L-III14

Heavy Metal Toxicity on *Idotea baltica* (Crustacea, Isopoda)

M. de NICOLA GIUDICI, C. GAMBARDELLA and S.-M. GUARINO

Dipartimento di Genetica, Biologia Generale e Molecolare - Università di Napoli, Via Mezzocannone, 8 - 80134 Napoli (Italia)
Stazione Zoologica "Anton Dohrn", Villa Comunale, 80121 Napoli (Italia)

Résumé

On décrit la toxicité acute (LT_{50}) de 6 métaux lourds (Cd, Cu, Cr, Hg, Fe, Zn) sur des femelles, des males et des juvéniles de l'isopode I. baltica. Des concentrations subletles de Cd ou Cu produisent des retards de survie et de croissance, et notamment des altérations du sex-ratio. Nos résultats confirment la susceptibilité des populations à des contaminations chroniques.

Environmental stresses caused by heavy metal contamination resulted in population disturbance, consequently reflecting the whole ecosystem biotic relantionship (1). It has been showed (2, 3, 4) that acute toxicity tests (LT_{50}) are unable to state the true ecological damages if no correlated to long term effects, being the persistence of a species more easily affect by continuous sublethal contamination than by a single massive one.

Idotea baltica, a crustacean isopod widely distribuited along marine coasts, constitutes a very important link between detritus and grazing food chains (5).

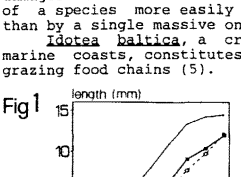
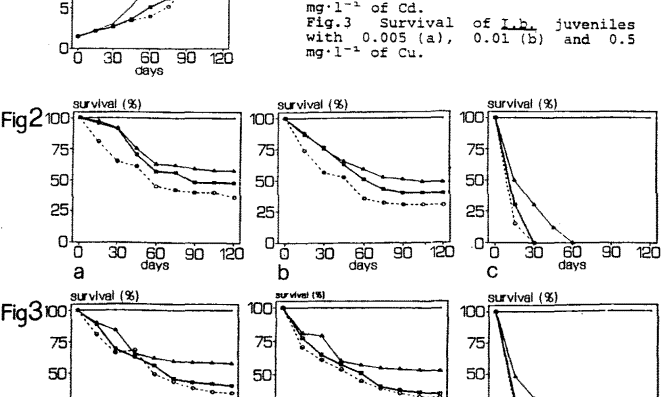


Fig.1 Body growth (as mm lenght) of juveniles bred SW (— control) in 0.5 $mg \cdot l^{-1}$ of Cd (-●-) or Cu (-⊖-) These data refer only to females.
Fig.2 Survival of I.b. juveniles with 0.005 (a), 0.01 (b) and 0.5 $mg \cdot l^{-1}$ of Cd.
Fig.3 Survival of I.b. juveniles with 0.005 (a), 0.01 (b) and 0.5 $mg \cdot l^{-1}$ of Cu.



Under standard laboratory conditions acute toxicities of Cd^{+2}, Cu^{+2}, Cr^{+4}, Hg^{+2}, Fe^{+2}, Zn^{+2} were evaluated by means of LT_{50} separately on males, females and juveniles exposed to several concentrations of metal ions, rancing from 0.01 to 10 $mg \cdot l^{-1}$. An increasing scale of toxicity, $Cd^{+2} < Fe^{+2} < Zn^{+2} < Cu^{+2} < Cr^{+4} < Hg^{+2}$, has been evaluated. Juveniles result more sensitive than adults ($p<.01$) and, for low concentrations of Cd^{+2} or Cu^{+2} only, males appeared more sensitive than females ($p<.01$).

Since Cd^{+2} and Cu^{+2} are more frequently recorded in coastal waters, their long-term effects has been studied on growth rate, sex-ratio and survival of juveniles. Low contaminations (0.5 $mg \cdot l^{-1}$, 0.01 $mg \cdot l^{-1}$, 0.005 $mg \cdot l^{-1}$) during: i) embryonic development (E^+J^-), ii) juvenile development (E^-J^+), iii) both embryonic and juvenile development (E^+J^+), were performed.

The highest concentration (0.5 $mg \cdot l^{-1}$) induces significative modifications in all tested biological parameters. When sex differentation takes places, sex-ratio measured on day 60, appears strongly modified, females largely exceeding males (75% and 84% respectively for Cd and Cu). This indicates a higher male sensitivity respect to the females during the first two month of development. Consequently the growth rate was determined at this concentration only for females specimens, whose lenght is strongly reduced ($p<.01$) by both Cd and Cu treatment (Fig.1).

No modifications of growth and sex-ratio is given by exposure to 0.005 $mg \cdot l^{-1}$ or 0.01 $mg \cdot l^{-1}$ Cd or Cu, while the survival is significantly affected (Fig.2,3), resulting the embryonic and juvenile treatment (E^+J^+) the most toxic and the embryonic treatment (E^+J^-) less. The Cu is more toxic than Cd in the juvenile treatment (E^-J^+).

No morphological differences between exposed and control animals never appeared.

In conclusion the acute toxicity test indicates the Hg the most toxic and the Cd the less one. The chronic toxicity test indicate that 0.5 $mg \cdot l^{-1}$ affects strongly growth rate, sex-ratio and survival up to the total disappearance of Idotea baltica population. On the other hand the lower concentrations (0.01 - 0.005 $mg \cdot l^{-1}$) mainly reduce the survival up to about 40%-60% of the control values with a general repercussion on the community.

REFERENCES

1) Ravera O. (1984) - Cadmium in freshwater ecosystem. EXPERENTIA, 40: 1-13
2) de Nicola Giudici M., Migliore L., Guarino S.M. & Gambardella C. (1987) - Acute and long term toxicity of cadmium on Idothea baltica Pall. (Crustacea, Isopoda): MAR. POLL. BULL., 18: 454-458.
3) de Nicola Giudici M. & Guarino S.M. (1989) - Effects of chronic exposure to cadmium or copper on Idothea baltica Pall. (Crustacea, Isopoda). MAR. POLL. BULL., 20(2): 69-73.
4) Gould E., Thompson R.J., Buckley L.J., Rusanowsky D. & Sennelfelder G.R. (1988) - Uptake and effects of copper and cadmium in the gonads of the scallop Placopecten magellanicus: Concurrent metal exposure. MAR. BIOL. 97: 217-223.
5) Saleema H. (1979) - Ecology of Idotea baltica (Isopoda) in the Nothern Baltic. OPHELIA 18(1): 133-159.