Seminar stiintific,

Luni, 29.05.2017, ora 12.00, sala Farkas Gyula:

Carotenoids assessment in aquatic macro- and microorganisms – with focus on the origin of blue colour of the Blue crab (*Callinectes sapidus*, Rathbun 1896)

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ABSTRACT

The blue colour of the shell of the Atlantic blue crab (*Callinectes sapidus*, Rathbun 1896) was thought to originate from astaxanthin-crustacyanin complex (ACC). Astaxanthin (AXT) is a carotenoid which, when in free state has the absorption maximum around 470 to 490 nm, but when bound to protein crustacyanin undergoes a strong bathochromic shift to maximum absorption of around 632 nm. The exact mechanism of such a strong change of absorption of AXT is still elusive (Salares, 1979; Cianci et al., 2002). We hypothesize that nanoarchitecture of the shell itself plays and important role in light reflection, refraction, scattering and diffraction, and thus that the blue colour stems from both chemical and photonic phenomena.

To elucidate underlying mechanisms of blue colour, Raman spectroscopy and scanning electron microscopy (SEM) were employed. Blue-coloured area on the crab shell was probed by four laser lines (532, 633, 785 and 830 nm) and imaged by SEM. Several species of free carotenoids and carotenoids bound to proteins have been detected by Raman spectroscopy in the blue area. Applying high laser power, or immersing a piece of the shell in hot water or ethanol resulted in colour change from blue to orange demonstrating degradation of carotenoid-protein complexes responsible for blue colour. Even after colour change, the pieces of crab shell had blue reflection when viewed against natural light. SEM analysis revealed that the surface of shell was criss-crossed with furrows and crests, orderly arranged, and each about 400 nm wide – corresponding roughly to the wavelength of the blue part of visible electromagnetic spectrum.

REFERENCES

Salares, V.R., Young, N.M., Bernstein, H.J., Carey, P.R. (1979) Mechanisms of spectral shifts in lobster carotenoproteins. The resonance Raman spectra of ovoverdin and the crustacyanins. *Biochimica et Biophysica Acta*, 576, 176 – 191.

Cianci, M., Rizkallah, P.J., Olczak, A., Raftery, J., Chayen, N.E. Zagalsky, P.F., Helliwell, J.R. (2002) The molecular basis of the coloration mechanism in lobster shell: β-Crustacyanin at 3.2-Å resolution. *PNAS*, 99(15), 9795 – 9800.