

Study of cellular basis of dependence on drug of abuse by exposing of paramecium caudatum to naloxone

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Introduction: exposure to narcotic drugs has been widely studied in laboratory mammals. But, this process has not been experienced in single-celled animal model. This laboratory has shown that the abuse drug morphine can aggregate the paramecia. In this study an exposure to the narcotic drug naloxone was evaluated in *Paramecium caudatum*.

Materials and Methods: This little animal (300-600 μm) was collected from natural sources and determined specifically. The unicellular animal was then abundantly cultivated in specific artificial medium enriched by inorganic ingredients. Only 1ml of the specific medium containing the organisms was added into the Sedgwick- Rafter cell counter and after homogenous distribution of animals, 1 μl of drug was infused into the cell counter. The field of drug infusion was viewed under magnification 4X of the light video microscope. The reaction of the animals to naloxone (0.05- 0.4 $\mu\text{g}/\mu\text{l}$) was tested during the time interval (0- 180 sec). The effect of drug was recorded as cell count/view throughout the time points. Based On the data provided by the cell counting/view, the point 60 sec was chosen as that through which the escape behavior of organisms was relatively weakened to naloxone. The control group was given solely distilled water (1 μl) and passed the experience as the experimental groups as well. All data were analyzed by using the analysis of variance (ANOVA).

Results: According to the results the drug naloxone caused significantly the avoidance as compared with the control ($p < 0.0001$). When L-arginine (1-8 $\mu\text{g}/\mu\text{l}$) was added to the medium before infusion of naloxone the response to naloxone was potentiated. However, this cumulative reaction was blocked by L-NAME pre-infusion.

Discussion: It may conclude that a molecule, nitric oxide (NO), signals the exposure of *Paramecia* to the narcotic drug naloxone. This result indicates part of the signal pathways involved in dependence on drugs of abuse at in vivo cellular level.

Keywords: *Paramecium caudatum*, Naloxone, Nitric oxide, Avoidance