**Biocompatible Materials for Implantable Antennas**

Layne A. Johnson and Erdem Topsakal
Department of Electrical and Computer Engineering
Mississippi State University, Mississippi State, MS, USA

Implantable wireless telemetry systems have been studied for various applications such as wireless monitoring of physiological parameters (glucose, blood pressure, temperature, etc.), ingestible pills and electronics, and pacemakers. Because the implantable antennas provide communication between the implant and the external environment, their efficient design is vital for overall system reliability. Initially, implantable antenna designs were limited to *in silico* and *in vitro* studies, but over the past few years, several *in vivo* studies have appeared in the literature. These studies suggest that *in vitro* verification of these antennas does not guarantee their proper functioning when implanted in the body. This is mainly because the electrical properties of the live tissues depend on temperature, age, and tissue chemistry. Therefore, *in vivo* testing is vital to ensure the proper functioning of the implants. Long-term *in vivo* studies require the implants to be encased in biocompatible materials.

In this study, we investigate several different biocompatible materials for long-term implantation. We have investigated several biomedical-grade based elastomers. These elastomers are good candidates for medical implants because they are very easy to prepare, and they have the desired viscosity for antenna encasing. The material comes with a curing agent that needs to be mixed with a 10:1 ratio. In order to reduce the air bubbles in the mixture, we used a vacuum mixer. After the mixture was successfully developed, we poured the mixture onto the antennas and cured them for 2 h at 55 $^{\circ}$C. Three different antennas were designed and tested on pigs. We have performed a two-week implant study for each antenna. At the end of the two weeks, we performed histopathology studies to investigate the long-term usability of each elastomer.