Patient Specific 3D Tissue Mimicking Gels

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According to The National Center for Biotechnology Information (NCBI), patient specific modeling (PSM) is gaining attention from research groups because of its improvements in medical diagnosis and that it can predict what therapies and surgical procedures are needed for individual patients. Patient specific modeling takes a patient's CT or MRI data and develops it into a computational patient specific model. One important aspect of designing medical devices that utilize microwave and electromagnetic fields is the *in vitro* testing stage where a gel that mimic the human tissues is used. Currently, generic tissue mimicking gels have been used for testing medical devices and not PSM gels.

In this study, we apply PSM for fabricating organ gels for medical microwave device testing. We first export the CT/MRI images (.STL) filed to a 3D printer and print patient specific organ molds. Instead of printing out the entire organ, the inside of the model is hollowed out by computational modeling meaning that just the surface of the patient specific organ can be selected to be printed out. Then the hollowed part of the model is filled with tissue mimicking gels through a hole on the outside that is physically drilled on the patient specific 3D printed model. To compare the PSM and generic model we have fabricated a kidney model. We have performed measurements related to hyperthermia treatment as an example and evaluated the heating patterns within the kidney at different depths. We have found that there are significant differences between the PSM and generic modeling. We anticipate that these differences are even greater for other organs such as breast, brain, and liver.