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The Development of Biodegradable Antibiotic-Capsules for a Long-term Drug Release Using Compression Sintering and Ultrasonic Welding Techniques

S.-J. Liu (a), Y.-E. Tsai (a), S.W.-N. Ueng (b), E.-C. Chan (c)

(a) Department of Mechanical Engineering, Chang Gung University, Taiwan

(b) Department of Orthopedic Surgery, Chang Gung Memorial Hospital, Taiwan

(c) School of Medical Technology, Chang Gung University, Taiwan

This report was to develop a novel solvent-free method for the manufacture of biodegradable capsules for a long-term drug delivery. To manufacture an antibiotic capsule, polylactide-polyglycolide copolymers were pre-mixed with vancomycin. The mixture was then injection compression molded to form a cylinder with a cover of 8mm in diameter. After the addition of gentamicin sulfate into the core, an ultrasonic welder was used to seal the capsule. An elution method and an HPLC assay were employed to characterize the in-vitro release rates of the antibiotics over a 30-day period. It was found that biodegradable capsules released high concentration of vancomycin and gentamicin (well above the minimum inhibition concentration) in vitro for the period of time needed to treat bone infection; i.e., 2 to 4 weeks. A bacterial inhibition test was carried out to determine the relative activity of the released antibiotics. The diameter of the sample inhibition zone ranged from 3 mm to 18 mm, which is equivalent to 16.7% to 100% of relative activity. By adopting this novel technique, we will be able to manufacture biodegradable capsules of various medicines for long-term drug delivery.