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The study of natural anti-aging compounds using two-photon microscopy technique

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Statement of the Problem: The non-controlled accumulation of oxidative damage is one of the crucial mechanisms of the aging process. Antioxidant defense is the main mechanism controlling the over generation of reactive oxygen species (ROS) thereby protecting the organism against oxidative damage. Nowadays, finding of natural compounds protecting different cell types against oxidative stress is of most importance. From this perspective, Helix pomatia snails can be considered as such protecting compounds due to their well-developed strategy of defence against oxidative injury.

Methodology & Theoretical Orientation: In total, 30 healthy volunteers (25-35 years young age group, male/female, 5/5; 45-55 years middle-aged group, male/female: 5/5; 65> years older-aged group, male/female: 5/5) were involved in this study. The albumen gland extract was isolated from 40 adult specimens of snails. After the generation of an *in vitro* model of oxidative stress the intracellular ROS were monitored in human red blood cells (RBCs) with and without albumen gland extract by two-photon laser scanning fluorescence microscopy using a ROS-sensitive, membrane-permeable fluorescent dye, 5(6)-carboxy-2',7'-dichlorofluorescein diacetate (carboxy-DCFDA).

Findings: According to the results obtained, Helix pomatia snails albumen gland extract significantly (P<0.05) reduces the oxidative stress not only in intact RBCs from the older-aged group, but also in RBCs from this group exposed to additional *in vitro* oxidative stress.

Conclusion & Significance: In conclusion, the snail's albumen gland protein extract effectively prevents the generation of intracellular ROS thereby demonstrating powerful antioxidant properties, and possesses a protecting effect against aging-generated ROS in human RBCs. And finally, the snail's albumen gland protein extract can be considered as harmless and effective natural antioxidative means in prevention of the aging-related pathological processes associated with OS.

Recent Publications

- 1. Tsakanova G, Arakelova E, Ayvazyan V, Ayvazyan A, Tatikyan S, Aroutiounian R, Dalyan Y, Haroutiunian S, Tsakanov V and Arakelyan A (2017) Two-photon microscopy imaging of oxidative stress in human living erythrocytes. Biomedical Optics Express 8(12):5834-5846.
- 2. Babayan N, Hovhannisyan G, Grigoryan B, Grigoryan R, Sarkisyan N, Tsakanova G, Haroutiunian S and Aroutiounian R (2017) Dose-rate effect of ultrashort electron beam radiation on DNA damage and repair *in vitro*. Journal of Radiation Research 58(6):894-897.
- 3. Tsakanov V M, Aroutiounian R M, Amatuni G A, Aloyan L R, Aslanyan L G, Avagyan V Sh, Babayan N S, Buniatyan V V, Dalyan Y B, Davtyan H D, Derdzyan M V, Grigoryan B A, Grigoryan N E, Hakobyan L S, Haroutyunian S G, Harutiunyan V V, Hovhannesyan K L, Khachatryan V G, Martirosyan N W, Melikyan G S, Petrosyan A G, Petrosyan V H, Sahakyan A A, Sahakyan V V, Sargsyan A A, Simonyan A S, Tatikyan S Sh, Tsakanova G V, Tsovyan E, Vardanyan A S, Vardanyan V V, Yeremyan A S, Yeritsyan H N and Zanyan G S (2016) AREAL low energy electron beam applications in life and materials sciences. Nuclear Instruments and Methods in Physics Research A 829:248-253.
- 4. Tsakanova G, Arakelova E, Soghoyan A and Ayvazyan V (2015) Oxidative stress and post-ischemic inflammatory response in ischemic stroke complicated with diabetes mellitus type 2. Journal of Biosciences and Medicines 3:94-98.
- 5. Tsakanova G, Stepanyan A, Nahapetyan K, Sim R B, Arakelyan A and Boyajyan A (2017) Serine proteases of the complement lectin pathway and their genetic variations in ischaemic stroke. Journal of Clinical Pathology 71(2):141-147.

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Biography

Gohar Tsakanova, PhD is a Senior Researcher and Deputy Director in the Institute of Molecular Biology NAS RA (National Academy of Sciences of Republic of Armenia). She has an extensive international experience having been invited to be trained or conduct research at prominent academic institutions in Germany, Denmark, Switzerland, Belgium and Hungary. She has also teaching experience having lectures on Proteomics and Protein Engineering Master Courses at the International Scientific-Educational Center NAS RA and Russian-Armenian University from 2013. Her primary work is related with the molecular and cellular pathomechanisms of ischemic stroke, aging and cancer, with the focus on immunology, genomics, neurobiology and two-photon imaging.

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