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## The Stability of Predator-Prey Model With Disease Infection

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## Abstract

The stability of ecological and biological modeling has special important. In this paper a predator-prey model with disease infection in both populations is proposed. By using local analysis of various equilibria, we obtained several threshold parameters which determine the stability of the existing equilibria. We also considered disease infection in both populations, and so the model yields more complex dynamics. Finally, we analyzed the locally and globally stability.

**Keywords:** Ecological threshold parameter; Basic reproduction number; Stability. Mathematics Subject Classification [2010]: 92D40,92D30,93D05.

## 1 Introduction

Infectious diseases have been known to be an important regulating factor for human and animal population sizes. In particular, for predator-prey ecosystems, infectious diseases coupled with predator-prey interaction to produce a complex combined effect as regulators of predator and prey sizes. Most of these previous studies focussed mainly on parasite infection and in prey only, although some studies did consider infection of predator through eating prey [1, 2]. In this present work, we begin by describing a predator-prey system with infection, based on the work C.F. McQuaid and N.F. Britton. We briefly discuss the disease-free model and analysis of the full model will be given[5].

## 2 Main Results

We propose a general theoretical model for a trophically transmitted parasite, where the parasite requires both an intermediate (prey) host and a definitive (predator) host, and there is no intraspecies infection. The parasite is transmitted from prey to predator by consumption of infected prey species, and from predator to prey environmentally through routes such as faecal contamination. Infected individuals immediately become infectious, and remain so for life. Here, we describe a model where Y represents the population of the prey species, and P the predator. The presence of a pathogen leads to infected classes

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