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Effects of Aroclor 1254® on Hydrocortisone Levels in Adult Rhesus Monkeys (*Macaca mulatta*)

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Byrne et al. (1988), using female Sprague Dawley rats, reported the effects of chronic (5-7 months) oral dosing with Aroclor 1254^R (polychlorinated biphenyls-PCB: 83.5 to 4180 μg/kg bw/day) on the serum levels of corticosterone, the principle glucocorticoid in rats. Their findings indicated that corticosterone levels were significantly depressed at dose levels of 479 μg/kg bw/day and above.

The objective of the present study was to determine the effects of PCB on the hydrocortisone levels in rhesus monkey (Macaca mulatta) serum. In the monkey the controlling hormone is hydrocortisone which is identical to that of humans. (Stancwyk et al. 1985)

MATERIALS AND METHODS

Adult female rhesus (Macaca mulatta) monkeys were randomly assigned into five groups (16 monkeys/group). Monkeys were administered orally PCB Aroclor 1254 (Monsanto electrical Grade, Lot #KAG3Y) at dosages of 0.0, 5.0, 20.0, 40.0, and 80.0 μg/kg bw/day. The dose of PCB was administered in a glycerol corn oil mixture (1:1) contained within a gelatin capsule. Animals were housed individually in stainless steel cages with ad libitum access to feed and water. The feed consisted of a commercial, certified and pelletized diet for monkeys, supplemented with fruits and/or vegetables (i.e. oranges, grapes, apples, bananas and/or carrots). The drinking water was supplemented one day per week with INFANTOL (0.6 mL/1000 mL).

Peripheral blood was collected in the morning from 20 monkeys/day in a randomized order. Blood was allowed to clot at room temperature for thirty minutes; separated by centrifugation (600 X g) for 10 min using a SURE-SEP II (Serum-Plasma Separator-General Diagnostics, Morris Plains, New Jersey); serum was aliquoted and frozen at -80°C until analyzed.

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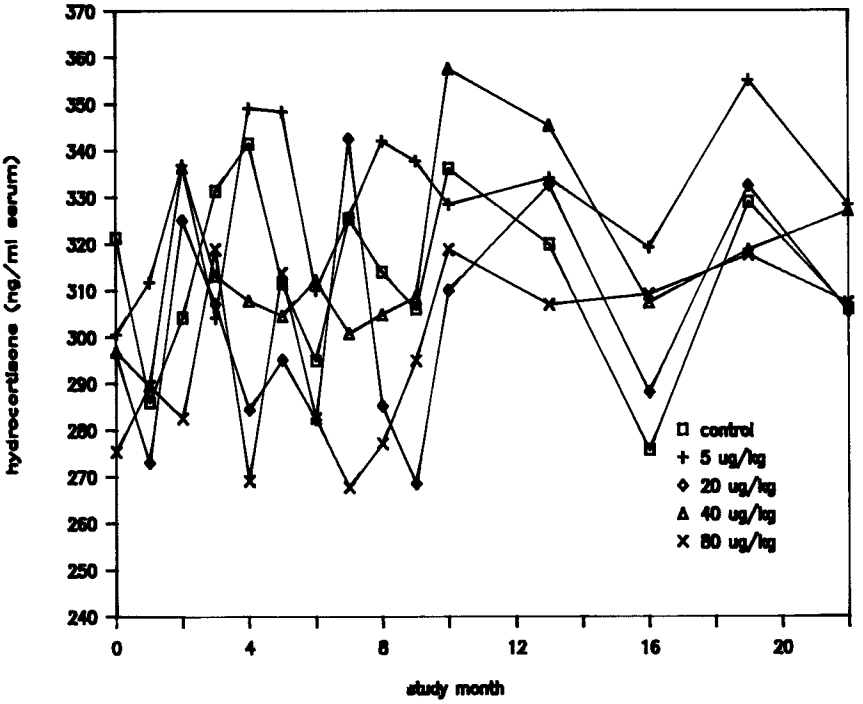

Figure 1. The effect of chronic treatment of PCB on hydrocortisone serum levels in adult female rhesus monkeys (Macaca mulatta).

Serum hydrocortisone levels were determined by the HPLC method of Loo & Jordan (1977) with the following minor modifications: Four mL of 60% methyl tert-butyl ether/methylene dichloride (v/v)% was used as the extraction solvent; the ethanolic content of the solid phase was optimized for hydrocortisone (0.2% acetic acid, 5% ethyl alcohol and 30% methylene chloride in hexane (v/v); a commercially packed 4.6 x 250 mm stainless steel column containing 5 μm silica gel (Li-Chrosorb SI-100, Brownlee Laboratories, Santa Clara, CA) was used. Prednisolone (U.S.P.) was used as the internal standard. The coefficient of variation obtained under these conditions was <5%.

RESULTS AND DISCUSSION

Serum levels of hydrocortisone were assessed at monthly intervals for the first 10 months of the study and then every 3 months until month 22. Average hydrocortisone levels (ng/mL serum) by dose group and study month are displayed in Fig. 1. Comparison of profiles were based on a multivariate analysis of polynomial trends (Morrison 1976).

PCB treatment did not have any effect on hydrocortisone levels. Profiles in the treated groups were similar ($p > .25$) to control profiles. Hydrocortisone levels at 22 months were as follows:

Treatment	Hydrocortisone concentrations in serum (ng/mL) ± S.E.M.
control	306.0 ± 18.7
PCB at 5 μg bw/day	328.4 ± 18.7
20 μg bw/day	305.4 ± 19.3
40 μg bw/day	327.1 ± 19.9
80 μg bw/day	307.4 ± 19.3

Our findings are in agreement with those of Byrne et al (1988). The latter study showed that a dose of 83.5 μg/kg bw/day, which is similar to the high dose used in the present experiment, did not have an effect on corticosterone concentrations in the serum of rats while higher dose levels (479-4180 μg/kg bw/day) of Aroclor 1254 reduced hormone levels in the serum significantly compared to baseline (pre-treatment) and control levels. It will be of interest to know whether similar doses of Aroclor 1254 will produce adverse effects on serum hydrocortisone levels in the monkey. It is hoped that our results combined with those of Byrne's group will be useful in designing additional studies to assess further the effects of PCB on the production of adrenocortical hormones.

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