and 35%sucrose in drinking water for 25 weeks); and an HFHSuCaff group submitted to HFHSu with caffeine consumption (1g/L) in the last 11 weeks. Insulin sensitivity and glucose tolerance were evaluated before and after caffeine (14 and 25 weeks of diet). Behavioral tests were performed to assess cognition, and anxiety-related diseases: novel object recognition (NOR); Y-maze, block test, and elevated plus maze (EPM). In terminal experiments, brains were collected, and protein analysis was performed in the hippocampus.

Chronic caffeine intake reverts glucose intolerance and insulin sensitivity. In block test, HFHSu animals spent less time sniffing the new block compared to CTL, effect attenuated by caffeine consumption by 34.1%. HFHSu animals interacted less time (61%) with new object in NOR, effect attenuated by caffeine consumption. In EPM, both HFHSu and HFHSu Caff animals spent less time in the open arms (54.5% and 49.2%, respectively). In Y-maze, HFHSu group spent less time in new arm compared to CTL (56.5%), effect attenuated

by 47.9% with caffeine. Hippocampal analysis reveals that HFHSu diet leads to a decrease in A1 adenosine receptor.

Chronic caffeine consumption reverts this and increases A2A receptors. Also, HFHSu diet led to an increase in IL-6 receptor, without alterations with chronic caffeine consumption.

Chronic caffeine consumption improves dysmetabolic-induced cognitive decline associated with the restoration of adenosine receptors levels and prevention of inflammation.

PO - (24894) - Pathophysiology and validity of a zebrafish model of sporadic amyotrophic lateral sclerosis

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Citation
Oliveira, N.A.S., Pinho, B.R., Bessa, J., Oliveira, J.M.A. Pathophysiology and validity of a zebrafish model of sporadic amyotrophic lateral sclerosis.

Presenting Author Profile

Nuno Alexandre Santos Oliveira is a research assistant and PhD student at UCIBIO, in the Faculty of Pharmacy of the University of Porto, in collaboration with i3S-UP, iMM-UL, and UCL. He is interested in the complex pathophysiology of neurodegeneration, including subcellular phenomena and cell-cell interactions, specifically in the context of amyotrophic lateral sclerosis.

Abstract

Amyotrophic lateral sclerosis (ALS) is a neurodegenerative disease characterised by loss of motor neurons and motor function. ALS also affects other neural cells and often causes cognitive and behavioural impairment.

ALS pathophysiology includes loss of proteostasis, oxidative damage, and metabolic dysfunction. Previous studies proposed bisphenol A (BPA) exposure as a model of sporadic ALS (sALS) in zebrafish. Here, we aimed to characterise this sALS model, identifying functional phenotypes and testing their face and predictive validity. We characterised the BPA (10-60 μM)-induced model of sALS in zebrafish (0-6 days post fertilisation), assessing motor/circadian activity, axon length, ER stress, oxidative stress, and metabolite levels. To evaluate the model's predictive validity, we tested the effects of an approved ALS drug, edaravone (100 μM), on sALS phenotypes. For a proof-of-concept of vulnerable cell identification, we tested the combination of in-situ hybridisation with a new zebrafish line encoding a fluorescent reporter of protein stress. We found that BPA reduces motor activity and shortens motor axons in a concentration-dependent manner. Further, BPA increases oxidative damage (ROS production, lipid peroxidation), ER stress and phenylalanine levels in whole zebrafish. Edaravone ameliorates BPA-induced motor, ER, and metabolic phenotypes. In summary, BPA induces sALS-consistent phenotypes in zebrafish. Edaravone counteracts BPA-induced sALS phenotypes, supporting the predictive validity of the model. The BPA-induced sALS model shows utility for pathophysiological studies, contributing to fulfil a need for validated sALS models. Future studies will seek the identification of differentially affected cells, by combining the BPA-induced model with in-situ hybridization and a reporter of protein stress.

PO - (24895) - Influence of basal phosphorylation status of AMPA receptors and CaMKII on synaptic plasticity and age-associated cognitive decline

Author
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Citation
Fernandes, D., Gil, M., Cunha-Reis, D. Influence of basal phosphorylation status of AMPA receptors and CaMKII on synaptic plasticity and age-associated cognitive decline.

Presenting Author Profile
I am Daniela Fernandes, a master's student at the University of Lisbon – Faculty of Science. My master's degree is in Biochemistry and Biomedicine, and my bachelor's degree is in Biology. I have been an intern in Professor Diana Cunha-Reis' Laboratory since February 2024, where we have been studying the process of aging in the central nervous system.

Abstract

Aging is a physiological process associated with cognitive decline and impaired LTP in rodent animal models. AMPA glutamate receptors mediate most excitatory neurotransmission in the CNS and AMPA GluA1 subunits are major targets of CaMKII and PKA (at Ser831 and Ser845 residues) during synaptic plasticity events that are essential for hippocampal-dependent learning and memory1,2. We now studied how AMPA subunit content and GluA1 phosphorylation, as well as CAMKII levels and autophosphorylation varies in the hippocampus with aging and its correlation with hippocampal-dependent cognition.

The cognitive performance of rats (Rattus Norvegicus) aged 4-21 months was evaluated using the Morris water maze3. The hippocampi were obtained and synaptosomes were isolated by differential centrifugation techniques. Protein content and phosphorylation levels were quantified using Western Blot analysis.

Cognitive performance in the MWM decreased along aging (n=4-5). CaMKII phosphorylation at Thr289 decreased mildly by 21,3% with age from 4 to 21 months old (n=3). The present study also revealed a decrease in GluA1 and an increase in GluA2 with aging with a consequent increase in the GluA1/GluA2 ratio (n=3). Although GluA1 phosphorylation at Ser831 showed a tendency to decrease along aging, this was not consistent across samples. GluA1 phosphorylation at Ser845 did not significantly change along aging.

These results suggest a potential contribution to the reduction in long-term potentiation (LTP) and synaptic plasticity with aging of AMPA receptor composition and CaMKII phosphorylation levels. Since these alterations were observed in the hippocampus it may indicate a possible contribution to the loss of capacity to form novel memories and impaired memory retrieval.

PO - (24913) - Impact of aging on prefrontal cortex neurotransmitter balance and basal phosphorylation of channels and enzymes crucial for synaptic plasticity

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Citation
Negalho, M., Alves, A.M., Cunha-Reis, D., Ajuda, R. Impact of aging on prefrontal cortex neurotransmitter balance and basal phosphorylation of channels and enzymes crucial for synaptic plasticity.

Presenting Author Profile
My name is Rafael Ajuda. I obtained my Bachelor's degree in Cellular and Molecular Biology from NOVA University of Science and Technology, and I am currently completing my Master's degree in Molecular Biology and Genetics. My latest project involved evaluating how synaptic proteins and monoamines are affected by aging, with a specific focus on the prefrontal cortex.

Abstract
Aging is a physiological process that impacts brain neurotransmission. The prefrontal cortex, a key brain region for higher cognitive processes like decision-

making memory and executive function, is particularly by aging. In this work we set out to investigate the impact of aging on neurotransmitter balance in the prefrontal cortex as well as the levels and phosphorylation status of enzymes and channels crucial for synaptic plasticity, such as AMPA receptors and CaMKII.

The protein and phosphorylation levels of CaMKII, AMPA GluA1 and GluA2 and NMDA GluN2B subunits were detected by western blot in hippocampal synaptosomes2 from rats aged 4 to 21 months. The levels of general (synaptophysin), GABAergic (gephyrin, GAT-1), glutamatergic (PSD-95) and monoaminergic (SERT, DAT) synaptic markers were instead probed in total hippocampal membranes.

We observed a biphasic variation of most synaptic markers (synaptophysin, PSD-95 and gephyrin, SERT, n=3-4), increasing from young adulthood (4M) to middle age (12M). Dopaminergic marker DAT (n=3) showed a more complex fluctuation across life while the GABAergic marker GAT-1 progressively decreased (4M-21M). Synaptic levels of AMPA GluA1 and GluA2 subunits, increased with age with GluA2 levels highly increased at 21M compared to younger ages. The GluA1/GluA2 ratio decreased markedly at 12M and 21M. The phosphorylation of GluA1 at Ser831 and Ser845 increased at 12M but declined by 21M. CamKII showed an overall increase at 21M, CaMKII phosphorylation at Tyr 286 did not show significant changes along aging.

This suggests that a progressive impairment in both GABAergic and monoaminergic transmission contributes to cognitive decline associated with the prefrontal cortex while upregulation of CAMKII levels may be an adaptive response to altered GluA1/GluA2 levels and AMPA receptor function to maintain synaptic plasticity mechanisms.

Reference

1. Rodrigues et al. (2021) Eur J Neurosci 54: 5272; 2. Appleby et al. (2011) J Neurochem 116: 530;

PO - (24914) - Sleep evaluation in head and neck cancer patients undergoing radiotherapy

Author
João Casalta-Lopes – Life and Health Sciences Research Institute (ICVS), School of Medicine, University of Minho, Braga, Portugal; Polytechnic University of Coimbra, Rua da Misericórdia, Lagar dos Cortiços, S. Martinho do Bispo, 3045-093 Coimbra, Portugal; Unidade Local de Saúde de São João, Porto, Portugal
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Citation
Casalta-Lopes, J., Maia, S., Martins, F., Soares, J.I. Sleep evaluation in head and neck cancer patients undergoing radiotherapy.

Presenting Author Profile
João Casalta-Lopes is a Radiation Oncologist at Unidade Local de Saúde de São João, an Invited Adjunct Professor at Polytechnic University of Coimbra and a PhD student in Medicine at University of Minho. His main interests are in Head and Neck Cancer and Radiation Protection.

Abstract
Introduction
Radiotherapy (RT) is often included in the treatment for head and neck squamous cell carcinoma (HNSCC), either radical or adjuvant. RT side

effects are challenging and influence patient's daily activities. Our aim was to quantify daytime sleepiness and sleep quality in HNSCC patients undergoing RT.

Methods

Patients with HNSCC undergoing RT were included in this cross-sectional study. Demographic and clinical data were collected. All patients filled out the Pittsburgh Sleep Quality Index (PSQI) and the Epworth Sleep Scale (ESS) questionnaires during or after RT treatment, while acute / subacute side-effects were observed.

Results

Eight patients were included (75% male, mean age: 62.8±13.8 years). Oral cavity was the most common location (50%). All but one patient underwent radical RT with concomitant systemic therapy. Tracheostomy was needed for 1 patient due to tumor obstruction; two patients had a non-oral enteral route. The most common acute side effects were radiation dermatitis (87.5%), xerostomia (75%), odynophagia (62.5%) and dysgeusia (50%). Median ESS total score was 6.5 (interquartile range [IQR]: 11), with 3 patients showing daytime sleepiness (1 mild, 1 moderate and 1 severe). Median PSQI global was 5.5 (IQR 7.5), with most patients reporting mild (50%) or moderately impaired (37.5%) subjective sleep quality, and some degree of sleep disturbance (75% mild, 12.5% moderate). Two patients needed frequent sleep medication, and moderate (25%) or severe (37.5%) daytime dysfunction was reported. Sleep duration and sleep efficiency were the least affected components (25% each).

Conclusion

Our results suggest that patients undergoing RT for HNSCC have some degree of daytime sleepiness, with a high impact on subjective sleep quality with some degree of sleep disturbance. Studies with the inclusion of more patients and longitudinal assessment are needed to further assess the impact of RT in daytime sleepiness and sleep quality in HNSCC.

PO - (24916) - Post-therapy epilepsy prevalence in patients with high-grade gliomas: a systematic review and meta-analysis

Author
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Citation
Ferreira, M.P., Carvalho, R.L., Soares, D.F.B., J.I., Casalta-Lopes, J. Post-therapy epilepsy prevalence in patients with high-grade gliomas: a systematic review and meta-analysis.

Presenting Author Profile

Joana Isabel Soares holds a degree in Neurophysiology, a MSc in Medicine and a PhD in Neuroscience. As an associate professor @ Coimbra Health School, she is responsible for several courses in anatomy, physiology and pathology. She is a researcher @ Health & Technology Research Center, Coimbra Health School, Polytechnic University of Coimbra, Portugal. She has publications in Brain Research, Neurosci Lett, Int J Mol Sci, J Comp Neurol and Epiletic Disorders.

Abstract

Introduction

High-grade gliomas (HGG) are the most common type of malignant glioma. Seizures are frequently the first clinical manifestation of HGG. Seizure-control is one of the main goals of treatment due to the impact in quality of life of these patients. Besides it impacts in morbidity and mortality rates there is a lack of evidence in the prevalence of post-therapy epilepsy. Our main goal was to evaluate the prevalence of epilepsy after the end of HGG treatment.

Methods

Our search was conducted across PubMed®, EMBASE®, Web of Science™, Cochrane Library, Sicelo and Scopus, in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. We included all studies conducted on adults with newly diagnosed HGG, who were treated with at least surgery or radiotherapy, and assessed for long-term side-effects (accounting for seizures) and published in Portuguese or English.

Results

Thirty-six studies were included in the meta-analysis, encompassing a total of 4036 patients with HGG. Patient's mean age ranged from 44 to 73 years, with a diagnosis of glioblastoma in 77,8% of all patients. Pretreatment seizures were observed in 21,2% of all cases. Surgery was the main treatment for all studies, with 1842 patients undergoing adjuvant therapy. Our meta-analysis identified a pooled prevalence of post-therapy seizures of 25.5%,

with a 95% confidence interval of [19.9%;31.1%] ($Z=8.90$, $p<.001$). A significant heterogeneity between studies was observed ($I^2=96\%$, $Q(35)=784$, $p<.001$) with no significant asymmetry in funnel plot analysis ($Z=1.27$, $p=.20$).

Conclusion

HGG are a recognized trigger for seizures. A high heterogeneity in all the evaluated variables was observed. To minimize the diversity of results, a larger prospective studies using appropriate epilepsy diagnostic techniques would be beneficial to have a more exact number of the high-grade glial patients that develop post-therapy epilepsy.

PO - (24924) - Forecasting brain derived time-series through traditional and ML algorithms

Author
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Hugo Ferreira – Faculdade de Ciências da Universidade de Lisboa; Neroes Tech
David Belo – Safe AI [4U]; European Commission

Citation
Barbosa, M., Ferreira, H., Belo, D. Forecasting brain derived time-series through traditional and ML algorithms.

Presenting Author Profile

My name is Miguel Barbosa, I'm a bachelor in Biomedical Engineering and currently a finalist thesis master student in this course. I'm an entrepreneur, founder of Tec2Med Global Innovators, a non-profit organization dedicated to bridge biomedical engineers, scientists and clinicians worldwide and cofounder of Tec2Med Summit an international leading congress in biomedical technological innovation for integrative medicine. I'm particularly interested in neuroscience, veterinary and space medicine.

Abstract

In the history of human scientific enterprise there has not been any other known physical structure which sparked so much wonder and curiosity, for its unparalleled complexity and efficiency, than the human brain. Many of our most widespread modern technologies are designed to catch brain attention, usually with the intent of causing a dependence relation.

According to the most recent general reports on mental health by the World Health Organization, published in 2019, and updated in September 2023, it is estimated that 4% of the people in the world suffer from anxiety related disorders, which are the most common mental illness type. Technologies which promote brain dependences are exacerbating the scenario. Despite the seriousness of this, less than 25% of people suffering with anxiety disorders actually receive treatment.

Predicting brain activity related features, can be key to develop more efficient diagnostics, treatment techniques and technologies, pulling Personalized Psychiatric Therapies into a new next level. Also, it can lead to a new era of powerful machine-brain interfaces, where technology adjusts to brain activity in real time.

In this work, I tried to answer the following questions: Could we predict previously sampled brain waves, and if so in which time-scale? When do we need to use machine learning algorithms to do predictions? What machine learning prediction algorithms show best results for such a task? I aimed to answer these questions by testing and comparing 5 different types of prediction algorithm models, a standard ARIMA model and 4 machine learning models: LSTM, GRU, LLM and a LSTM Multi-Channel Integration Prediction Model (LSTM-MIP). I present my results in graphical frames which use brain derived data and also through brain maps. My results show it is possible to achieve fairly good predictions of brain derived waves when using proper algorithmic models.

Theme: Other (miscellaneous)
PO - (24852) - Modelling skin barrier function: a new perspective beyond TEWL

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Citation
Vieira, J., Júlio, A., Hrdinová, I., Kováčik, A., Vávrová, K., Rosado, N.S., C., Pereira-Leite, C. Modelling skin barrier function: a new perspective beyond TEWL.

Presenting Author Profile

Catarina Rosado has a PhD in Pharmaceutical Technology from Cardiff University, UK. She is currently Associate Professor at Universidade Lusófona and a researcher at CBIOS, leading the Formulation Strategies & Nanosolutions lab. She is interested in skin physiology, namely in skin barrier function, hydration and ageing. Her research is focused on the development of non-invasive strategies to assess the efficacy and safety of topical and transdermal formulations.

Abstract

Skin provides a crucial interface with the environment, mainly for its complex epidermal structure. Assessing skin barrier function can be challenging, in the clinical context and to establish the efficacy and safety of topical formulations. *In vivo* transepidermal water loss measurements (TEWL) are traditionally considered the gold standard. However, this methodology has drawbacks and requires many volunteers. Moreover, fast performance screening is often necessary during formulation production.

This work aimed to explore alternative *in vitro* models to gauge skin barrier function. As proof of concept, an impaired barrier model was developed and the repair capacity of tailored nanovesicles specifically designed for the topical delivery of ceramides (cerosomes) was probed.

The methodologies were based on human epidermis mounted in Franz cells, using partial organic lipid extractions to create an impaired skin barrier model. TEWL and Fourier-transform infrared (FTIR) measurements were made before and after nanovesicles application. Furthermore, cerosomes occlusive effect was assessed by a theophylline permeation assay.

The model provided further insights into stratum corneum lipids role and revealed that cerosomes could form an occlusive film, decreasing TEWL and theophylline permeability, while increasing the lipid/protein ratio in damaged skin, as shown by FTIR. Overall, these models showed to be suitable for barrier function assessment.

PO - (24863) - Synthetic skin models: insights into permeation enhancement mechanisms

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Citation
Júlio, A., Vieira, J., Martins, M., Martinho, T., Roque, R., Saraiva, N., Pereira-Leite, C., Rosado, C. Synthetic skin models: insights into permeation enhancement mechanisms.

Presenting Author Profile
Catarina Rosado has a PhD in Pharmaceutical Technology from Cardiff University, UK. She is currently Associate Professor at Universidade Lusófona and a researcher at CBIOS, leading the Formulation Strategies & Nanosolutions lab. She is interested in skin physiology, namely in skin barrier function, hydration and ageing. Her research is focused on the development of non-invasive strategies to assess the efficacy and safety of topical and transdermal formulations.

Abstract
Synthetic membranes made from silicone elastomers (silastic) can be used in permeation studies to mimic the epidermal stratum corneum to skin penetration. Due to challenges in obtaining human skin, alternatives are crucial, but the non-biological nature of silastic may not fully capture the dynamic interactions of living tissues. Their hydrophobicity can limit the permeation of hydrophilic substances, potentially skewing results for compounds with different solubility profiles.

We aimed to provide further insights into skin physiology, studying the relevance of this model under penetration enhancement by assessing the performance of ionic liquids (ILs)-containing transfersomes designed to improve transcutaneous delivery of hydroxycinnamic acids.

The ILs, (2-hydroxyethyl)–trimethylammonium-L-phenylalaninate [Cho][Phe] and (2-hydroxyethyl)–trimethylammonium glycinate [Cho][Gly], were incorporated at 0.2%v/v in transfersomes loaded with and without bioactive (0.4-1.5 mg/mL). Their physicochemical properties and compatibility with human keratinocytes were assessed. Bioactives' permeation was evaluated in silastic membranes and human epidermis.

TransfersomILs had particle size around 75 nm, good homogeneity and zeta potential around -40 mV. They maintained cell viability of HaCaT (above 90%). When ILs were incorporated into the transferosomes, each compound had a higher flux through silastic membrane, thereby displaying increased

permeation. [Cho][Gly] exhibited a superior performance as a penetration enhancer. Similar trends were observed using human epidermis.

These results confirm that silastic membranes behave similarly to human epidermis in their interactions with penetration enhancers, being a suitable synthetic model to predict permeability for poorly soluble compounds.

PO - (24897) - Impact of ATP synthase mutation on cell bioenergetics and targeting mitochondrial deubiquitinases in mitochondrial diseases

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Citation
Pinho, B., Chacko, A., Nogueira, C., Duchen, M., Oliveira, J. Impact of ATP synthase mutation on cell bioenergetics and targeting mitochondrial deubiquitinases in mitochondrial diseases.

Presenting Author Profile
Brígida Pinho is a researcher at the Mitochondria and Neurobiology Lab of the Portuguese research unit UCIBIO. Her research interests focus on mitochondrial biology and diseases, as well as the role of mitochondria in cellular proteostasis and in the pathophysiology of neurodegenerative diseases. She is currently principal investigator of a project aiming to develop

strategies to reduce mutant mitochondrial DNA load in mitochondrial disorders.

Abstract

Mitochondria contain their own DNA, the mitochondrial DNA (mtDNA), which encodes some mitochondrial proteins and RNA. Mutations in mtDNA can cause several diseases whose severity depends on the mutant-to-healthy mtDNA ratio, making the development of strategies to reduce mutant mtDNA urgent. Here, we studied the effects of the m.8993T>G mutation, which affects the ATP synthase, on cell physiology, and if the mitochondrial deubiquitinase USP30, which removes ubiquitin tags from mitochondria, reduces mutant mtDNA load by promoting degradation (mitophagy) of dysfunctional mitochondria.

We analyzed proliferation and metabolism of 143B cybrid cells, containing wild-type or m.8993T>G mutant mtDNA under glycolytic and oxidative phosphorylation (OXPHOS) conditions. We treated the cybrid cells with the USP30 inhibitor MF-094 or solvent under glycolytic conditions, and we assessed mitochondrial ubiquitination, mitolysosome formation and mutant mtDNA load.

Under OXPHOS conditions, mutant cells showed reduced proliferation and ATP levels compared to wild-type cells. Under glycolytic conditions: mitochondrial inhibitors (rotenone, myxothiazol, antimycin and oligomycin) reduced resazurin metabolism in wild-type but not in mutant cells, which also showed increased extracellular acidification; MF-094 treatment increased TOM-20 ubiquitination and mitolysosome formation but did not alter mutant mtDNA levels. These results suggest that the ATP synthase mutation increases reliance on glycolysis and that MF-094 did not reduce mutant mtDNA levels under glycolytic conditions despite increasing mitophagy. We are currently investigating whether mitochondria with mutant mtDNA are preferentially ubiquitinated under OXPHOS conditions – an effect that could potentially be enhanced by USP30 inhibition.

PO - (24902) - Microcirculation as a predictor of cardiometabolic risk: a cross-sectional analysis

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Citation
Menezes, R., Alves, E., Gomes, A., Alves, M., Chinita, J., Rocha, Â., Martins, G., Rodrigues, P., Pires, C., Vasconcelos, A., Rocha, C., Rodrigues, L.M. Microcirculation as a predictor of cardiometabolic risk: a cross-sectional analysis.

Presenting Author Profile

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Abstract

Monitoring individuals with a risk of developing cardiometabolic complications is a good practice that reduces the appearance of more severe symptoms. This cross-sectional study evaluated 8 individuals (50% females; 50% males) with a mean age of 54.5 ± 9.07 years old to assess if microcirculatory alterations coincide with the alteration of cardiometabolic markers. The sample mean BMI was 26.4 ± 2.13 kg/m^2, categorizing it as overweight; specifically, 2 individuals had normal weight, 5 were overweight, and 1 was obese. Mean systolic and diastolic blood pressure were 124 ± 10.5 mmHg and 75.5 ± 5.50 mmHg, respectively, with all values in the recommended range. The sample mean daily caloric intake was 1790 ± 558.6 kcal, with all macronutrients in the recommended range. Blood flow was measured in all 4 limbs using photoplethysmography and a 36.57 ± 26.67% and 37.84 ± 13.45% mean difference was found between the left and right superior and inferior limbs, respectively. Variation on inferior limbs was higher than in a similar healthy aged group (30.30±24.08%). Biochemical analysis revealed a mean fasting glucose level of 102 ± 22.0 mg/dL, with a maximum value of 146 mg/dL. The mean glycated hemoglobin (HbA1c) was 5.6 ± 0.60%, with a peak value of 6.4%, showing a favorable glycemic control. Lipid profile analysis showed mean total cholesterol of 198 ± 26.24 mg/dL, with a maximum of 241 mg/dL; mean LDL cholesterol was 124 ± 24.4 mg/dL, with a maximum of 161 mg/dL; and mean HDL cholesterol was 53.1 ± 11.6 mg/

dL, with a minimum of 39 mg/dL. The mean triglyceride level was 107 ± 51.2 mg/dL, with 1 individual reaching the maximum of 197 mg/dL. The 10-year QRISK®3 score, had a mean value of 6.64 ± 5.25, with the highest individual score 14.9. Overall, the sample exhibited an increased cardiovascular risk and higher microcirculatory limb differences compared to the healthy population's reference values, suggesting a potential association between these variables.

PO - (24908) - Using zebrafish as a model for investigating Wolcott-Rallison Syndrome via PERK inhibition

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Citation
Lima, L.A., L.P., Oliveira, N., Silva, R., Sousa, B., Bessa, J., Pinho, B., Oliveira, J. Using zebrafish as a model for investigating Wolcott-Rallison Syndrome via PERK inhibition.

Presenting Author Profile

Leonor Pereira Lima holds a master's in Pharmaceutical Sciences from the University of Porto and is currently a research fellow at the UCIBIO-Mitochondria and Neurobiology Lab. She is interested in studying neurodegenerative diseases, mainly questions about differential vulnerability and clinical heterogeneity.

Abstract

Wolcott-Rallison Syndrome (WRS), caused by loss-of-function mutations in PERK (an endoplasmic reticulum stress sensor), presents neonatal diabetes and skeletal dysplasia as hallmarks, and cardiac, motor, or cognitive impairments as broad-spectrum phenotypes. Current treatments are mainly symptomatic [1], highlighting the need for effective disease models for scalable drug testing. Zebrafish, presenting high fecundity, rapid development, optical transparency, and 70% genetic similarity to humans, are ideal for such studies [2]. To determine if zebrafish could model WRS, we pharmacologically inhibited PERK using GSK2606414 (GSK) and assessed the development of WRS-like phenotypes. Zebrafish were treated with GSK and evaluated for hatching, viability, and morphological abnormalities. 10 μM GSK decreased survival and caused distinct morphological defects, including curly up-tail lordosis. These abnormalities were unaffected by muscle contraction, as shown using the muscle relaxant tubocurarine (3 mM), indicating skeletal defects like those in WRS patients. To evaluate if zebrafish mimic the neonatal diabetes of WRS, we analysed the pancreas in double transgenic zebrafish (GFP-β cells and mCherry-Δ cells or exocrine pancreas) and

measured the uptake of a fluorescent glucose analogue. 10 μM GSK elicited diabetic-like phenotype resembling WRS in zebrafish by delaying endocrine pancreas development and reducing glucose uptake. Additionally, GSK-treated zebrafish showed impaired neuromotor activity and muscle integrity, cardiac oedema, and bradycardia. These findings suggest that PERK inhibition in zebrafish mimics WRS phenotypes, supporting the development of a zebrafish genetic model with PERK loss-of-function mutations for WRS drug testing. REF: [1] 10.1186/1750-1172-5-29; [2] 10.1016/j.drudis.2022.02.011. Acknowledgments: FCT: DL57/2016/CP1346/CT0016; UIDB/04378/2020; UIDP/04378/2020; LA/P/0140/2020; SFRH/BD/138451/2018; PTDC/BIA-MOL/3834/2021; CEECIND/03482/2018.

PO - (24909) - Development of a predictive model for simulated 1,000 m kayak ergometer performance in young athletes based on biomechanical and physiological parameters

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Coelho, A., Nakamura, F., Morgado, M., Alves, F., Baldassarre, A.D., Flatt, A., Rama, L. Development of a predictive model for simulated 1,000 m kayak ergometer performance in young athletes based on biomechanical and physiological parameters.

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international projects, including Erasmus Plus ReStart. He holds advanced coaching certifications, has published in journals, and is Vice-President of the National Canoe Coaches Association.

Abstract

Performance in 1,000 m kayak competitions is strongly associated with physiological and biomechanical factors, allowing for the development of predictive models that can optimize training and performance in young athletes. This study aimed to develop a predictive explanatory model for the 1000-m time-trial (TT) performance in young national-level kayakers, from biomechanical and physiological parameters assessed in a maximal graded exercise test (GXT). Twelve young male flat-water kayakers (age 16.1 ± 1.1 years) participated in the study. The design consisted of 2 exercise protocols, separated by 48 hours, on a kayak ergometer. The first protocol consisted of a GXT starting at 8 km.h-1 with increments in speed of 1 km.h-1 at each 2-minute interval until exhaustion. The second protocol comprised the 1000-m TT.

Results

In the GXT, they reached an absolute $\dot{V}O_2max$ of 3.5 ± 0.7 (L.min-1), a maximum aerobic power (MAP) of 138.5 ± 24.5 watts (W) and a maximum aerobic speed (MAS) of 12.8 ± 0.5 km/h. The TT had a mean duration of 292.3 ± 15 s, a power output of 132.6 ± 22.0 W and a $\dot{V}O_2max$ of 3.5 ± 0.6 (L.min-1). The regression model [TT (s) = 413.378 − 0.433 × (MAP) − 0.554 × (stroke rate at MAP)] presented an R2 = 84.5%.

Conclusion

It was found that $\dot{V}O_2max$, stroke distance and stroke rate during the GXT were not different from the corresponding variables ($\dot{V}O_2peak$, stroke distance and stroke rate) observed during the TT. The MAP and the corresponding stroke rate were strong predicting factors of 1000 m TT performance. In conclusion, the TT can be useful for quantifying biomechanical parameters (stroke distance and stroke rate) and to monitor training induced changes in the cardiorespiratory fitness ($\dot{V}O_2max$).

PO - (24919) - Brave new sound: applications of handheld ultrasound devices in medicine

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Citation
Ferreira, H.A. Brave new sound: applications of handheld ultrasound devices in medicine.

Presenting Author Profile

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Abstract

Recent years have witnessed the commercial availability of an ever-increasing portfolio of handheld ultrasound (HHU) devices, as technology is enabling smaller form-factor devices with suitable image quality and operating times. In this review, the applications in medicine and usage scenarios of such devices were studied, such that a future roadmap for such devices could be traced.

Herein, search engines Pubmed; BASE; and Google Scholar, were used to search for scientific papers containing the following keyword terms in the title: "handheld ultrasound" OR "handheld ultrasonography" OR "handheld point-of-care ultrasound", in the time spans of 1987-2018 and 2019-2025, addressing the usage of HHU devices on different clinical applications and scenarios.

In the 1987-2018 and 2019-2024 time spans, respectively 89 and 185 papers were deemed as suitable. The described applications mainly consider the assessment of heart and peripheral lung diseases, including the assessment of dyspnea, acute coronary syndrome, hypotension/shock and syncope; trauma; airway management and unrecognized esophageal intubations; hydronephrosis, transurethral catheter position or urinary retention; carotid examinations in ischemic stroke; and also in breast, thyroid, pulmonary embolism, deep vein thrombosis, and muscle-skeletal assessment; guiding spinal-epidural procedures, and intra-articular injections and other rarer applications.

The described scenarios include the COVID19 pandemics, and also the usage in the ICU, emergency care, home palliative care, pregnancy, labor room and newborn nurseries, remote and rural communities, low-income countries, bound refugees, and finally medical education, in particular by providing an imaging support for the study of anatomy & physiology.

Since the COVID19 pandemics a larger adoption of HHU devices has been observed, mainly in critical settings for diagnosis but also for intervention, with novel applications growing rapidly nowadays.

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