On the Mathematical Modelling of a Bacteria Behaviour Using Reaction Schemes

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Trying to find a mathematical model explaining the behaviour of a biological process is a difficult challenge when one only has some experimental measures of few parameters concerning this process. In this work we are interested in mathematical models for the production of exopolysaccharide (EPS). by aeribacillus placidus. Several experiments [2], have shown that this production begins with a long period (several hours) in which the biomass and EPS remain undetectable. Then there is a fast increase followed by a stationary situation or a slow decrease of the biomass and EPS. Some differential models have already been proposed such that their computed solution stay in the interval error of the experimental measures. Here we are interested in two particular models arising from reaction schemes consisting of two phases, mainly a non reproductive phase and a reproductive phase, in the life of a bacteria. This approach has been proposed in [1]. It is shown that both models,even if they have different hypotheses lead to theoretical solutions that very close to the experiments whereas the Andrews-Haldane model cannot fit well the first hours of the process. Then some interesting mathematical properties of these two models are studied. Numerical simulations coming from these models are presented.

References

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