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Effects of Maternal Exposure to 3,3',4,4',5-Pentachlorobiphenyl (PCB126) or 3,3',4,4',5,5'-Hexachlorobiphenyl (PCB169) on Testicular Steroidogenesis and Spermatogenesis in Male Offspring Rats

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On days 7-21 of gestation, Sprague-Dawley rats were orally administered 3 or 30 µg/kg/d of 3,3',4,4',5-pentachlorobiphenyl (PCB126) or 3,3',4,4',5,5'-hexachlorobiphenyl (PCB169) daily. Their male offspring were autopsied at 3, 6, and 15 weeks after birth to investigate the effects of the 2 polychlorinated biphenyls (PCBs) on spermatogenesis and steroidogenesis in their testes. PCB treatment caused a decrease in the area ratio of 3ß-hydroxysteroid dehydrogenase (HSD)-expressing cells (Leydig cells)/testis at 3 weeks after birth. When PCB126 was administered to pregnant rats, the plasma testosterone levels in their offspring were decreased at 3 weeks. The expression levels of P450scc, 3ß-HSD, and $P450_{17\alpha}$ mitochondrial RNAs (mRNAs) were unchanged, although the StAR (steroidogenic acute regulatory protein) mRNA expression level was increased at 6 weeks. On the other hand, when PCB169 was administered, plasma testosterone levels were decreased at 3 and 6 weeks and were increased at 15 weeks. Plasma luteinizing hormone (LH) levels were decreased at 6 weeks, and plasma follicle-stimulating hormone (FSH) levels were increased at 15 weeks. The expression levels of 3ß-HSD and $P450_{17\alpha}$ were increased, and the mRNA level of 5α-reductase 1 was decreased at 15 weeks. PCB169 treatment suppressed the conversion of round spermatids between stages VII and VIII. These results indicate that in utero and lactational exposure to PCB126 or PCB169 decreases plasma testosterone levels in 3-week-old rats, with no change in the expression levels of the mRNAs of enzymes, and that PCB169 inhibits testicular steroid synthesis more strongly than PCB126. PCB169 greatly altered the concentration of testosterone, indicating a stronger inhibitory effect on spermatogenesis. Low testosterone and LH levels in prenatally PCB169-exposed rats until 6 weeks after birth presumably retard the functional differentiation of testicular Leydig cells; however, the increased testosterone levels at 15 weeks suggest that Leydig cells in PCB-exposed rats are virtually mature by the 15th week.

Key words: PCB, androgen, pituitary