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HYDROLOGICAL VARIABILITY OF THE RIVER KRKA ESTUARY (1984-86)

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SUMMARY

The river Krka estuary, due to its beauty, represents an unique green oasis in the midst of greysh middle adriatic coastal karstic area. As such and for reasons of its protection, was proclamined a natural parc.23 Km in lenght, all of canyon configuration, it originated during postpleistocenic period by inundation of an eroded karstic valley. Predominancies of estuarine processes in karstic areas, make the river Krka estuary object of interdisciplinary investigations and an ideal scientific polygon.

Montly flows of river Krka are characterised by a great variability of their fluvio-nival regimes with maxima in autumn/winter (humid period with 400 m^3/sec) and minima during the summer (dry period with 10-30 m^3/sec). So, hydrograms of the river Krka obtained in such a way, show a great variability.

The river Krka estuary can be classified as a type of partialy mixed estuary with a stable stratification during the summer period and instability during spring and autumn. The most characteristic feature of the mentioned stratification are clearly expressed picnocline on the depth from 0.5-4.0 met. The increased salinity value gradients are present only in the layer that spreads from the picnocline tovard the bottom. Vertical oscilations in the estuary reach up to 0.5 m and essentialy have no influence to the estuary stratification. Except for the surface fresh water layer and the saline near bottom layer, intrusions were occasionaly registred, and their appearence mechanisms are yet under research.

The estuary dynamics was investigated by currents measurements on a few main stations. The currents are essentialy influenced by the river flow, tidal cycle, regional morphology and specially the main local winds (NE and SE). The surface fresh water layer shows the maximum current velocity (1.2 Knots).

Transparency as a function of bioproduction, suspended matter and turbidity clouds, vary from about 1-10 m.

The thermohaline estuar relations are closely connected by the seasonal changes of air temperature as well as with water column stability. The summer relations are characterised by high discontinuity layer (thermo-halo-picnocline) T°C≅ 14.0-24.0; Sal‰ ≅ 0.0-38.0 whyle the winter relations by isothermy and temperature inversion T°C≅ 12; Sal ‰ ≅ 0.0-38.0; Changes of thermohaline relations much influence on variation of density, pH and alkalinity parameters.

The whole Krka estuary rapresents a well aerated area. Oversaturations expressed in spring and summer period are caused by a high fotosintetic activity.

The concentrations of all the nutrient salts (P,N and Si) as measured in the estuary indicate high bioproductive potentials (with exception of reactive dissolved phosphorus). From the biological analisis of the phytoplancton catchies is evident, that in all seasons of the year the biomass is temporarly increasing (especially micro and nanoplancton).

BIOACTIVATION OF PROXIMATE CARCINOGEN N-HYDROXY-ACETYLAMINOFLUORENE IN THE MARINE MUSSEL MYTILUS GALLOPROVINCIALIS

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The postmitochondrial fraction of the marine mussel (Mytilus galloprovincialis) digestive gland has the potential to bioactivate several precarcinogenic aromatic amines, but not the precarcinogenic polycyclic aromatic hydrocarbon benzo(a)pyrene, to Salmonella typhimurium TA 98 mutagens (Britvić and Kurelec, 1986). This metabolism is catalyzed by FAD-containing monooxygenase (Kurelec, 1985), and a considerable part of these metabolites is conjugated via UDP-glucuronyl transferase to water soluble glucuronides (Kurelec et al., 1986a).

In our preliminary investigation of the activation of model aromatic amide acetylaminofluorene (AAF) we have noticed striking qualitative differences in the activities between carp and mussel preparations. In order to clarify these differences we have undertaken experiments using N-hydroxy-acetylaminofluorene (N-OH-AAF, 10 μM),the product of AAF first step metabolism catalyzed by FAD-containing monooxygenase as a substrate, subcellular fractions of the mussels digestive gland or carp liver as the activating system in the Ames test, paraoxon (10 μM) and pentachlorophenol (PCP, 0.1 μM) as inhibitors, and an incubation medium (as described, Kurelec 1985.) fortified with dithiothreitol.

Table 1. The activation of N-hydroxy-acetylaminofluorene to TA 98 mutagens by mussel digestive gland and carp liver preparations

Tissue fraction	Additions to S-9 mix		
	none	paraoxon	PCP
Mussel			
. postmitochondrial	282	135	.
. microsomal	93	74	.
. cytosolial	271	113	248
Carp			
. postmitochondrial	980	389	.
. microsomal	1058	77	.
. cytosolial	1018	530	562

Activation into mutagens was expressed in the No. of S. typhimurium TA 98 his+ revertants per plate (mean from triplicate) per mg of protein in the case of postmitochondrial fraction (PMF) and cytosol, or per the amount of microsomal protein obtained from 33 mg of tissue (wet weight).

The mussel PMF activation potential is located predominantly in cytosol.A major part of this cytosolial activity is catalyzed by N,O-acetyltransferase, since 59% of its activity could be inhibited by paraoxon, an inhibitor of cytosolial N,O-acetyltransferase, and a minor part is catalysed by sulfotransferase activity,since only 9% of its activity is inhibited by PCP, an inhibitor of sulfotransferase. The very low microsomal activity is practically insensitive to paraoxon, an inhibitor of microsomal deacetylase.

In contrast, carp PMF activation is equall distributed among microsomal and cytosolial fractions. 90% of microsomal activity could be inhibited by paraoxon, an inhibitor of microsomal deacetylase. 48% of cytosolial activation could be inhibited by paraoxon, an inhibitor of cytosolial N,O-acetyltransferase, and 45% by PCP, an inhibitor of sulfortansferase.

Results presented here show that beside the striking difference between carp and mussel in the first step of activation, there is also a qualitative difference in the second step of transformation of precarcinogens to ultimate mutagens, i.e. the mussel performs this step via cytosolial N,O-acetyltransferase in contrast to the carps (and mammals) type of transformation which includes microsomal deacetylase as well as both cytosolial N,O-acetyltransferase and sulfotransferase.

Thus, the mussel, and probably other marine invertebrates (Kurelec et al., 1985.), possess a specific metabolic path of activation of precarcinogenic aromatic amines that is qualitatively different from the well characterized activation system described in mammals. This may bring new insight to our understanding of the fate and effects of carcinogens in the marine environment.

LITERATURE

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