Influence of polychlorinated biphenyls on LH-stimulated secretion of progesterone and oxytocin from bovine luteal cells

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Abstract

Polychlorinated biphenyls (PCBs) due to their lipophilic properties can be easily accumulated in animal and human body and elicit diverse effects causing impairment of reproductive processes. Since these compounds were not be able to affect directly the luteal steroidogenesis, the aim of the present study was to verify hypothesis that PCBs can impair the effect of LH on the secretory function of luteal cells. Bovine luteal cells from different stages of the oestrous cycle (days 1-5, 6-10, 11-15 and 16-18) were exposed for 72h to various congeners of PCBs (PCB 126, PCB 77 and PCB 153) at the doses of 1, 10 or 100 ng/ml, in the presence or absence of LH (100 ng/ml), to determine the possible effect of these compounds on progesterone (P4) and ovarian oxytocin (OT) secretion. Only PCB 77 on days 1-5 and 16-18 increased P4 secretion. All PCBs decreased LH-stimulated secretion of P4 from luteal cells obtained from all days of luteal phase. Dioxin-like congener (PCB 126) inhibited (P<0.05) the most evidently LH effect on P4 secretion. All congeners, except the lower doses of PCB 126, increased (P<0.05) OT secretion. They can also increase LH-stimulated secretion of OT, but the effect was dependent on the congener used and on the phase of oestrous cycle. On days 1-5 and 10-15, PCB 126 diminished LH-stimulated effect on OT secretion from luteal cells. PCB 77 (mimicking both dioxin and estradiol effect) in the higher doses, amplified effect of LH-stimulated OT secretion, while on all other days it diminished LH influence. PCB 153, which has estrogen-like properties, amplified LH effect on OT secretion during all studied days of the cycle.

We conclude that PCBs (supposedly via estrogen and arylhydrocarbon – AhR receptor) may directly affect LH-stimulated function of CL. This does not appear to be a direct adverse effect on luteal steroidogenesis, but rather indirect on OT secretion from or within CL.

Key words: PCBs, luteinizing hormone, progesterone, oxytocin, corpus luteum, cow

Introduction

The corpus luteum formed from steroidogenic cells of the ovarian follicle after its ovulation is a temporary, endocrine female gland, essential for the proper course of the estrous cycle and pregnancy. It produces and secretes P4 and OT. The latter supports CL function at the first part of the cycle (Miyamoto et al. 1991) but next it participates in luteolysis at the end of the luteal phase (Kotwica et al. 1999). Luteinizing hormone (LH) is a main stimulus of P4 synthesis in CL (Carlson et al. 1971), and in early stages of the estrous cycle it also increases the secretion of luteal OT (Stormshak 2003). Hence the lack of luteal cells response on LH stimulation can significantly affect CL function.