ABSTRACT

THE EFFECT OF GLUTARALDEHYDE ON THE DEGRADABILITY OF BOVINE HYDROXYAPATITE GELATIN GENTAMICIN PELLETS

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In this research, a human bone implant in the form of a pellet was developed. The pellets were used as bone fillers to replace and repair the damaged, lost bone and to cure an infection, and were capable of carrying active ingredients such as medicine and hormones. Pellets were made from biodegradable and bioabsorbable materials that can be degraded and absorbed in the body so there is no need for recovery after surgery. The purpose of this research was to determine the effect of the addition of glutaraldehyde as a cross-link agent with several concentration variations in the composition of the formula which was Bovine Hydroxyapatite (BHA)-gelatin-gentamicin-glutaraldehyde.

The formulation composition of the pellet preparation used was bovine hydroxyapatite (BHA)-gelatin with a ratio of (80:10), 10% gentamicin and added by glutaraldehyde as a crosslink agent.

The method of this research used the tests on the pellets, which were the compressive strength test and degradation test. The compressive strength testing method was performed using an autograph tool in which the pellets were pressed with a load cell compress machine speed of 5 mm/minute, until the pellets begin ken, then the numbers printed on the tool were recorded. The results obtained were in the form of the force (F) needed to press the sample until cracks occur in the sample which was read on the tool screen in units of MPa, divided by the surface area (mm^2) read on the tool screen. Before the pellets were pressed, they were measured for its diameter (mm) and its length (mm) using a screw micrometer.

The next testing method was performing the degradation test to observe the loss of pellet weight by soaking the pellets in a 2ml solution of PBS pH 7.4. The afterwards was inserting the marked venoject into the incubator at 37^0C and keep the PBS at a pH of 7.4. Then, observation was performed at 1, 2, 3, 4, 5, 6, 12, 24 and 1, 3, 7 hours. The next was collecting the pellets in venoject from each formula in an incubator and drying its surface using filter paper to clean the residue fluids until no PBS fluid absorbed anymore. After the pellet preparation was dry, its weigh (m) was measured, then the pellets were dried in an oven with a temperature of 50 ° C to a constant weight and weighing it and recording its weight (md). Furthermore, the average percentage of lost weight (W_{lost}) and the percentage of swelling were calculated.

In this research it can be concluded that, the optimal compressive strength test and degradation test was the formula 8 pellet (2ml BHA-gelatin- gentamicin-glutaraldehyde 2%), which had a compressive strength of 8.14 ± 1.28 MPa so that the pellets can be used as a substitute for cancellous bone 2-12 MPa and the degradation test on the 7th day had a weight loss value of 18.88 ± 2.15% and the percentage of swelling was 28.33 ± 0,91% the smallest among the other thirteen formula groups. Therefore the smaller the percentage of weight lost and the percentage of swelling, the better the integrity of the pellet structure as a bone filler.

Keywords : Glutaraldehyde, Bovine hydroxyapatite, Gelatin, Gentamicin, Degradation, Crosslink agent, Pellets, Compressive strength, osteomyelitis