**Spectroscopy of novel dicationic cyanine dyes as potential markers** **for mitochondrial DNA**

**Spektroskopija novih dikationskih cijaninskih boja kao potencijalnih markera za mitohondrijsku DNA**

Iva Orehovec,1 Ivo Crnolatac,1 Ana Tomašić Paić,1 Ivo Piantanida,1 Atanas Kurutos,2 Nikolai Gadjev,2 Todor Deligeorgiev,2

*1Institut Ruđer Bošković, Zagreb, Croatia*

*2Sofia University „St. Kliment Ohridski“, Sofia, Bulgaria*

E-mail: iorehov@irb.hr

Cyanine analogues are small molecules attractive for their use as fluorescent probes. They are characterized by a dramatic increase in fluorescence emission intensity upon association with biomacromolecules. The interest in synthesis and various applications of cyanine dyes is very big due to their sensitivity, low toxicity, remarkable fluorescence enhancement upon DNA/RNA binding and specific or selective affinity to certain base pair sequences. Therefore, cyanine dyes have a widespread use in molecular biology and medicine as spectrophotometric markers in fluorescence-based techniques.

 Inspired by previous results on mitochondria specific dyes [1-2], in this work are presented spectroscopy methods we have used for studying interactions of **five novel** benzoxazolium and benzothiazolium **asymmetric dicationic monomethine cyanine dyes with DNA/RNA, in order to elucidate the mode of binding and the specific affinity for different polynucleotides. Apart from the fluorescence spectroscopy, the study includes UV/Vis spectrophotometry and circular dichroism spectroscopy, as well as the thermal melting experiments. Combined studies revealed that** AK-A dyes bind with micromolar affinity to all ds-DNA/RNA. While AK-A dyes intercalate into ds-DNAs, they switch binding mode for ds-RNA, forming aggregates within ds-RNA major groove. Also, fluorimetric response of dyes is strongly dependent on a dye structure and some dyes show fluorimetric selectivity between various ds-DNA and ds-RNA, dependent on a type of polynucleotide secondary structure. AK-A dyes specifically accumulate in mitochondria with negligible antiproliferation activity on human carcinogenic lung (H460) and breast cancer (MCF-7) cells. Obtained results reveal great potential of novel dyes as imaging agents in cell biology.



Figure 1: Studied compounds AK-A.

**References**

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[2] Branilović, M. G., Crnolatac, I., Deligeorgiev, T., Kaloyanova, S., Piantanida, I., Tomić, S., Tumir, L. M., Vasilev, A., *Chemistry-a European Journal* **18** (2012), 3859-3864.