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Atmospheric pressure dielectric barrier discharges interacting with liquid covered tissue[1] WEI TIAN, MARK J. KUSHNER, University of Michigan — Tissue treated by atmospheric pressure dielectric barrier discharges in plasma medicine are often covered by a thin layer of liquid, water with dissolved gases and proteins. The liquid processes the plasma produced radicals and ions prior to their reaching the tissue. We report on a computational investigation of the interaction of DBDs with a thin liquid layer covering tissue. The simulations were performed with *nonPDPSIM*, a 2-D plasma hydrodynamics and radiation transport model. The liquid is treated identically to the gas as a partially ionized substance but with a higher density. Liquid evaporates into the gas with a source given by its saturated vapor pressure. Transport of gas phase species into the liquid is determined by Henry's Law considerations. The tissue is treated as a dielectric and the species fluxes onto the tissue are recorded. The liquid layer, typically hundreds of microns thick, is water containing dissolved O_2 and alkane-like hydrocarbons (RH). In the model, the DBDs are operated with multiple pulses at 100 Hz followed by a 1 s afterglow. Gas phase reactive oxygen and nitrogen species (RONS) intersect the water vapor saturated air above the liquid and then solvate when reaching the liquid. The photolysis of water by plasma produced UV/VUV plays a significant role in the radical production. Without RH, O_2^- and hydronium (H_3O^+) dominate the water ions with H_3O^+ determining the pH. The dominant RONS in the liquid are O_3, H_2O_2, and HNO_x. With RH, ROS are largely consumed, leaving R•(alkane radical) to reach the tissue.

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