

SPORULATION IN BACILLUS SUBTILIS VIA QUORUM SENSING - AN ODE AND COUPLED PDE-ODE MODEL

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The talk presents mathematical modelling approaches to study the sporulation phenomenon of *Bacillus subtilis* by investigating the dynamics of quorum sensing signalling molecule *PhrA* pentapeptide. As a first step an ODE model is introduced and validated by experimental data provided by the BioQuant laboratory in Heidelberg to obtain first impressions of the sporulation process. Next we consider a coupled PDE-ODE model since further biological experiments performed on *Bacillus subtilis* colonies have demonstrated that not the entire colony sporulates. This is exemplified by a reaction-diffusion equation with a non continuous reaction term in a two-dimensional space describing the extracellular signalling molecules and a linear ODE for the internal signalling molecules. The non continuity of both models is caused by the fact that no *PhrA* is produced if the *Bacillus subtilis* is sporulated otherwise the production term of *PhrA* vanishes. The numerical results are obtained by finite element implementation using the event function method.