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Global analysis of two tuberculosis models. (English) Zbl 1056.92052

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Summary: Two models for tuberculosis (TB) that include treatment of latent and infective individuals are considered. The first model assumes constant recruitment with a fixed fraction entering each class, having the consequences that TB never dies out and that the usual threshold condition does not apply. The unique endemic equilibrium is locally asymptotically stable for all parameter values and is shown to be globally asymptotically stable under certain parameter restrictions. The second model has a general recruitment function, but all recruitment is into the susceptible class.

Three threshold parameters determine the existence and local stability of equilibria. The disease-free equilibrium is globally asymptotically stable when the basic reproduction number is less than or equal to one. The endemic equilibrium, when it exists, is shown to be globally asymptotically stable under certain parameter restrictions. Global stability results for the endemic equilibria are proved using the geometric approach of *M. Y. Li* and *J. S. Muldowney* [*J. Differ. Equations* 124, 425-448 (1996; [Zbl 0847.34059](#))].

MSC:

[92D30](#) Epidemiology

[34D23](#) Global stability of solutions to ordinary differential equations

[34C60](#) Qualitative investigation and simulation of ordinary differential equation models

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Keywords:

Epidemic model; tuberculosis; global stability; compound matrices

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