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**James F Selgrade\*** (selgrade@math.ncsu.edu), Box 8205, North Carolina State University, Raleigh, NC 27695-8205, **Leona A Harris**, The College of New Jersey, Ewing, NJ 08628, and **Drew Pasteur**, The College of Wooster, Wooster, OH 44691. *A Model for Hormonal Control of the Menstrual Cycle: Structural Integrity but Sensitivity with Regard to Data.*

A 13-dimensional system of delayed, ordinary differential equations which predicts serum concentrations of five hormones important for regulation and maintenance of the menstrual cycle of adult women is presented. Parameters for the system are fit to two different data sets for normally cycling women. These two best fit parameter sets yield two models, which have somewhat different dynamical behavior – one model has two stable periodic solutions and the other has only one stable periodic solution. By analyzing the bifurcation diagram with respect to just one parameter, we display a hysteresis loop which explains model differences. Hence, both models have similar dynamical structures but different dynamical behavior due to sensitivity to parameters which manifests itself when slightly different data sets are used to estimate parameters. This observation indicates the importance of understanding broader model behavior beyond the specific simulations corresponding to one parameter set if a modeler wishes to make biological conclusions from model behavior. Implications for hormonal regulation of the menstrual cycle are discussed. (Received August 25, 2008)