

CASE REPORT

Treatment with a dietary fat substitute decreased Arochlor 1254 contamination in an obese diabetic male

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Abstract

A case manifesting symptoms due to organochlorine toxicity was treated with the fat substitute olestra in his diet. Before treatment, the patient was obese, with severe type 2 diabetes mellitus and mixed hyperlipidemia, chloracne, frequent headaches, and numbness and paraesthesias of his trunk and lower limbs. Earlier attempts at weight loss had been unsuccessful due to worsening of his symptoms. After inclusion of olestra in his diet for 2 years, weight loss was successful without aggravation of his symptoms, and the patient reverted to normoglycemia and normolipidemia. Olestra may have assisted weight loss and amelioration of his diabetes by increasing fecal elimination of organochlorines, rather than by preventing the partitioning of these pollutants into tissues, where they have been reported to exert antimetabolic effects on substrate oxidation.

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1. Case report

Organochlorine pollutants are present in all organisms including humans. Various studies suggest organochlorines are teratogenic, carcinogenic, hepatotoxic and immunosuppressive. In high concentrations, organochlorines cause chloracne, endocrine disturbances and neuropathies. The lipophilic organochlorines are concentrated in body fats, so weight loss leads to mobilisation of the pollutants from adipose tissue [1]. Consequently, weight loss is complicated by exacerbated toxic effects of the pollutants such as decreased oxidative capacity of skeletal muscle [2]. It has been speculated that this effect of mobilisation could inhibit weight loss [3]. In mice after dosing with the organochlorine Arochlor 1254, high concentrations were found in the gall bladder, indicating enterohepatic recycling of the pollutant compound through bile [4].

Olestra is an example of dietary fat substitutes resistant to digestion by mammalian lipases. Hence dietary olestra

creates a lipophilic ‘sink’ in the intestinal lumen, effectively trapping organochlorines secreted in bile as part of the enterohepatic cycling of the pollutant. In patients, dietary olestra greatly increased the rate of fecal elimination of organochlorines [5]. We describe here a clinical experience with a patient (male, born in 1940) heavily contaminated with Arochlor 1254. A fat sample obtained in 1997 by adipose tissue biopsy showed 3200 mg/kg Arochlor 1254. Over approximately 2 years with olestra in his diet (approximately 16 g/day in crisps), the patient achieved a weight loss of 18 kg, and the concentration of Arochlor 1254 in his adipose tissue was dramatically decreased to 56 mg/kg measured in December 2003. Previous attempts at weight reduction were unsuccessful because of worsening of his symptoms, particularly chloracne and neuropathy. Olestra facilitated weight loss without aggravation of his symptoms, and, remarkably, his diabetes initially requiring daily injections of insulin completely disappeared over the course of his management. Presumably, alleviation of his diabetes is related principally to weight loss, but elimination of the pollutant might have assisted by normalising his oxidative metabolism. Hyperlipidemia was simultaneously normalised (Table 1).

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Table 1

Effects of olestra on obesity, plasma lipids, and diabetes

	Before olestra (before August 2001)	After olestra (after August 2003)
Body weight (kg)	101	83
BMI (kg/m ²)	33.0	27.1
Plasma cholesterol (mmol/L)	8.6	3.7
Plasma triglycerides (mmol/L)	11.8	1.4
Blood glucose (mmol/L)	17	5.3

While this patient represents a case of extreme pollution, the ubiquitous presence of organochlorines suggests that management of obesity in the general population could be facilitated by dietary fat substitutes resistant to digestion, so that weight loss is not accompanied by mobilisation of pollutants into tissues causing defects in substrate oxidation. Sequestration of pollutants into the feces could similarly occur in patients treated with a lipase inhibitor, such as orlistat. This case study suggests possible dietary means to reduce the body burden and associated toxicity of persistent organic pollutants, especially during states of obesity.

Acknowledgment

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