

DNA DAMAGE AND REPAIR DURING THE ESTROUS CYCLE OF THE RAT.

Ida van Zyl, Antoinette Fick¹ and Piet Pretorius

Division of Biochemistry, School for Chemistry and Biochemistry, ¹Animal Housing facility, North-West University, Potchefstroom Campus, Potchefstroom, 2520

A search of Medline's Database for the last 20 years of studies in which rats were employed as research subjects shows that males were used over females by a ratio of approximately 3:1. That proportion becomes 4:1 or higher when search terms become more specific, for example by including "memory" or some drug of abuse as keywords. This preference is acknowledged to be in part because of concerns over how physiological and behavioural variations across the estrous cycle can influence results (Parker et al, 2001:399). Female subjects are more prone to rhythmic variation because of specific hormonal cycles and are susceptible to genetic damage during ovulatory and estrogenic stages of the menstrual cycle (D'Souza et al, 1988). Examples of previous studies showed variation in results where the estrous cycle was involved: 1) The effect of exercise on mitochondria respiration does vary according to the hormonal status (Gigli & Bussmann, 2001:1505), 2) Physiologic changes in serum estradiol during the menstrual cycle are associated with changes in IL-6 and PTH levels (Chiu et al, 2000), to name only a few. This study is aimed to determine the degree of DNA damage during each of the different phases of the estrous (rat) and menstrual (human) cycle. The Comet Assay (single cell gell electrophoresis) is a quick and effective method to determine DNA damage. The results show definite changes in the degree DNA damage, measured as single and double strand breaks, during the female hormonal cycle. These observations emphasize the necessity to take into account this hormonal rhythm when using female subjects to study, for instance, the role of antioxidants in DNA damage and repair events.

Parker, G.C., McKee, M.E., Bishop, C., Coscina, D.V. 2001. Whole-body metabolism varies across the estrous cycle in Sprague-Dawley rats. *Physiology & Behaviour*. 74, 399-403.

Gigli, I., Bussmann, L.E. 2001. Exercise and ovarian steroid hormones, their effect on mitochondrial respiration. *Life Sciences* 68, 1505-1514.

D'Souza, D., Thomas, I.M., Das, B.C. 1988. Variation in spontaneous chromosomal damage as a function of biological rhythms in woman. *Human Genetics*, 79, 83-85.

Chiu, K.M., Arnaud, C.D., Ju, J., Mayes, D., Baccetti, P., Weitz, S., Keller, E.T. 2000. Correlation of estradiol, parathyroid hormone, interleukin-6 and soluble interleukin-6 receptor during the normal menstrual cycle. *Bone*, 26 79-85.