Lab-based all year round anti-fouling bioassay to screen for pre- and post-settlement biocide activity against barnacles.

Christian Pansch¹, Per Jonsson¹, Emiliano Pinori², Mattias Berglin² and Hans Elwing¹

¹ University of Gothenburg, Sweden, ² SP Technical Research Institute of Sweden

Rationale

- Current antifouling technologies are mainly based on the continuous release of biocides and consequently discharge into the environment.
- Barnacles are important fouling organisms worldwide - largely increasing the hydrodynamic drag of ships and damaging coatings on underwater surfaces.
- Barnacles are extensively used as a model in antifouling research mostly in static lab-based systems - however, reliable flow-through test assays for the screening of antifouling paints and its incorporated biocides are rare.
- We have developed a test assays to screen diverse low-release biocide paints and their pre- as well as post-settlement activity against barnacles.

The Flow Cell Assay

- Test assay for coatings where antifouling activity is confined to the paint surface and biocides are bound to the paint matrix - antifouling activity exercised only when the fouling organism makes contact with the paint, e.g. at settlement or post-settlement penetration:
  - Open flow cells with continuous flow-through seawater prevent accumulation of biocides
  - Design and nylon net ensure the panels to be the only surfaces available for settlement
  - Choice or no-choice tests: each flow cell holds two treated or one treated and one control panel (11 x 11 cm)

The settlement assay can be easily extended to screen for post-settlement activity of biocides against barnacles.

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Preliminary Results

- Preliminary tests with biocide-free panels show high settlement rates and demonstrate that settled barnacles can be monitored after metamorphosis to explore time-dependent post-settlement effect of biocides.
- This novel flow-cell assay is now used to test for antifouling activity against barnacles, where the biocide effect is triggered when post-settlement barnacles penetrate the coating.

Conclusions

This settlement assay produces all-year round reliable results in order to test for large-scale and more realistic anti-settlement activity of biocides against barnacles.

The settlement assay can be easily extended to screen for post-settlement activity of biocides.

It has the potential to be further applied in various other fields of anti-fouling research, in pre- and post-settlement inhibition studies.

This assays is at the moment applied within the European FP7 Collaborative project “LEAF 1”, aiming to develop sustainable antifouling solutions based on a newly discovered “Low Emission AntiFouling” paint concept.