

Performance of a Miniaturized Hydrocyclone for the Isolation of *Schistosoma Mansoni* Eggs

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Abstract

Schistosoma mansoni parasites affect million people worldwide. When inhabiting the blood vessels of the host, they lay eggs, with format ovular and dimensions ranging from 114 μm to 180 μm long and 45 μm to 70 μm wide (averaging around 140 μm \times 60 μm), that can be retained in the body, causing intestinal schistosomiasis, or remain as traces in the stool and even in the urine. The intensity of the infection can be evaluated by the number of eggs present in the stool of an infected individual. In fact, there are several methods of diagnosis, but most of them are restricted due to the financial and infrastructural difficulties of developing countries, where the disease is most frequently encountered. Thus, the application of the traditional methods has been regarded as impractical in these areas and there is a continuous search for new techniques, viable of the economic and technical points of view, to overcome this problem. In face of this scenario, a new method of diagnosis was explored in this study. Particularly, a portable miniaturized hydrocyclone (presented in Figure 1) was proposed for the isolation of *Schistosoma mansoni* eggs from human stool, which can be further analyzed by low cost image processing techniques. This device allows testing without the use of chemicals, high end equipment or significant training, which may be scarce in the areas affected by the endemic. COMSOL Multiphysics® software was applied for the simulation of the two phase (eggs and carrier solution) flow inside the hydrocyclone, through CFD Module. The mixture model was used for the solution of the mixture velocity, pressure and the volume fractions. In particular, different three-dimensional geometries were studied and their effect on the separation performance was assessed. Figure 2 presents a preliminary result obtained with the simulations. The numerical model was able to predict the technical viability of the proposed method of diagnosis in terms of collection efficiency.

Reference

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Figures used in the abstract

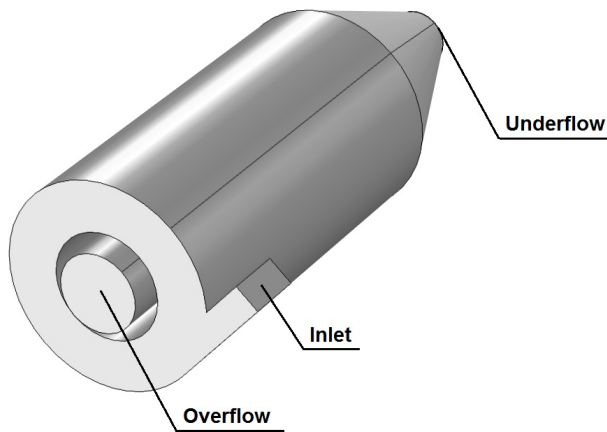


Figure 1: Overview of the hydrocyclone three dimensional geometry and the boundary conditions.

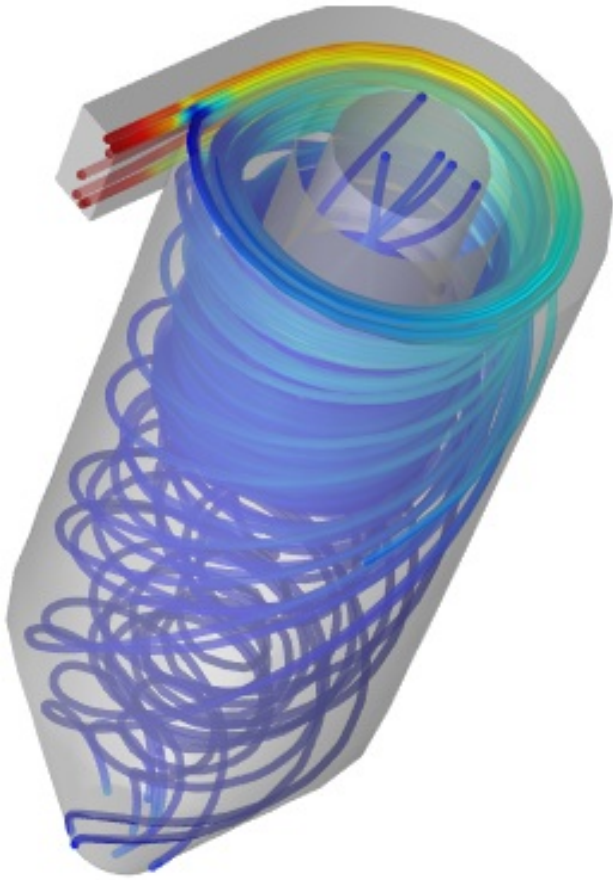


Figure 2: Preliminary result: streamlines colored by velocity magnitude.