1163-92-407   **Churni Gupta** (`churnibidisha@ufl.edu`), **Necibe Tuncer** (`ntuncer@fau.edu`) and **Maia Martcheva*** (`maia@ufl.edu`), Department of Mathematics, University of Florida, Gainesville, FL 32601. *A Network Immuno-epidemiological Model of HIV and Opioid Epidemics.* Preliminary report.

We introduce a network immuno-epidemiological model of HIV and opoid epidemics where the jointly affected class is structured by the within-host dynamics. We fit the within-host model to data, collected in monkeys. We compute the reproduction numbers of the HIV and opoid epidemics. We show that the disease-free equilibrium is locally stable if both reproduction numbers are below one, and unstable if at least one of the reproduction numbers is above one. The HIV-only equilibrium exists if the reproduction number of HIV is larger than one. The opioid-use only equilibrium exists if the reproduction number of opioid use is larger than one. The HIV-only equilibrium is locally asymptotically stable if the invasion number of the opioid epidemic is below one and unstable if the invasion number of opoioid epidemic is above one. The opoioid-only equilibrium is locally asymptotically stable if the invasion number of the HIV epidemic is below one and unstable if the invasion number of HIV epidemic is above one. Simulation suggest that larger networks lead to higher reproduction numbers. (Received September 05, 2020)