

A comparison of the behaviour of ^{51}Cr in the trivalent and hexavalent states in three mollusc species

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The presence of radioactive ^{51}Cr in the marine environment has been pointed out previously by several investigators. Chromium-51 is found in sea water in the trivalent and hexavalent states (FUKAI, 1967). In our previous papers (PAPADOPOULOU *et al.*, 1986, STAMOULI and PAPADOPOULOU, 1988, PAPADOPOULOU and STAMOULI, 1989, STAMOULI and PAPADOPOULOU, 1990) we studied the accumulation of ^{51}Cr in the trivalent and hexavalent forms in various mollusc species. Based on the results of these studies we thought that a comparison of the accumulation of the two different valence states of ^{51}Cr by these species would be of interest.

The mollusc species studied were *Venus verrucosa*, *Venerupis aureus* and *Mytilus galloprovincialis*. These edible species, which are common in Greek coastal waters and have a commercial value, were sampled from a farm in Salamis Island, Saronikos Gulf (Greece).

The uptake experiments were performed in different aquaria for each species ($T=20^{\circ}\text{C}$, $S=38\%$) using the gamma ray emitting radioisotope ^{51}Cr (H.L. 27.8 d) in the trivalent state (as chromic chloride) or in the hexavalent state (as sodium chromate) at radioactivity concentration $40 \mu\text{Ci } ^{51}\text{Cr}/20 \text{ l}$ sea water. The uptake experiments lasted 20-27 days. After the end of the uptake experiments the distribution and concentration of the accumulated ^{51}Cr in the trivalent or hexavalent forms in the different parts of the bodies of the mollusc species were determined.

The accumulation of trivalent ^{51}Cr by the three species was found to follow a similar pattern: In the first days of the uptake experiments $^{51}\text{Cr(III)}$ was rapidly concentrated and reached a stable level within a few days (8-10 days). Medium concentration factors were determined ($K=65$ in *Venus verrucosa*, $K=47$ in *Venerupis aureus* and $K=55$ in *Mytilus galloprovincialis*). The accumulation of hexavalent ^{51}Cr followed also a similar pattern in the three mollusc species but different from that of the trivalent ^{51}Cr . After the more rapid uptake of $^{51}\text{Cr(VI)}$ during the first days of the experiments the rate of accumulation was found to decrease; but, over a period of 27 days equilibrium concentrations were not attained. The uptake of hexavalent ^{51}Cr by these species was low, the concentration factors after 27 days reaching the values $K=2$ in *Venus verrucosa*, $K=4.7$ in *Venerupis aureus* and $K=6.1$ in *Mytilus galloprovincialis*.

Comparison of the distribution patterns of ^{51}Cr in the trivalent and hexavalent states in the tissues of the three mollusc species showed that the percentage of the whole body $^{51}\text{Cr(VI)}$ radioactivity determined in the soft parts was higher than that of $^{51}\text{Cr(III)}$. Among the soft parts of these species the percentage of $^{51}\text{Cr(VI)}$ detected in viscera showed lower values than that of $^{51}\text{Cr(III)}$, while the fractions of $^{51}\text{Cr(VI)}$ determined in muscle, mantle and gills were higher than those of $^{51}\text{Cr(III)}$.

Based on the above mentioned results it could be noted that the physiological behaviour of chromium in the studied mollusc species seems to be influenced by its valence state.

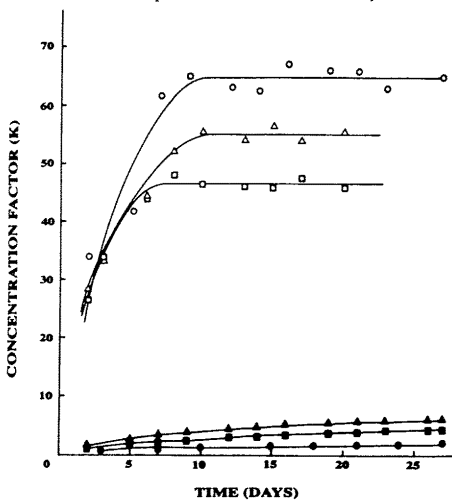


Fig. 1. Comparison of the accumulation of ^{51}Cr in trivalent and hexavalent states by three mollusc species.

- 1) *Venus verrucosa*: ○ $^{51}\text{Cr(III)}$, ● $^{51}\text{Cr(VI)}$,
 2) *Venerupis aureus*: □ $^{51}\text{Cr(III)}$, ■ $^{51}\text{Cr(VI)}$,
 3) *Mytilus galloprovincialis*: △ $^{51}\text{Cr(III)}$, ▲ $^{51}\text{Cr(VI)}$

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