The effect of obesity on the bone morphometry and histomorphometry in male and female Wistar rats

D. Wolski¹, A. Wawrzyniak¹, M. Bieńko², J. Michalik³, R.P. Radzki², M.B. Arciszewski¹

¹Department of Animal Anatomy and Histology, Faculty of Veterinary Medicine, University of Life Sciences in Lublin, Poland
²Department of Animal Physiology, Faculty of Veterinary Medicine, University of Life Sciences in Lublin, Poland
³Department of Oncology and Environmental Health, Faculty of Nursing and Health Sciences, Medical University of Lublin, Poland

Abstract

The study was undertaken to determine the effect of continuation or changes of the diet on the morphometry and histomorphometry of bone in male and female Wistar rats with experimentally induced obesity by high energetic diet. Sixty-four 90-day-old Wistar rats obtained from obese parents (16 male, 16 female) and control parents (16 male, 16 female) were used in this study. After 21 days of the baby period, rats were divided into four groups: obese rats fed with high energy feed (F/F), control rats fed with a standard diet (C/C), obese rats with changed diet from high energy diet to control diet (F/C) and control rats with changed diet from control diet to high energy diet (C/F). After 90 days of experimental feeding, the rats were sacrificed. Thereafter, body weight and the isolated humerus were measured and next, the histological stainings and counts were done. Our results revealed that change in the parent’s diet from F to C in the female leads to increased bone growth length and reduction of body weight in female and male. Reverse diet changes (from C to F) lead to decreased bone length only in the female. Moreover, the continuation by offspring of both sexes with a high-energy diet contributes to a reduction in osteocytes, reduction in bone marrow cavity and cortical expansion, but a change in nutrition from parents’ standard diet to high-energy diet leads to increase in osteocytes dimensions. The continuation of feeding with F diet promotes the accumulation of adipocytes in the bone marrow in female and male, and correction of nutrition from F to standard diet leads to a reduction in their number in the bone marrow compared to groups continuing feeding with high-energy diet.

Key words: bone tissue, histomorphometry, humerus, obesity, osteocytes, adipocytes, rats

Correspondence to: D. Wolski: e-mail: darek.wolski@o2.pl