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Effect of a mixture of pyrethroids at doses similar to human exposure through food in the Indian context

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Abstract

Residual amounts of pyrethroids were detected in rice and vegetables of the Indian market. Thus, consumers are exposed to a mixture of pyrethroids on a daily basis through food. Though a large number of studies reported the toxic effects of pyrethroids, there are no reports that used doses equivalent to human consumption. In this study, male Wistar rats were exposed daily to a mixture of pyrethroids for 1–15 months which is equivalent to the amount present in rice and vegetables consumed by an average Indian each day. The oxidant-antioxidant status (lipid peroxidation, nitric oxide; activities of catalase, glutathione peroxidase, glutathione S transferase, and superoxide dismutase) and anatomical changes in the general organs (liver, lung, and kidney) and male reproductive tract tissues (caput, cauda, testis, and prostate) were evaluated. Further, liver and kidney function tests, lipid profile, and complete blood picture were analyzed. Increased oxidative stress, perturbations in the antioxidant enzyme activities, and damage to the anatomical architecture were observed. Disturbances in the liver function and lipid profile were significant. Results of our study demonstrate that exposure to a mixture of pyrethroids at a dose that is equivalent to human consumption can cause systemic and reproductive toxicity, which may ultimately result in the development of lifestyle diseases. This first line of evidence will fuel further studies to determine the impact of food-based pyrethroid exposure on the long-term health of humans and to envisage policies to reduce pesticide content in food products.

KEYWORDS

blood picture, kidney function, lipid profile, liver function, male reproductive, oxidant-antioxidant status, pesticides, pyrethroids

1 | INTRODUCTION

Environmental factors play a key role in the well-being of an individual. Besides the lifestyle factors, the quality of air, food, and water that one consumes are crucial factors in maintaining good health and to avoid susceptibility to various diseases. Exposure to pesticides by humans in agricultural, domestic, and industrial settings has contributed to the onset of a number of health hazards, which

ultimately affect the general physiological functions. Food contamination by pesticides has been a matter of concern because of the percolation of these compounds into the food chain when used for agricultural purposes. The presence of residual levels of pesticides in agricultural products is reported globally.^[1,2] Among the pesticides used for agricultural purposes, synthetic pyrethroid-based ones are the preferred choice, because of their high specificity and low toxicity to vertebrates.^[3] Because of the presence of these pesticides in food