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Effets métaboliques et endocriniens de la privation hydrique et/ou alimentaire chez le rat

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Résumé

Nous visons à étudier, chez le rat, l'effet d'une privation hydrique, d'une privation alimentaire et de leur combinaison pendant trois jours, sur l'activité du cortex surrénalien, de l'axe hypophyso-thyroïdien et du système vasopressinergique. Les taux de la corticostérone plasmatique ont été déterminés par méthode fluorimétrique. Les taux de la thyroxine libre (FT4) et de la thyréostimuline (TSH) ont été mesurés par immunodosage chimiluminescent et les taux de la vasopressine (AVP) ont été déterminés par un dosage radio-immunologique. La corticostéronémie a significativement augmenté au sein des trois groupes traités. Une insuffisance thyroïdienne reflétée par une baisse du taux de la FT4 sérique a été notée après une déshydratation, une dénutrition et leur association. Paradoxalement, une baisse significative du taux de la TSH sérique a été observée chez les rats dénutris et les rats déshydratés et dénutris, alors qu'une légère baisse non significative a été montrée chez les rats déshydratés. Une augmentation du taux de l'AVP plasmatique a été observée après une privation hydrique et après une privation hydrique et alimentaire simultanée, alors qu'aucune modification n'a été observée au cours d'une privation alimentaire. Cette étude montre qu'une privation hydrique ou alimentaire ou les deux conjointement activent le cortex surrénalien et sont considérées comme un état de stress. Par ailleurs, nos résultats révèlent que le stress nutritionnel perturbe l'activité de l'axe hypophyso-thyroïdien par des mécanismes différents de ceux du stress hydrique. Par ailleurs, il semble que la privation alimentaire freine partiellement la stimulation du système vasopressinergique produite par la privation hydrique. ***Pour citer cet article : A.G. Kasdallah et al., C. R. Biologies 328 (2005).***

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Abstract

Metabolic and endocrine effects of water and/or food deprivation in rats. We aim at studying the effect of water deprivation, food deprivation and their combination for three days on adrenal cortex, pituitary-thyroid axis and vasopressinergic system activity in rats. Corticosterone level was determined by fluorimetric method. The levels of free thyroxine (FT4) and thyroid stimulating hormone (TSH) were determined by immunoenzymatic assay and vasopressin (AVP) level was determined by radio-immunoassay. In all three groups, basal levels of plasma corticosterone were increased. A thyroid dysfunction was shown after water deprivation, food deprivation and their combination reflected by a significant decrease in FT4 levels. Paradoxically, a significant decrease in TSH level was observed in food-deprived rats and in rats subjected to simultaneous food and water deprivation, while a slight and not significant decrease in TSH level was shown in water-deprived rats. A significant increase in plasma AVP level was observed after water deprivation and simultaneous water and food deprivation, while no change was found after food deprivation. The data indicated that water deprivation, food deprivation and their combination stimulated the adrenal cortex, thereby suggesting a stress state. On the other hand, it seems that nutritional stress modifies the pituitary-thyroid axis through mechanisms different from those of osmotic stress. Moreover, it seems that food deprivation partially prevented the stimulatory effect of water deprivation on vasopressinergic system. ***To cite this article: A.G. Kasdallah et al., C. R. Biologies 328 (2005).***

Mots-clés : Corticostérone ; Privation hydrique ; Privation alimentaire ; Thyroxine libre (FT4) ; Thyréostimuline (TSH) ; Vasopressine (AVP)

Keywords: Corticosterone; Water deprivation; Food deprivation; Free thyroxine (FT4); Thyroid-stimulating hormone (TSH); Vasopressin (AVP)

Abridged English version

The response pattern of the stressful stimuli, depends upon the type of stress. The aim of our study was to investigate and to compare the impact of acute dehydration, starvation and their combination for 3 days. The variation of certain blood variables such as hematocrit, plasma osmolality, natremia, proteinemia, and glycaemia was determined. Corticosterone level and the activity of pituitary-thyroid and vasopressinergic axis were evaluated.

Plasma corticosterone level was measured by fluorimetry. The levels of FT4 and TSH were determined by immunoenzymatic assay, while AVP levels were determined by radioimmunoassay. All results were expressed as means ± SE. Data were tested by analysis of variance (ANOVA) for comparison between control and treated groups.

Our results reveal an elevation in the plasma corticosterone level in response to a three-day water deprivation, food deprivation and their combination. This elevation was potentiated in combined water- and food-deprived rats.

A significant decrease in FT4 level was shown in all three groups contrasted with a significant decrease in TSH level in food-deprived and combined water- and food-deprived rats and a slight and not significant decrease in TSH level in water-deprived rats. This suggests that nutritional stress modifies pituitary-thyroid axis through mechanisms different from those of osmotic stress. Indeed, it seems that water deprivation has a direct impact on the thyroid level and results in a primary hypothyroidism, whereas food deprivation may act at the central level and cause a secondary hypothyroidism. However, for more precision, a dosage of TRH (Thyroid-Releasing Hormone) was required and may allow us to situate the level of action of nutritional stress.

Furthermore, a significant increase in plasma AVP concentration and a depletion of AVP from pituitary and hypothalamus in response to hyperosmolality, hypovolemia and hypernatremia were shown in water-deprived rats. In contrast, the activity of the vasopressinergic axis was not affected in food-deprived rats, despite a significant hypovolemia. However, in combined water- and food-deprived rats, we note a significant increase in plasma AVP level concomitant with unchanged osmolality, hypovolemia and hypernatremia. It should be noted that, food deprivation may inhibit the stimulatory effect of water deprivation on vasopressinergic axis by restoration of the pituitary AVP content and a moderate increase of plasma AVP level.