Effect of TCDD on the intestinal absorption, distribution and excretion of a single oral dose of retinol in the rat

Annika Hanberg, Christina Trossvik and Helen Håkansson
Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden

Introduction

The symptoms of TCDD toxicity and those of vitamin A deficiency show several similarities, particularly as regards effects on growth regulation, cellular differentiation and proliferation, maintenance of epithelial tissues, and reproduction. The similarities include both the time-course for effect to occur and the quality of effect. In addition, TCDD interferes with the vitamin A turnover in the rat, e.g. reduces hepatic vitamin A levels[1]. Most data suggest that TCDD interacts with the highly regulated but yet not fully understood process of vitamin A storage[2,3]. However, the effect of TCDD on the absorption of dietary vitamin A has not yet been sufficiently investigated.
The aim of the present investigation was to study the intestinal absorption of vitamin A into the lymph of control and TCDD-treated rats, as well as the distribution and excretion of the newly absorbed vitamin A dose.

Materials and Methods

Male Sprague-Dawley rats (about 260 g) were exposed to TCDD (10 μg/kg) in corn oil or the vehicle alone via gavage. Five days after exposure the intestinal lymph duct was cannulated under anaesthesia in 6 control and 9 TCDD-treated rats. The catheter was led out from the abdomen and into a tube, which was attached to the abdomen with surgical tape. The rats were thereby free to move around in the cage in contrast to previously reported methods where the rats were restrained during the lymph collection. After 24 hours recovery from surgery the rats were given a dose of ^{3}H-retinol in corn oil (0.05 nmol, 2.5 μCi/rat) via gavage. The lymph was collected every second hour for 12 hours, and after 24 hours. Urine and faeces were collected during 24 hours, when the rats were killed by blood withdrawal under anaesthesia. Blood, liver, lung, kidney, thymus, intestines and their contents were removed, weighed and stored at -70°C.
Six control and 6 TCDD-treated rats were similarly treated, except for the lymph duct cannulation, in order to study the distribution and excretion of the absorbed ^{3}H-retinol.
All tissues, as well as the urine, faeces and intestinal contents, were analyzed for radioactivity.

Results and Discussion

The non-operated rats gained weight during the study, while the operated rats lost weight. However, no differences in body weight gain/reduction were seen between controls and TCDD-treated rats. TCDD caused liver enlargement and thymic atrophy in both operated and non-operated rats.
The new method for collecting intestinal lymph worked satisfactorily. In addition, the rats were allowed to move around in the cages which reduced stress and the absorption process was probably more normal than if conventional methods for lymph collection had been used. The total amount of ^{3}H-retinol recovered in the intestinal lymph during 24 hours was significantly lower in the TCDD-treated rats than in the control rats. In addition, the uptake into the lymph was delayed in TCDD-treated rats. However, TCDD did not significantly increase the part of the dose not absorbed (^{3}H-retinol in faeces and intestinal contents).
In non-operated rats, TCDD caused a decrease of ^{3}H-retinol in the liver and increases of ^{3}H-retinol in the kidneys and the urine. These effects of TCDD-exposure on the distribution and excretion of retinol are in accordance with results reported by Håkansson and Ahlborg[1].

References

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