

## Biological activities of synthetic analogues of poly-APS

Polymeric alkylpyridinium salts (poly-APS) are compounds isolated from the marine sponge *Reniera sarai*. They exert a broad spectrum of biological activities: hemolytic, cytotoxic and cytotoxic, inhibition of acetylcholinesterase, antimicrobial, antitumoral and antifouling activity.

Recently, synthetic analogues of poly-APS were synthesized. Synthetic analogues of poly-APS mimic the natural ones and make them suitable for commercial production and application.

Synthetic alkylpyridinium compounds show reversible type of acetylcholinesterase inhibition. The membrane activity of compounds was assayed using bovine erythrocytes with a turbidimetric method. Synthetic compounds with longer alkyl tail are more effective causing hemolysis at lower concentrations.

The antimicrobial activity was tested in vitro against *E. coli* and *Staphylococcus aureus*. The activity of all the tested compounds was higher against *Staphylococcus aureus*. All compounds exert antimicrobial activity with minimum inhibitory concentration from 10 to 0.3 mg/ml for *E. coli* and from 1 to 0.03 for *S. aureus*.

Non-small cell lung cancer cells which are the most common form of lung cancer have been shown to express molecules belonging to the cholinergic system including nAChRs. Agonists of nAChRs activate receptor activity promoting cell proliferation and blocking apoptotic activity. 3-alkylpyridinium synthetic analogues are  $\alpha 7$  nAChR antagonists and are able to attenuate cell proliferation and promote apoptotic activity. We show that synthetic poly-APS selectively inhibited tumor cell growth in a concentration dependent manner with no toxicity towards normal lung fibroblasts.

The inhibitory effect of synthetic poly-APS was also assessed against two species of wood decaying fungi *Trametes versicolor* and *Gloeophyllum trabeum*. Synthetic poly-APS showed inhibition of wood decay fungi growth. The brown-rot fungus *G. trabeum* was slightly more sensitive. Fungicidal activity of synthetic poly-APS closely correlates with the length of their alkyl chains.

Antifungal potential of synthetic poly-APS was also assayed against a pathogenic fungus *Candida albicans* and *Saccharomyces cerevisiae*. 3-alkylpyridinium synthetic analogues with longer alkyl chain were again the most active compounds.

Fish embryo test using zebrafish (*Danio rerio*) was used for determination of the acute lethal, sublethal and teratogenic effects of 3-alkylpyridinium synthetic analogues. Only lethal effects were present with  $LC_{50}$  between 1 and 2  $\mu\text{g/ml}$ .