To study the mode of action of PnTx2-6 could contribute to better understand erectile dysfunction (ED). Erectile dysfunction is a growing world health problem, especially in patients affected by vascular diseases, including diabetes and hypertension. In addition, some people cannot use, or do not respond to the conventional drugs to treat ED. So, based on the properties of PnTx2-6 to cause erection and on its amino acid sequence, we designed a smaller peptide, called PnPP-19 (*Phoneutria nigriventer* potentiator peptide, 19 amino acid residues), in an attempt to optimize a new compound, i.e. decreasing the toxicity and retaining the potentiation of erectile function. The experimental results, *in vivo* and *ex vivo,* showed that PnPP-19 is able to potentiate erectile function, in normotensive rats and mice, besides to restore erectile function in hypertensive and diabetic animals. Our studies have shown that action mechanism of PnPP-19 involves the *via* of nitric oxide (NO)/cGMP. In addition, PnPP-19 showed no apparent toxicity, ve r y low immunogenicity to mice and, different to the native toxin, it did not target any sodium channel – the main targets of PnPTx2-6, neither affected rat heart. Compared to the native toxin, PnPP-19 shows several advantages, as a higher specificity, lower toxicity and immunogenicity, besides a simpler synthesis. The technology involving PnPP-19 was transferred to Biozeus company and so far, several pre-clinical tests have been done. In a first exploratory clinical trial in healthy subjects, PnPP-19 showed to be safe when topically administered. In conclusion, PnPP-19 could be indicated to patients not responding or not indicated to receive the conventional drugs used to treat ED.

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SY8 - Photobiology and its application in Health Sciences

SY8.1 - Optical therapy and medical diagnosis assisted by metallic nanoparticles

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Metallic nanostructures are receiving increased attention as an important material for medical therapy and medical diagnosis. In medical therapies, metallic nanoparticles (NP) have been exploited in photothermal therapy applications. Light energy absorbed by the metallic NP can be converted to heat that dissipates to the environment, increasing the temperature of the NP surrounding medium, thereby potentially destroying cells or tissues. Various nanoparticle shapes, such as spheres, rods, shells and cages, show robust potential for thermal related therapy. Likewise, Photodynamic Therapy (PDT) has emerged as an important therapeutic option, for numerous disease treatments. PDT combines photosensitizing drugs and light to induce selective damage on a target tissue or microorganism. Metallic NP could improve PDT action by enhancing the generation of oxygen singlet by a photosensitized molecule. On medical diagnosis, metallic nanoparticles have been used as platforms for biosensors. Several examples of nanostructured optical biosensors were demonstrated, aiming the identification of cancer-related biomolecules, Alzheimer disease, influenza virus, HIV-1 virus, Dengue virus, hepatitis B virus, and preeclampsia. In this presentation the light interaction of light with metallic nanoparticles will be described, and the use of NP on optical therapy and medical diagnosis will be reveled.

SY8.2A - Biochemical changes in serum of obese mice related to photoactivation of brown adipose tissue

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Obesity is closely related to the development of insulin resistance and type-2 diabetes. Mammal fat consists of white and brown adipose tissues (WAT and BAT). Although most fat is energy-storing WAT, brown adipocytes dissipate energy as heat. Thus, the thermogenic capacity of BAT and its activation makes it an interesting target for treating metabolic syndrome (MS). On the other hand, photobiomodulation (PBM) has proven to be beneficial to manage the chronic inflammatory component of obesity and hyperglycemia by irradiating WAT. However, PBM has still not been used to activate BAT. In this work, obese and hyperglycemic mice were treated with PBM, and their BAT was irradiated. The mouse serum was collected and submitted to attenuated total reflection (ATR)-Fourier transform infrared (FTIR) spectroscopy to evaluate the biochemical changes promoted by PBM. Five animals were fed with standard food (normal diet – ND) and used as negative control. The remaining 10 animals were submitted to a hyperlipidic diet (high fat – HF) and their body mass, Lee index and glycemia were measured weekly during 15 weeks to induce MS. After MS establishment, the HF animals were divided into two groups: HF and HF660. The HF660 group was exposed to six irradiation sessions using a 662 ± 20 nm LED. The radiant exposure was 5.7 Jcm^{-2} at 19 $mWcm^{-2}$ per session, delivered at 300 s, on days 1, 3, 7, 10, 14 and 21. The HF group was sham-irradiated. After the treatment ended, the mouse serum was collected from cardiac puncture under deep anesthesia. Serum samples were prepared and analyzed by ATR-FTIR spectroscopy. The lipid absorptions were responsible for the clearest differences among the IR spectra. An intense C=O stretching absorption at 1742 cm^{-1} was noticed only for HF group. Acyl CH_2 stretching absorptions at 2853 and 2925 cm^{-1} were also more pronounced in HF group. After PBM, these major lipid peaks decreased their vibrational modes. In fact, hierarchical cluster analysis identified the similarities between the spectra and grouped ND and HF660 groups into a same cluster. Taking together, our findings suggest that PBM applied to the BAT is able to promote biochemical changes in serum of obese mice mainly in lipid bands.

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