

SS1. Anatomy-Physiology-Pathophysiology session

09:40 - 11:00 Friday, 26th August, 2022

Eszterhazy hall / Eszterházy terem

Track Anatomy

Presentation type Oral / szóbeli előadás

Zsolt Bagi, Gábor Horváth, Ákos Koller, Péter Tóth

A. Scientific session: Anatomy-Physiology-Pathophysiology session

Moderátor: Prof. Dr. Koller Ákos, Dr. Tóth Péter

Zsűritag: Prof. Dr. Koller Ákos, Dr. Tóth Péter, Prof. Dr. Zsolt Bagi, Gábor Horváth MD, PhD

Opening lecture: Prof. Dr. Zsolt Bagi

09:40 - 10:00

82 Cerebral vascular dysfunction and MRI-defined white matter integrity in Alzheimer's disease

Zsolt Bagi MD/PhD

Augusta University, Augusta, USA

Abstract

Aims: Patients with Alzheimer's Disease (AD) display cerebral white matter (WM) hyperintensities in association with microvascular brain injury (mVBI). We determined the extent to which vasomotor dysfunction of WM penetrating arterioles is associated with mVBI in autopsy brains from patients with low or high AD neuropathology, and determined if these changes correlate with quantitative indices of MRI-defined WM integrity.

Methods: We analyzed 28 consecutive cases of prefrontal rapid autopsies in a population-based cohort with low or high AD neuropathological changes, and with or without cerebral microinfarcts. WM penetrating and pial surface arteriolar responses to the agonist, bradykinin were assessed ex vivo with videomicroscopy. Diffusion tensor imaging was used to measure mean apparent diffusion coefficient (ADC) and fractional anisotropy (FA) in post-mortem prefrontal WM.

Results: Patients with high AD neuropathology and mVBI exhibited a significantly reduced dilation in response to bradykinin selectively in WM arterioles, when compared to low or high AD cases without mVBI or to pial surface arterioles. Moreover, in cases with low AD pathology the magnitude of bradykinin-induced WM arteriole dilation was correlated with higher FA and lower ADC. In contrast, dilation to bradykinin was associated with lower FA and higher ADC in cases with high AD neuropathology.

Conclusions: Impaired vasodilation to bradykinin occurs in WM penetrating arterioles in AD patients with WM microinfarcts. Notably, the dilator response of WM arterioles strongly correlated with MRI-defined WM integrity suggesting that impaired bradykinin-mediated vasodilation in WM penetrating arterioles contributes to disrupted white matter microstructural integrity as defined by MRI.

Categories

Physiology-Pathophysiology

Language of your presentation:

English

10:00 - 10:10

25 Effect of treadmill training on acute central hyperthermic effects of corticotropins in middle-aged male Wistar rats

Botond Biró

Institute for Translational Medicine, University of Pécs Medical School, Pécs, Hungary

Abstract

Botond Biró (presenter), Márta Balaskó associate professor, Dóra Kovács PhD student

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Keywords: training, corticotropin, hyperthermic, Wistar, age

Introduction: Training affects the regulation of the energy balance. Efficiency of mediators of hyperthermia show age-dependent changes, with a hyperthermic response to corticotropin-releasing factor (CRF) decreasing with age, while urocortin 2 (Ucn2) induced hyperthermia increasing with age. The aim of our present study was to investigate the effects of training on responses to corticotropins in male rats.

Methods: The 12-week training (1 hour per day, 5 days a week) was started at 3 and 9 months of age, respectively. The hyperthermic effects of 1 µg CRF and 5 µg Ucn2 administered intracerebroventricularly (ICV) in 6-month-old and 12-month-old male Wistar rats were measured, respectively. The guide-cannula was implanted in the right lateral ventricle under ketamine + xylazine anesthesia. During the tests, the core temperature (T_c) was recorded with a thermocouple connected to a Benchtop Thermometer. Our animal study permission number is BA/35/66-6/2020. IBM SPSS Statistics Version 24 was used for statistical analysis.

Results: ICV injection of both CRF and Ucn2 increased T_c. CRF caused bigger increase in T_c in the younger age group and Ucn2 in the older age group. Training reduced CRF hyperthermia in both age groups, and significantly reduced Ucn2 hyperthermia only in the older group.

Conclusion: For Ucn2, training reduces age-related changes in responsiveness. In the case of CRF, stress tolerance is maybe the cause of hyperthermia inhibition. (ÁOK_KA_2021_37_Dr.Balaskó Márta)

Categories

Physiology-Pathophysiology

Language of your presentation:

Hungarian

10:10 - 10:20

60 Analysis of the central thermoregulatory effects of urocortin 2 with regard to aging

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Institute for Translational Medicine of University of Pécs, Pécs, Hungary

Abstract

Keywords: aging, obesity, cachexia, hyperthermia, urocortin2

Aims: In aging societies around the world, aging anorexia and sarcopenia present severe problems in public health. Responsiveness to various central mediators affecting energy balance change with aging. In our study we aimed to test whether age-related changes in the responsiveness to central Urocortin2 (Ucn2) may contribute to age-related changes, herefore, we have investigated the hypermetabolic/hyperthermic effects of Ucn2 in rats.

Methods: Male Wistar rats from 3 to 18 months of age received intracerebroventricular (ICV) injections of 5 ug Ucn2. Implantation of ICV guide cannula into the right cerebral ventricle was carried out under anesthesia. Oxygen consumption was measured in an OxyletPro indirect calorimeter. Core (T_c) and tail skin (T_s) temperatures were recorded thermocouples attached to Benchtop thermometer. During these tests animals were restricted their physical activity. We have also tested the effects of intraperitoneally injected cyclooxygenase-2 (COX-2) inhibitor on the Ucn2-induced hyperthermic effects.

Results: Central injection of Ucn2 increased VO₂ and T_c in all age-groups. This hyperthermia was suppressed by the COX-2 inhibitor. Hypermetabolic/hyperthermic effects of Ucn2 proved to be stronger and more sustained with aging. The strongest and longest lasting responses were detected in the 18-month age-group. No change in heat loss was detected.

Conclusions: The Ucn2-induced hyperthermia proved to be a co-ordinated, fever-like phenomenon. To our surprise, we have found that hypermetabolic/hyperthermic effects of Ucn2 were increasing with aging. Thus, age-related changes in these effects of Ucn2 may indeed contribute to the development of aging cachexia.

Categories

Physiology-Pathophysiology

Language of your presentation:

Hungarian

18 PACAP AND PAC1 RECEPTOR IN THE HUMAN EYE

Inez Bosnyak¹, Evelin Patko¹, Edina Szabo¹, Denes Toth², Tamas Tornocky³, Alexandra Vaczy¹, Tamas Atlasz^{1,4,5}, Dora Reglodi^{1,4}

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Abstract

Keywords: human eye, PACAP, PAC1R, immunohistochemistry

Aims: Pituitary adenylate cyclase-activating polypeptide (PACAP) is a neuropeptide, which has strong neuroprotective and general cytoprotective effects. PACAP is also present in the eye and numerous actions have been described in ocular tissues. Among others, PACAP has a strong retinoprotective effect, is necessary for stable pupil maintenance and it is involved in regulation of circadian rhythm and aqueous humor circulation. However, there is no descriptive data about PACAP and its receptors in the human eyebulb. Our aim was to investigate the distribution of PACAP38 and its specific receptor (PAC1R) in the human eye.

Methods: Semiquantitative evaluation was performed after anti-PACAP(n=7) and anti-PAC1R(n=7) antibody labeling and hematoxylin staining. Immunoreactivity was scored depending on staining intensity.

Results: Our results showed high level of immunopositivity in the corneal epithelium and endothelium. The iris and the ciliary body had strong immunopositivity for both PACAP and PAC1R. Several layers of the retina showed immunoreactivity and the ganglion cell layer had a special pattern in the immunolabeling.

Conclusion: In summary, our study indicates the widespread occurrence of PACAP and its specific receptor in the human eye, implying that the results from in vitro and animal studies have translational value and most probably are also present in the human eye.

Supported by FK129190, K119759, K135457 and ÚNKP-21-3-I-PTE-1299; National Brain Research Program NAP2017-1.2.1-NKP-2017-00002; MTA-TKI-14016; PTE AOK-TANDEM; GINOP-2.3.2-15-2016-00050 "PEPSYS"; 20765/3/2018/FEKUTSTRAT, 2020-4.1.1-TKP2020-FIKP III. Project No. TKP2020-IKA-08 has been implemented with the support provided from the National Research, Development and Innovation Fund of Hungary, financed under the 2020-4.1.1-TKP2020 funding scheme.

Categories

Anatomy

Language of your presentation:

Hungarian

10:30 - 10:40

48 Anatomy in the virtual reality

Máté Szemes, Zsombor Márton, Balázs Ujvári MD, Nóra Füredi Ph.D
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Abstract

Keywords: anatomy, learning, virtuality

Aims:

Forced by the pandemia, our aim was to create a virtual autopsy room what students may use for their studies with their smart devices.

Methods:

Fotogrammetric method was applied for this study, which is based on photographs of an object taken from multiple angles. Then, a virtual copy of the object can be created using the appropriate photogrammetric software.

At the beginning of the process, the specimen is hung on a scaffolding using damil strands thereby all its details can be seen from all angles. This step is important to avoid the position-, shape-, or color change during the photography. Subsequently, it is photographed using a camera fixed on a rotating table around the scaffold. Photos are uploaded to the computer to reconstruct the 3D anatomical model using Reality Capture program. Furhermore, these models are uploaded to a website what we have developed. Important structures are labelled on. In this phase, 3D anatomical models are ready for use.

Results:

In the spring of 2021, the first public version was released where students were able to rotate the models in the virtual atmosphere.

In the summer of 2021, we started to develop a virtual space where students may observe models in a similar way to a computer game make it more effective and entertaining.

Conclusions:

After a lots of positive feedback, statistical analysis is under process.

Support:

In the winter of 2021, we won PotePillars financial support.

Categories

Anatomy

Language of your presentation:

Hungarian

10:40 - 10:50

85 PACAP receptor expression of the human cornea

Barbara Hinnah

Department of Anatomy, Histology and Embryology, University of Debrecen, Debrecen, Hungary

Abstract

PACAP RECEPTOR EXPRESSION OF THE HUMAN CORNEA

Hinnah Barbara (presenter)

Department of Anatomy, Histology and Embryology, University of Debrecen

Keywords: cornea, PACAP, keratoplasty, PAC1, PKP

Aims: PACAP is a neurohormone in the CNS reported to have anti-inflammatory and anti-ischaemic effects in many extraneuronal tissues. Our aim was to examine the PACAP receptors' (PAC1, VPAC1, VPAC2) expression in surgically removed corneas and to compare the results in relation with patients' medical history and surgical indications.

Methods: At the Ophthalmology Clinic of the University of Debrecen an average of 60 perforating keratoplasty (PKP) surgeries are performed annually. We examined corneas removed during PKP (n=70), corneas from deceased without eye conditions were used as physiological controls (n=10). Samples were analyzed by RT-PCR to determine PAC1, VPAC1, VPAC2 and pre-pro-PACAP mRNA levels. Protein expressions were also monitored by Western blot.

Results: Pre-pro-PACAP RNA was detected in 60% of control and 63% of the patient samples. PACAP receptor RNAs were not significantly reduced in patient samples (PAC1 $p=0.053$; VPAC1 $p=0.148$; VPAC2 $p=0.09$). There were no significant changes in the protein levels of the PACAP receptors in the following diseases: keratopathia bullosa, keratoconus, dystrophy, degeneration, ulceration, bacterial keratitis. Furthermore, reoperations, co-morbid hypertension or diabetes did not affect PACAP receptor protein levels significantly.

Conclusions: PAC1, VPAC1 and VPAC2 receptors are present in human cornea at both RNA and protein levels. As the expression of the receptors did not decrease significantly, conducting a study of administration of PACAP-containing eye drops should be considered in each of the conditions.

Support: ÚNKP-21-2-I-DE-246

Categories

Ophthalmology

Language of your presentation:

English