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## **MRI compatible FUS robotic device for treatment of canine and feline mammary tumors**

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Veterinary medicine has expanded its applications beyond traditional approaches, increasingly incorporating the Focused Ultrasound (FUS) technology in veterinary oncology. A robotic device comprising a positioning mechanism for navigating a single element spherically focused transducer of 1-3 MHz in four PC-controlled axes has been developed for veterinary FUS applications. Motion is established using piezoelectric motors and monitored by dual optical encoder setups. Sufficient accuracy and repeatability of motion were demonstrated through benchtop and Magnetic Resonance Imaging (MRI) techniques, with an estimated mean positioning error smaller than 0.1 mm. The system was proven safe for operation inside conventional MRI scanners with minimal effect on the overall image quality. Efficient performance of the system was initially validated through extensive ex-vivo studies in tissue-mimicking phantoms and excised tissue. The prototype was then evaluated for its ability to precisely ablate naturally occurring mammary tumours in dogs and cats (n=5). Histological examination with H and E staining demonstrated well-defined areas of coagulative necrosis in the exposed tumours with no damage to healthy intervening tissues. No adverse events compromising animal welfare were recorded. Overall, FUS ablation of pet mammary cancer under proper monitoring was proven safe and feasible. Application of this technology in veterinary medicine would help advance knowledge on human sarcomas, optimize therapeutic protocols and more rapidly translate research into clinical practice.

### **Recent Publications**

1. Antoniou A, Evripidou N, Giannakou M, Constantinides G, Damianou C (2021) Acoustical properties of 3D printed thermoplastics. *J Acoust Soc Am* 149(4): e2854
2. Antoniou A, Drakos T, Giannakou M, Evripidou N, Georgiou L, Christodoulou T, Panayiotou N, Ioannides C, Zamboglou N, Damianou C (2021) Simple methods to test the accuracy of MRgFUS robotic systems. *Int J Med Robotics Comput Assist Surg* 17(4): e2287
3. Antoniou A, Giannakou M, Evripidou N, Evripidou G, Spanoudes K, Menikou G, Damianou C (2021) Robotic system for magnetic resonance guided focused ultrasound ablation of abdominal cancer. *Int J Med Robotics Comput Assist Surg* 8: e2299

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