

## What's New in MR Safety: Active Implants, Device Labeling, and Identification

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Electronically-activated or “active” implants are generally contraindicated for patients due to a variety of possible risks including those related to magnetic field interactions, excessive heating, induced currents, and electromagnetic interference (1). Comprehensive MRI testing is required to define parameters for a given active implant that would permit patient to undergo MRI examinations by following highly specific conditions. Performing proper MRI testing is often challenging and complicated. For example, factors that may impact MRI-related heating for an active implant include, the following:

- The specific type of active implant that is in the patient
- Field strength and RF wavelength of the MR system
- Type of transmit RF coil used (i.e., transmit head vs transmit body RF coil)
- The amount of RF energy delivered, RF power level
- The specific absorption rate (SAR)
- The technique used to calculate or estimate SAR used by the MR system
- The patient's anatomy undergoing MRI
- The landmark position or body part undergoing MRI relative to the transmit RF coil
- The orientation and configuration of the implantable pulse generator and the lead relative to the source of RF energy

As result of comprehensive testing that defined acceptable conditions and/or redesigning the active implant to address the possible hazards, there are now several devices with approved MR conditional labeling (2) including cochlear implants, implantable infusion pumps, neurostimulation systems, and cardiac devices (1, 3, 4). Notably, for each active device, highly specific guidelines must be followed to ensure patient safety (1, 3, 4).

### References

- (1) Shellock FG. Reference Manual for Magnetic Resonance Safety, Implants, and Devices: 2013 Edition. Los Angeles, CA; Biomedical Research Publishing Group; 2013.
- (2) Shellock FG, Woods TO, Crues JV. MRI Labeling Information for Implants and Devices: Explanation of Terminology. Radiology 253:26-30, 2009.
- (3) Shellock FG. MRI Safety and Neuromodulation Systems. In: NEUROMODULATION. Krames, Elliot S., Peckham, P. Hunter & Rezai, Ali R., Editors. Academic Press/Elsevier, New York, 2009.
- (4) <http://www.mrisafety.com>