

1144-92-173

**Patrick De Leenheer\*** (deleenhp@math.oregonstate.edu). *Toxin production in a chemostat to avoid the tragedy of the commons*. Preliminary report.

We consider a chemostat with two types of bacteria, cooperators and cheaters. Cooperators produce a common good required for nutrient uptake; cheaters also need this common good but don't produce it. In previous work we have shown that in this case the Tragedy of the Commons occurs: both cooperators and cheaters are doomed when there is a nonzero amount of cheaters present initially. Here we show that this tragedy can be avoided when cooperators also produce a toxin that harms cheaters, but not cooperators, provided that the toxicity rate is sufficiently large. In this case, cooperators can outcompete the cheaters. Such defense mechanism occurs for instance in *Pseudomonas Aeruginosa*, where cooperators can produce toxins like cyanide, as well as detoxification products making them resistant to the toxin. It also occurs in other organisms such as eusocial insects like ants, wasps and bees. This is joint work with Hal Smith (Arizona State University), Sergei Pilyugin (University of Florida) and Martin Schuster (Oregon State University) (Received August 23, 2018)