ABSTRACT

Background Biomaterial and Regenerative Medicine Laboratory Dr. Sardjito, Yogyakarta has successfully developed the HA fabrication process from eggshell waste. In its development, the use of hydroxyapatite (HA) as a substitute material to fill bone defects has given good results and assisted in the bone healing process. The studies carried out in this research included a preliminary test to see the presence of allergic reactions caused by hydroxyapatite using acute and subchronic dermal toxicity tests on white rats (Rattus novergicus Berkenhout, 1769) Wistar strain. Toxicity test is a one of non-clinical biomaterial evaluation to get safety for further clinical research and in vivo test in animal is to prevent exposure of dangerous to safety human evaluation. Toxicity and allergic reactions or hypersensitivity to HA biomaterials have not been much studied. Test of toxicity or allergy is a supplement safety data on the use of self-produced HA as raw material for implants. Acute Dermal Toxicity test in animal is to evaluate toxicity material effect in short time with Dermal pathway. While, subchronic dermal test is to follow up evaluation from acute dermal.
Objective To determine the potential for toxic or allergic reactions caused by exposure to hydroxyapatite material produced from chicken egg shells in white rats (Rattus novergicus Berkenhout, 1769) Wistar strain.
Method Data were obtained from a preliminary test involving 5 female rats which were exposed to 1000 mg/kg BW of hydroxyapatite dissolved in distilled water in the upper dorsal area for 14 days to then evaluate their toxicity (the presence of dermatitis lesions and routine hematology). Furthermore, a subchronic toxicity test was carried out for 28 days involving 4 test groups consisting of 5 rats each exposed to HA with various concentrations (0, 25, 50, and 100 mg/kg BW) to be evaluated by observing the presence or absence of lesions. dermatitis on the skin, routine hematological examination, blood chemistry (ALT, Bilirubin, Urea, Creatinine), and histopathological examination of organs (skin, liver, kidney, and spleen).
Results Acute dermal toxicity test for 14 days on Wistar female white rats divided into 3 dose groups (25 mg/kg BW; 50 mg/kg BW; 100 mg/kg BW) of hydroxyapatite chicken egg shells with 3 rats each compared to 3 rats mouse control group. Weight profile evaluation per weeks showed no significant value between groups, for initial weight (p=0,221), week 1 (p=0,448), and week 2 (p=0,397). Morphological and histopathological examination scores showed no significant difference between the control and treatment groups on the skin (p=1,000), liver (p=0,876), kidney (p=0,799), and spleen (p=1,000). Likewise, with the subchronic toxicity test for 28 days in male and female rats which were divided into control groups and treated with 3 doses of hydroxyapatite (25 mg/kgBW; 50 mg/kgBW; 100 mg/kgBW) there was no significant difference between the skin (p=1.000), liver (p=0.888), and kidney (p=0.876). For the daily weight profile evaluation showed no significant value between groups, for initial weight (p=0,836), day 7 (p=0,970), day 14 (p=0,999), day 21 (p=0,958), and day 28 (p=0,849). Routine hematological examination (RBC, HB, HCT, MCV, MCH, MCHC, PLT, WBC, lymphocyte, eosinophil) and the blood chemistry (ALT, Bilirubin, Urea) showed no significant differences between control and test group, in the other hand, creatinine has significant differences (p=0,001).
Conclusion Hydroxyapatite from egg shells has no potential for dermal toxicity through acute dermal toxicity tests on female Wistar white rats and subchronic on male and female Wistar white rats.