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ON A MULTIPHASIC CONTINUUM MECHANICAL MULTISCALE MODEL FOR LIVER PERFUSION AND METABOLISM

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In this talk we present a continuum mechanical model for the description of the metabolism in the hepatocytes that strongly depends on the perfusion of the micro vessels within the liver lobules. The micro vessels, so called sinusoids, guide the blood along columns of hepatocytes from the corners of the lobules to the central vein. While the blood passes hepatocytes nutrients, drugs and toxins are taken up by the hepatocytes. In order to implement the biochemical reactions into our finite element simulation a system of ordinary differential equations is imbeded calculating reaction rates of the presumed substances. Input for the ODE-system from the overlying scale is the information about the external variables that are carried in the blood whereas internal variables are stored stationary in the hepatocytes. The perfusion of the lobules is modeled by a homogenized multiphasic approach based on the theory of porous media [2] taking anisotropic perfusion and remodeling strategies into account [1].
After a short motivation and introduction the basic equations for the continuum mechanical description for the perfused lobule will be given, followed by the results of finite element simulations using parameters from clinical studies. A summary of the ongoing work and outlook will finish the talk.

REFERENCES

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