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**Brittni Hall\*** (bkh0018@auburn.edu), **Xiaoying Han**, **Hans-Werner Van Wyk** and **Peter E Kloeden**. *A nonautonomous chemostat model for the growth of gut microbiome with varying nutrient*. Preliminary report.

A mathematical model describing the growth of gut microbiome inside and on the wall of the gut is developed based on the chemostat model with wall growth. Both the concentration and flow rate of the nutrient input are time-dependent, which results in a system of non-autonomous differential equations. First the stability of each meaningful equilibrium is studied for the autonomous counterpart. Then the existence of pullback attractors and its detailed structures for the nonautonomous system are investigated using theory and techniques of nonautonomous dynamical systems. In particular, sufficient conditions under which the microbiome vanishes or persists are constructed. Numerical simulations are provided to illustrate the theoretical results. (Received September 21, 2021)