

# Reaction-diffusion model for Orai1-STIM1 interaction during CRAC channel formation

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Ca<sup>2+</sup>-release activated Ca<sup>2+</sup> (CRAC) channels are the major pathway of store-operated Ca<sup>2+</sup> entry to activate immune cells. Upon Ca<sup>2+</sup> -release from the ER stromal interaction molecules (STIM) in the ER membrane and Orai proteins in the PM interact and form CRAC channels, whose Ca<sup>2+</sup> -conductance can be modulated by extracellular reactive oxygen species (ROS). We formulate a reaction-diffusion model to quantify the STIM-Orai interaction during CRAC channel formation and analyze different Orai1 channel stoichiometries and different ratios of STIM1 and Orai1 in comparison with experimental data. We incorporate the inhibition of Orai channels by ROS into our model and calculate its contribution to the CRAC channel amplitude.