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## LETTER

## Two cases of birth defects overlapping Stratton-Parker syndrome after multiple pesticide exposure

In January 2009, a farming couple contacted us because two of their three children had been born with congenital malformations. One had a somatotrophic deficiency, an imperforate anus and a small atrial septal defect at birth. The other had hypospadias, a micropenis, total deficiency of growth hormone and an imperforate anus. These disorders are rarely encountered together in the same person or family. However, in some cases they have been grouped with other symptoms under Stratton-Parker syndrome, the aetiology of which remains unknown.<sup>1,2</sup> Stratton-Parker syndrome symptoms noticeably overlap those found in our cases (table 1). As only males have been affected to date and all cases have occurred sporadically, some authors propose an X-linked recessive inheritance.<sup>2</sup> As in our cases there are no known familial antecedents or genetic origins identified to date, an environmental origin can be postulated. In particular, many pesticides were used by this family around the time of the pregnancies. The father sprayed, without protection, more than 1.3 tons of pesticides per year (including 300 l of glyphosate based herbicides) which contain well-known endocrine disruptors such as carbendazim, 2,4-dichlorophenoxyacetic acid, glyphosate, ioxynil, linuron, trifluralin and vinclozolin. The whole family had close contact with the father, consumed the products of their garden and were also exposed through the consumption of pigs and poultry fed farm produce.

The intensive use of pesticides puts farmers at risk of reproductive disorders. Exposure to some pesticides during pregnancy is associated with increased serum oestrogenic bioactivity leading to genital malformations.<sup>3</sup> This family was exposed to many formulations which are themselves

## What this paper adds

- ▶ Stratton-Parker syndrome is rare and encompasses growth retardation, imperforate anus and often genital abnormalities, but no genetic origin is known.
- ▶ Two new cases are reported from the same family spreading 1.3 tons of pesticides per year without protection.
- ▶ Among these pesticides are numerous endocrine disruptors with similar developmental combined effects in laboratory animals.
- ▶ We suggest possible environmental origins for this syndrome; a synergic pollution effect during embryonic development cannot be excluded.
- ▶ We need to develop further an active precautionary approach when there is scientific uncertainty and improve the epidemiological and toxicological knowledge of commercial pesticide mixtures.

mixtures of different chemicals. The adjuvants in formulations may amplify the toxicities of the active principles,<sup>4</sup> which can act in synergy like most pollutants.<sup>5</sup> For instance, some of the antiandrogenic chemicals, such as vinclozolin, sprayed by the father can act synergistically with other antiandrogens with cumulative effects on male reproductive development in laboratory animals.<sup>6</sup> The results of in vivo experiments with pesticides can explain and/or reproduce at least in part the symptoms seen in this family. The adverse effects of these pesticide cocktails are more than the sum of the effects of their separate constituents. Thus, in our case we cannot exclude the role of a cocktail of endocrine disruptors at epigenetic, genetic or physiological levels during parental gametogenesis or pregnancy.

The effects reported overlap those of Stratton-Parker syndrome. Generally, a causal relationship is established through epidemiology for microbial and hereditary pathologies. However, this is not possible for environmental disorders: their specific pattern is usually caused by the multiple, long-term and combined effects of xenobiotics or external factors. This case shows that there are real concerns about the health of those exposed to mixtures of endocrine

disruptors. We need to develop an active precautionary approach when there is scientific uncertainty and improve the epidemiological and toxicological knowledge of commercial pesticide mixtures.

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**Table 1** Comparison of our cases to those reported by Stratton and Parker

Case	Stratton and Parker (1989) <sup>1</sup>	First child (born 2004)	Third child (born 2008)
Sex	Male	Male	Male
Age at last examination	17 months	5 years 1 month	1 year 1 month
Early developmental delay	+	+	+
Congenital heart defects	+	+	–
Pituitary gland hypoplasia	NR	+	NR
Wormian bones	+	NR	NR
Renal hypoplasia	+	NR	NR
Bowel defects	Imperforate anus	Imperforate anus	Imperforate anus
Genital abnormalities	Bilateral cryptorchidism, hypospadias	–	Micropenis, hypospadias
Brachycamptodactyly	+	NR	NR
Hypoplastic nose	+	+	+

+, present; –, absent; NR, not reported.