

## Oberseminar zur Numerik und Optimierung

Im Rahmen des Oberseminars der AG Numerik und Optimierung wird

Herr **Dr. Peter Rashkov**, Bulgarian Academy of Sciences,

am Mittwoch, den **13. November 2019**, zum Thema

*Mathematical model of the host immune response to mature and immature dengue viruses*

vortragen.

### **Abstract.**

Dengue fever is an emerging vector-borne disease in tropical and subtropical regions with potential of spread in Southern Europe and the Middle East. The dengue virus has four distinct serotypes (DENV-1 to DENV-4) which co-circulate. Completion of DENV synthesis in the infected human cells requires cleavage of the viral surface protein prM by the cellular enzyme furin. Then these mature viruses are released from the cells. However, dengue patient blood samples reveal presence of immature dengue viruses which are essentially not infectious because the uncleaved protein prM renders them incompetent for fusion with cells. Such immature viruses therefore are produced during the course of infection, and experiments show they regain full infectivity when they interact with anti-prM antibodies. This finding has implications for patients which are reinfected with DENV from a different serotype, and developing the severe form of the disease. We propose a mathematical model for the infection dynamics that includes immune cells, signalling molecules, antibodies and mature and immature virus. It incorporates recent experimental observations on the different interactions of plasmacytoid dendritic cells with DENV-infected cells producing virus with different degree of maturity, which the model focuses on. Because of currently inconclusive biological evidence we consider two scenarios of the role of such cells. The large number of model parameters with unidentified or uncertain values require a Monte Carlo approach for the numerical simulations. This allows us to establish qualitative relationships between relevant indicators of the viral dynamics and immune response. Our modelling indicates directions for potential experiments that could be conducted to validate the two proposed scenarios of interactions. This is joint work with Milen Borisov (Sofia-Bulgaria) and Gabriel Dimitriu (Iasi-Romania), recently published in *Bulletin of Mathematical Biology* ([doi.org/10.1007/s11538-019-00664-3](https://doi.org/10.1007/s11538-019-00664-3)).

Der Vortrag findet um **16:15 Uhr** im Seminarraum **06D10** am Fachbereich Mathematik und Informatik, Hans-Meerwein Str., Lahnberge, statt.

Es lädt ein die AG Numerik und Optimierung