CHEMISTRY FACULTY OF M.V.LOMONOSOV MOSCOW STATE UNIVERSITY
MINISTRY OF EDUCATION AND SCIENCE RUSSIAN FEDERATION
RUSSIAN FOUNDATION FOR BASIC RESEARCH
N.M.EMMANUEL INSTITUTE OF BIOCHEMICAL PHYSICS OF RUSSIAN ACADEMY OF SCIENCES
MOSCOW STATE UNIVERSITY INTERNATIONAL BIOTECHNOLOGY CENTER
RESEARCH INSTITUTE OF PURE BIOCHEMICALS
ZAO "BioChimMac"
GROUP OF COMPANIES "BIOPROCESS"

INTERNATIONAL CONFERENCE

BIOCATALYSIS-2005:
FUNDAMENTALS & APPLICATIONS

ORGANIZING COMMITTEE

Chairman: **Prof. S.Varfolomeev**

Scientific Secretary: **Dr. T.Osipova**

Members:

Dr. N.Eremeev
Prof. A.Gabibov
Dr. S.Kurzeev
Dr. E.Zaitseva
Dr. P.Binevskii
Dr. G.Kazankov
Prof. V.Tishkov
E. Sadykhov

PROGRAMME COMMITTEE

Chairman: **Prof. V.Tishkov**

Members:

Prof. A.Gabibov
Prof. A.Maximenko
Prof. A.Levashov
Prof. I.Kurochkin
Prof. S. Kalyuzhnyi
Prof. V.Švedas

LACCASE-MEDIATED TRANSFORMATION OF ATRAZINE IN THE ENVIRONMENT

Valentina N. Davidchik [1], Natalia A. Kulikova [2], Elena V. Stepanova [1], Olga V. Koroleva [1]

[1] *A.N. Bach Institute of Biochemistry, Moscow, Russia; E-mail:* vdavidchik@gmail.com
[2] *M.V. Lomonosov Moscow State University, Moscow, Russia*

Laccase (EC 1.10.3.2) is a unique extracellular multicopper oxidase which activity can be determined in soils annually. Laccase can oxidize different aromatic compounds, such as phenols, anilines, etc. Substrate specificity of enzyme can be considerably expanded using redox mediators. The introduction of redox-mediators in system containing xenobiotic and enzyme allows transforming compounds that initially do not oxidized by laccase. Laccase is therefore considered to be a promising enzyme for application in biotechnology, especially for enzymatic treatment of the contaminated soils. This study was aimed to investigate the mechanisms of transformation of widely used persistent herbicide atrazine in different natural environments in the presence of laccase from *Coriolus hirsutus*.

The initial step of this research was to evaluate sorption capacity of soil particles towards atrazine. The data of atrazine sorption on soil particles have been assessed in terms of xenobiotic distribution coefficient (Kd). Three soils including chernozem, grey forest and sod-podzolic soils were used in this study. The sampled soils were characterized according to standard protocol. Atrazine concentration in reaction mixture varied in the range 1 to 10 mg/l; concentration of laccase was 6.4×10^{-8} M. Atrazine concentrations were determined using HPLC.

The highest atrazine adsorption capacity was observed for sod-podzolic soil (Kd = 1.9 L/kg), whilst Kd values for chernozem and gray forest soil were determined as 1.4 and 0.4 L/kg, respectively. Introduction of laccase resulted in increase of Kd values for all the studied soils. The greatest effect of laccase on atrazine adsorption was registered for grey forest soil (Kd = 1.1 L/kg), whereas for sod-podzolic soil (Kd = 2.5 L/kg) and chernozem (Kd = 1.7 L/kg) that was less pronounced. The experiments on desorption revealed that atrazine adsorption onto soil particles was partly reversible. In the presence of laccase, however, desorption was considerably low, probably due to chemisorption process. As there was no atrazine binding to laccase under selected experimental conditions, the enzyme was hypothesized to catalyse and/or initiate the process of atrazine transformation via mechanism of oxidative coupling. Laccase interaction with humic acids was previously shown to be of complex nature that affects the process of atrazine transformation. The study of atrazine adsorption process on soil particles has confirmed the assumption about xenobiotic chemisorption as the increase of atrazine adsorption in the presence of laccase on all examined soil samples was observed presumably via the mechanism of oxidative coupling.

The research was supported by RFBR (№№ 04-04-49679, 03-04-49180).