

IMPOSEX IN *H. TRUNCULUS* IN THE LAGOON OF VENICE: ROLE OF TBT AND OTHER ENDOCRINE DISRUPTORS

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Abstract

The imposex occurrence in population of the gastropod *H. trunculus* has been investigated in the Lagoon of Venice. The morphological modifications in the organisms were related to levels of different endocrine disruptors, such as butyltin and phenyltin compounds, PCBs, PAHs, organochlorine pesticides, in the animal tissues, both in the visceral coils and the rest of the soft body. A good correlation was found between the biological response and the concentrations of xenobiotics.

Key words: Imposex, endocrine disruptors, Hexaplex trunculus, Lagoon of Venice

A wide variety of xenobiotic compounds of anthropogenic origins released in the environment by numerous applications, have been reported to be able to affect aquatic organisms at different levels of the biological organization (molecular, cellular, systemic or individual) and in the long term to threaten the population, community or ecosystem levels. It is the case of substances suspected to act as endocrine disruptors [1] such as Organotin Compounds (OTCs), Polychlorinated Biphenyls (PCBs), Organochlorine Pesticides and Polycyclic Aromatic Hydrocarbons (PAHs). Interacting with the endocrine system of the organism, they can reduce the reproductive capacities and damage the population survival. A well known example is the appearance of male sexual characteristics (namely a penis and a vas deferens) on females of gastropods in response to tributyltin (TBT) exposure. This phenomenon, known as imposex [2], caused the sterilisation of females of the whelk *Nucella lapillus*, leading to the decline of populations of the mollusc in the southwest coasts of England [3]. It is reported to affect more than 150 species of gastropods [5] world-wide [4].

With the aim of studying the occurrence of the imposex phenomenon in the Lagoon of Venice, populations of at least 40 individuals of the common Mediterranean gastropod *H. trunculus* (Neogastropoda: Muricidae) were collected in 5 sites and morphologically inspected to assess the level of the biological modification in the 8-stages scale of the Vas Deferens Sequence (VDS). The content of organotin compounds, both butyltins and phenyltins (TBT, TPhT and their metabolites, DBT, MBT, DPhT and MPhT, respectively) was determined in pooled tissues of the same stages of imposex, using a liquid-liquid extraction, the derivatization with the Grignard reagent and the determination with GC-MS after purification of the extract with Florisil. Both the visceral coils and the rest of the soft tissues were analysed.

A good agreement was found between the biological and the chemical results in the examined stations, confirming the effective role of this species as a bioindicator of organotin contamination and its high sensitivity. No stages lower than 3 were found and even in the station supposed to be the least contaminated the level of imposex in this gastropod was unexpectedly high. A significant correlation ($r=0.917$, $p<0.05$) was found between the butyltin content in the entire organism and one of the morphological modifications induced, the length of the penis in females, in the form of a dose-response curve. An even better correlation was found using the sum of butyltin and phenyltin compounds ($r=0.982$, $p<0.05$).

The same samples were also analysed for the PCBs, PAHs and organochlorine pesticides to establish, beside the undoubted role of TBT, a possible synergistic or antagonistic role of this endocrine disruptors in the induction of the abnormalities. The PLS method (Partial Least squares regression in latent variables) was applied to relate the imposex response (Y) to the concentrations of the four classes of compounds (X block) analysed in this study. The chemometric model shows, with a good predictive capacity of the dependent variable, that the concentrations of PCBs and pesticides positively contribute to the explanation of the imposex effect. On the contrary, a negative effect seems to characterise PAHs in respect to PCBs, pesticides and OTCs.

References

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