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A mathematical model of methotrexate's effect on adalimumab immunogenicity in axial spondyloarthritis

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Spondyloarthritis (SpA) is a chronic inflammatory disease impacting the spine and joints. Tumor necrosis factor inhibitors (TNFi), like adalimumab, are used to treat severe cases, but up to 25% of patients stop due to reduced effectiveness, often from anti-drug antibodies (ADA) forming [1]. Methotrexate (MTX), while ineffective alone in axial SpA, has shown potential in reducing the formation of ADA to TNFi [2, 3].

The objective of the study is to develop a mathematical model that describes the impact of MTX in reducing the immunogenicity of adalimumab in SpA. Based on mathematical models already established in the literature, an Ordinary Differential Equations (ODEs) model was formulated to describe the dynamics of the therapeutic compounds in the study (adalimumab and MTX, if applicable), the immune cells (T cells and B cells), and the relevant cytokines for the disease.

The data used to calibrate the model are sourced from a patient study [4], which involved 110 patients, from whom adalimumab concentration, lymphocyte counts, and antibody titers have been collected along five visits during the course of treatment.

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References

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