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In-silico comparison between in-vitro experiments and in-vivo application of cardiac radiofrequency ablation

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Radiofrequency ablation (RFA) is a minimally invasive treatment for cardiac arrhythmia.
Experimental studies play a central role in the investigation of RFA treatment effects. Typically, in-vitro and in-vivo experiments are conducted on animal cardiac tissue. In-vitro experiments consider the cardiac tissue outside the organism, while during in-vivo experiments the tissue remains in its natural state. The difference in the experimental setup leads to a discrepancy in the predicted lesion. Our aim is to assess this discrepancy between the two experimental approaches using in-silico models.

A validated computational model for an in-vitro experimental setup is presented in. Building on this model, we derive the mathematical description of the in-vivo experimental setup by adjusting the governing equations to reflect the impact of blood perfusion on the bioheat equation.
A comparison between the experiment types is established by simulating a standard power of 30 W ablation protocol for 30 s. We observed that the volume of the created lesion and the maximum temperature in the cardiac tissue differ significantly according to the simulated experiment type.

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