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**Peter Olofsson** (polofsso@trinity.edu), Mathematics Department, Trinity University, One Trinity Place, San Antonio, TX 78212, and **Xin Ma\*** (xma@trinity.edu), Mathematics Department, Trinity University, One Trinity Place, San Antonio, TX 78212. *Estimating bacterial lag phase: a branching process approach.*

Before a population of bacteria (or other cells) starts growing exponentially, there may also be an initial phase, the lag phase, when the bacterium adjusts to a new environment. Accurate estimation of the lag phase is important in the field of predictive food microbiology. We propose a branching process model for the cell population and demonstrate how this approach leads to improved estimates of the lag phase. (Received September 05, 2010)