

# On the roles of serotonin and dopamine in the settlement of the cyprids of the barnacle *Balanus amphitrite* (= *Amphibalanus amphitrite*)

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KEY WORDS: serotonin, dopamine, barnacle, biofouling.

## Abstract

*In the cyprid of Balanus amphitrite (=Amphibalanus amphitrite) was investigated by settlement tests the role of serotonin, related substances and dopamine. The results indicate an activity of serotonin in B. amphitrite cyprid as settlement inhibitors.*

## Introduction

Serotonin (5-hydroxytryptamine, 5-HT) immunoreactivity (IR) in the nervous system of *B. amphitrite*, adult and cyprid [1] suggests a role in neurotransmission. Barnacles are sessile marine crustaceans, with a cyprid larvae specialized for settlement, by the cement gland secretion, and metamorphoses into an adult [2]. 5-HT and related compounds, its agonist/antagonist and L-tryptophan, affect cyprid settlement [2]. We investigated the role of 5-HT in settlement.

## Materials and Methods

Cyprids were obtained from laboratory cultures [3]. Five days old cyprids were used for settlement assays [4]; tests were done with a 16:8h L:D cycle, except for 8-hydroxy-2-(di-n-propylamino)-tetralin (8-OH-DPAT) (in darkness). Drugs: 5-HT creatinine sulphate, dopamine HCl (DA), fluoxetine HCl, d-fenfluramine HCl and pargyline HCl; 8-OH-DPAT; p-chlorophenylalanine. For statistical analysis the two-way ANOVA method was used: the concentrations of the bioactive molecules (fixed and orthogonal) with 5 levels (from 0 to 10  $\mu\text{g ml}^{-1}$ ) or 6 levels (from 5, to 10  $\mu\text{g ml}^{-1}$ ) and time with 3 levels 24, 48 and 72 h were considered [4].

## Results

Tests with 5-HT did not show significant effects, with DA promoting settlement at 1-10  $\mu\text{g ml}^{-1}$  (Fig. 1). Fluoxetine,

at lower concentrations, showed a significant settlement promotion while from 1 to 10  $\mu\text{g ml}^{-1}$ , and after 48 and 72 h, it inhibited settlement. 8-OH-DPAT strongly inhibits settlement in significant way after 48 h. Fenfluramine strongly inhibits after 72 h. The p-chlorophenylalanine shows settlement enhancement from the 24 hours at 0.1  $\mu\text{g ml}^{-1}$ . Pargyline shows significant effect at 48 and 72 hours, from 1 to 10  $\mu\text{g ml}^{-1}$  underlines a significant or highly significant inhibition. The statistical analysis (ANOVA and SNK Test) are not show.

## Discussion

Fluoxetine (5-HT reuptake inhibitor), d-fenfluramine (5-HT releaser) and pargyline (monoamine oxidase inhibitor), increase the availability of 5-HT and always inhibit settlement. The 8-OH-DPAT, agonist of 5-HT<sub>1A</sub> receptor, decreases the settlement. The p-chlorophenylalanine inhibiting the synthesis of 5-HT, increases the settlement, suggesting that 5-HT could control settling. DA promotes settlement. The cement gland presents dopaminergic innervation [2]: these two amines could be antagonists, DA stimulating, 5-HT inhibiting the exocytosis of the cement. We hypothesized a 5-HT inhibitory role in settlement. The results help to clarify the settlement mechanism.

## References

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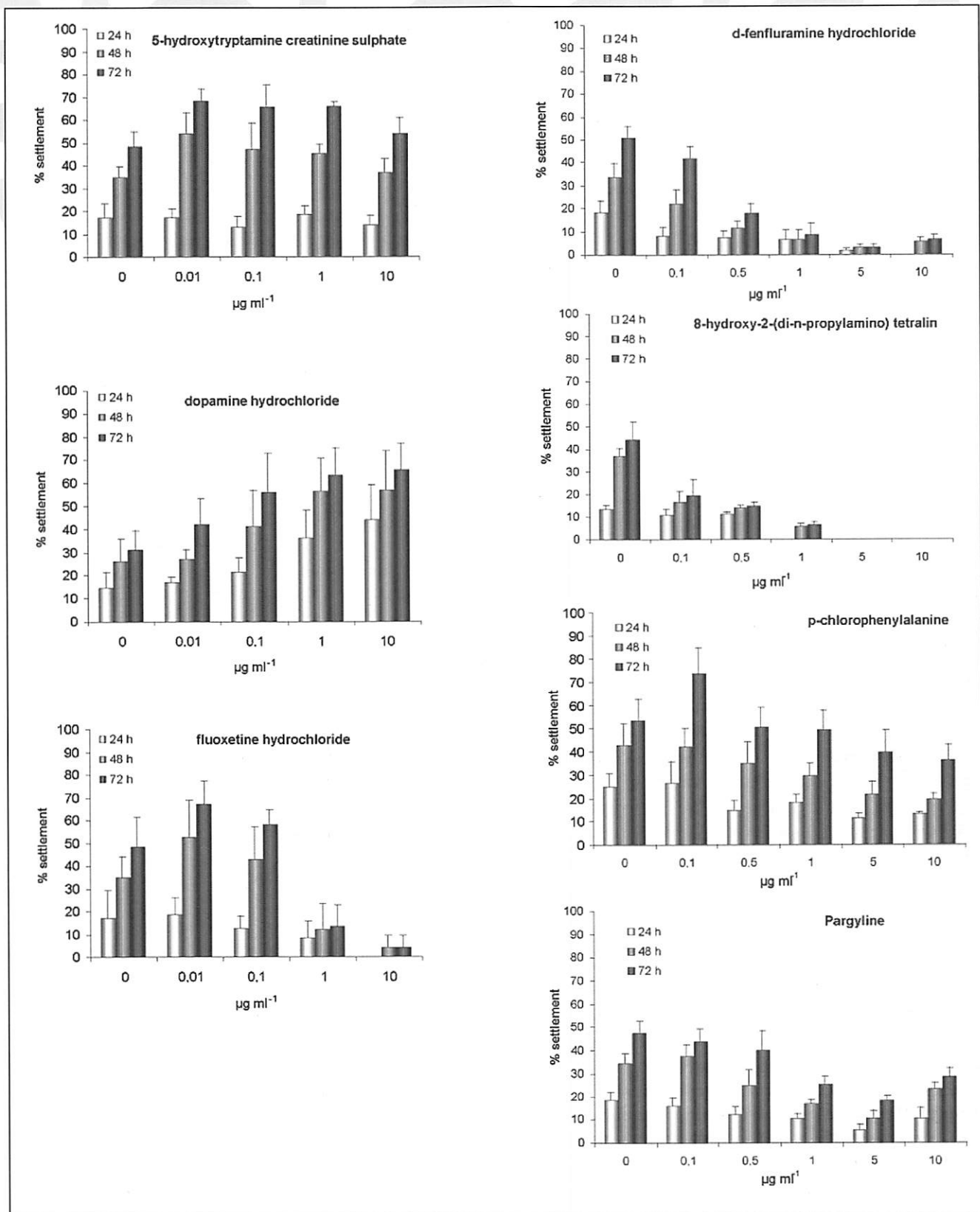


Figure 1. Tests with 5-HT, DA and 5-HT related molecules, percentage of settlement vs 5 (from 0 to 10  $\mu\text{g ml}^{-1}$ ) or 6 levels (from 5, to 10  $\mu\text{g ml}^{-1}$ ) and time with 3 levels (24, 48 and 72 h).