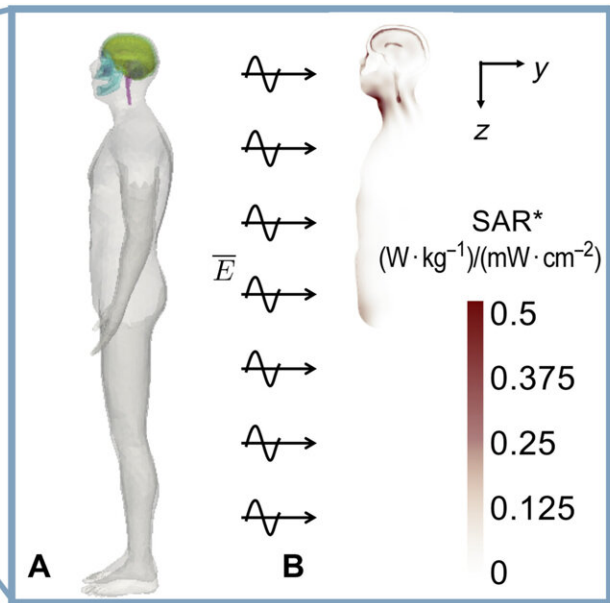


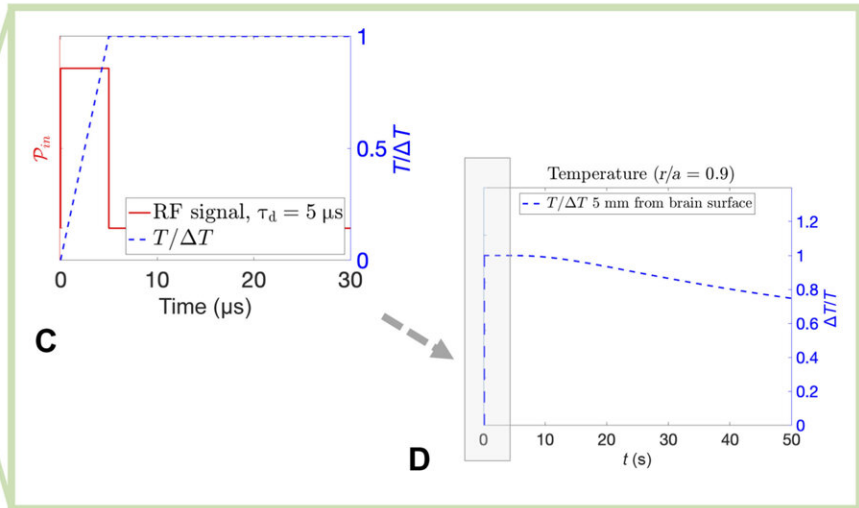
Exposure to high-powered microwave frequencies may cause brain injuries

April 25 2022, by Laura Simmons

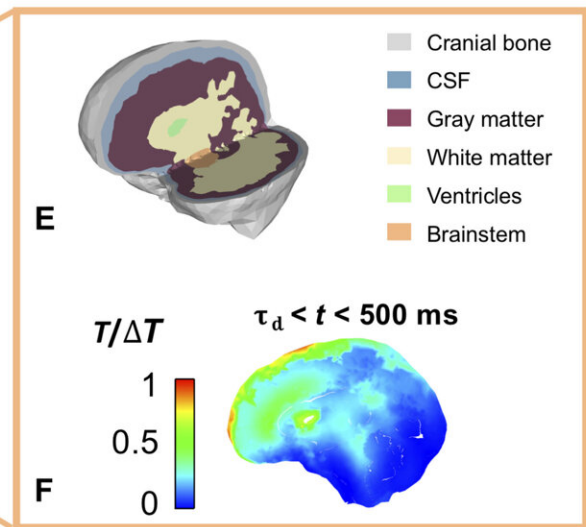
1 FDTD simulation (EM field)
Input: Full-body geometry, carrier frequency, field direction and polarization
Output: SAR* (normalized specific absorption rate)



2 Calculate temperatures from single pulse
Input: SAR*, c_p , τ_d , P_{in}
Output: $\Delta T(t)$



3 FEM simulation (thermoelastic expansion)
Input: $\Delta T(t)$, head geometry
Output: Pressure, strain, etc.



Flow chart of the computational approach. First, a simulation of full-body irradiation with microwaves (A and B) is used to find the normalized SAR (SAR*) within tissues. The SAR* values are used to compute temperature changes (C) and registered as initial conditions to a 3D FEM. At the end of the pulse duration (e.g., $\tau_d = 5 \mu\text{s}$), the temperatures are maintained constant in the FEM simulations because of the slow time scales of thermal conduction, as shown by the idealized approximation of cooling at the surface from a single pulse in (D). The FEM (E) is prescribed as temperature initial conditions for computation of the early time (

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