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Dysfunctions in the immune system, due to genetics, disease or environmental factors, can lead to bacterial colonization and chronic inflammation. In chronic obstructive pulmonary disease (COPD), respiratory infections can initiate chronic inflammation of the airway. We propose a system of nonlinear ordinary differential equations to describe interactions between macrophages, both inflammatory and anti-inflammatory cytokines, and bacteria. Small changes in parameters governing inflammatory cytokine production and macrophage sensitivity to these cytokines result in dramatically different model behaviors. When the immune system is functioning properly, a non-aggressive pathogen will not provide a sufficient trigger to initiate chronic inflammation, however, in disease positive feedback of the inflammatory cytokine can induce chronic inflammation even after a bacterial infection has been resolved. In addition, if the macrophage population is more sensitive to inflammatory cytokines small perturbations initiated by bacteria will also lead to chronic inflammation. We have found nonaggressive bacteria are able to initiate chronic inflammation and propose why anti-inflammatory cytokine therapy may not be effective in resolving this inflammation. (Received January 28, 2009)