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Endocrine-disrupting chemical, methylparaben, in environmentally relevant exposure promotes hazardous effects on the hypothalamus-pituitary-thyroid axis

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ABSTRACT

Methylparaben (MP) belongs to the paraben class and is widely used as a preservative in personal care products, medicines, and some foods. MP acts as an endocrine disrupting chemical (EDC) on the hypothalamic-pituitary-thyroid (HPT) axis. However, the effects of MP have not yet been completely elucidated, as published results are scarce and controversial. The objective of this work was to evaluate the effects of subacute exposure to MP on the HPT axis of male rats. To achieve this, in this study the animals were divided into four experimental groups: control, MP3, MP30 and MP300 (3, 30 and 300 μg/kg/day, respectively). The rats were gavage for 14 days and sacrificed at the end of MP treatment. Our findings demonstrated that MP can promote important changes in thyroid morphology, including a decrease in follicular area, colloid area, epithelial area, and epithelial height, affecting the homeostasis of the HPT axis, and affecting the expression of genes related to hormonal biosynthesis. Furthermore, changes in interstitial collagen deposition were also demonstrated. Finally, we conclude that exposure to MP can be harmful to health, as it is involved in the dysregulation of the thyroid gland, affecting its morphophysiology, suggesting that even doses considered safe by current legislation can be dangerous and should be reconsidered.

1. Introduction

Parabens are alkyl esters whose main metabolite is para-hydroxybenzoic acid (PHBA). These compounds present structural differences in the alkyl group (substituent radical), being classified as benzylparaben (BeP), butylparaben (BuP), ethylparaben (EP), methylparaben (MP), and propylparaben (PP) which have been widely used in the cosmetics industries, pharmaceutical, and food products as preservatives due to their high stability to different pH and heat ranges, and because they have microbicidal potential (Soni and Carabin, 2005; Andersen, 2008; Haman et al., 2015).

Therefore, skin absorption is the primary way people are exposed,

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