Modelling and simulation of tuberculosis lesions dynamics in a minipig bronchial tree

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Abstract
The purpose of this research is to progress in the understanding of the latent tuberculosis infection in an experimental animal model. The bubble model, which described lesions’ dynamics in infected mice, has been adapted to minipigs, taking into account its bronchial tree for the spreading of lesions and using the data provided by UTE [1] to calibrate it.

Tuberculosis
TB is a contagious disease that on 2013 killed nearly 1.5 million people [2]. Infected people: lesions controlled, asymptomatic, not infectious. Sick people: lesions not controlled, symptoms, infectious. Tuberculosis dynamic hypothesis: lesions spread through the bronchial tree. In upper lobe lesions growth favored [3].

Experimental data
24 minipigs were infected with Mycobacterium tuberculosis, after 12 weeks they were euthanized. Some of them received anti-TB treatment. After the euthanasia their lungs were analyzed with X-ray computed tomography (X-ray CT) in order to determine size, position and density of tuberculosis lesions.

Conclusions
Minipigs latent infection was properly modelled and understood. Bronchial tree structure is crucial to understand endogenous reinfection process and thus maintain latent infection. Unlike mice, coalescence is not relevant. Lesions growth is mainly caused by inflammatory and immune responses.

References: