Optimization of an analytical method for the extraction and determination of anti-fouling booster in biological tissues.

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Abstract

The biocides used to paints, which act as anti-fouling, are groups of substances potentially adverse to aquatic ecosystems. Anti-fouling paints are treatments to minimize corrosive processes on ships and port's structures, reducing maintenance costs, saving fuel and decreasing the transmission of non-native species of coastal ecosyzstems [1].

However, the overuse of antifouling paints have triggered a serious environmental problems, such as genetic mutations in molluscs (imposex) and oysters as the phenomenon "Balling", i.e. related with the use of TBT. Although the use of this compound was prohibited in 2003, vessels that had been painted could remain with their paintings until 2008 when the presence of tributyltin (TBT) was definitely forbidden after the ban of the use of organotin [2,3].

Anti-fouling paints industries sought new alternatives and a third generation of biocides have been sinthetized, the non-metallic organic compounds. The most research biocides in the world are, 4-chloro-3-methylphenol, chlorothalonil, dichloflunid, diuron, irgarol, thiram and zineb. Although they are less persistent in the environment, many of these compounds have been associated with noxious effects such as metabolic disorders, infertility and inhibition of growth, low in immune defense and death in some organisms [4].

Due to the formation of a dimorphism of male sex organs (penis and vas deferens) in females, the *Stramonita haemastoma* (Linnaeus, 1766) is considered a bioindicator for TBT and Triphenyltin (TPhT), both anti-fouling first generation. The use of their soft tissues can be available option for the chemical analysis of the presence of the new anti-fouling in port areas. For that, this study proposes the development, validation and application of an analytical method for the extraction, preconcentration and determination of selected antifouling biocides (chlorothalonil, dichloflunid diuron, irgarol) in biological tissue samples from *Stramonita haemastoma* [5].

References

1. Castro, I. B.; Westphal, e.; Fillmann, g. Tintas anti-incrustantes de terceira geração: novos biocidas no ambiente aquático. Química Nova, v. 34, n. 6, p. 1021-1031, 2011.

2. Dimitriou, P., Castritsi-Catharios, J., Miliou, H. Acute toxicity effects of tributyltin chloride and triphenyltin chloride on gilthead seabream, Sparus aurata L., embryos. Ecotoxicology and Environmental Safety. Vol 54, Pag 30–35, 2003.

3. IMO (International Maritime Organization). Anti-fouling systems. Available in: http://www.imo.org/OurWork/Environment/AntifoulingSystems/Pages/Default.aspx. Accessed on: mar, 19, 2014.

4. Sapozhnikova, Y.; Wirth, E.; Schiff, K.; Brown, J.; Fulton, H. Anti-fouling pesticides in the coastal waters of Southern California. Marine Pollution Bulletin. v. 54, p. 1962-1989, 2007.

5. Garaventa, F.; Pellizzato, F.; Faimali, M.; Terlizzi, A.; Medakovic, D.; Geraci, S.; Pavoni, B. Imposex in Hexaplex trunculus at some sites on the North Mediterranean Coast as a base-line for future evaluation of the effectiveness of the total ban on organotin based antifouling paints. Hydrobiologia, Vol. 555, p 281-287, 2006.