**Dexmedetomidine Attenuates Gestational Propofol Anesthesia-Induced Spatial Memory Impairment in Offspring Rats**

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**ABSTRACT**

**TITLE:**
Dexmedetomidine Attenuates Gestational Propofol-Induced Spatial Memory Impairment in Offspring Rats

**BACKGROUND:**
Maternal exposure to commonly used anesthetics, including propofol, causes neuronal injury in the fetal brains, which may be associated with long-term neurobehavioral disturbances in the offspring. Recent evidence suggests that dexmedetomidine (DEX) is neuroprotective in isoflurane-induced brain injury.

**OBJECTIVE:**
To assess whether administration of DEX ameliorates the neurocognitive deficits in offspring exposed to propofol in utero.

**METHODS:**
Pregnant rats (gestational day 20) were treated with propofol for 1 h with dexmedetomidine or saline, or no anesthetic (control). Learning and memory functions of the offspring were assessed at postnatal day 35 using an 8-arm radial maze (ARM).

**RESULTS:**
The rats exposed to propofol in utero showed impaired learning and memory at postnatal day 35. Dexmedetomidine (5.0 µg/kg, i.p.) significantly mitigated propofol-induced learning and memory impairment in the offspring rats.

**CONCLUSIONS:**
Offspring rats exposed to propofol in utero show neurocognitive deficits measured by pup’s performance in ARM. It appears that co-administration of DEX attenuates this effect.

**RESULTS**

**METHODS**

With IACUC approval, pregnant rats (gestational day 20) were assigned to receive control condition or propofol anesthesia for 1 h with saline or Dex. Propofol was administered to pregnant rats by continuous infusion via a tail vein catheter. Control pregnant rats had catheter placed in tail vein, but no infusion. For Dex study, Dex (5.0 µg/kg, i.p.) or saline were administered 10 minutes before the 1-h propofol anesthesia. Pregnant rats were allowed to deliver their pups in their respective cages. Beginning at 4 weeks (postnatal day 28) of age, the offspring rats were evaluated for spontaneous locomotor activity and spatial working memory in 8-arm radial maze (ARM).

**Figure 1** Propofol anesthesia for 1 h in pregnant rats at G20 leads to learning and memory impairment in offspring rats tested at P35. Rats exposed to propofol in utero made significantly more errors than the control rats on day 1, 2 and day 3 across 5 days of test (A). There was also significant difference between groups in terms of the total number of errors over 5 days of test (B). Rats exposed to propofol in utero also took longer time to complete visiting all eight arms relatively to the controls on day 1, 2 and day 3 across 5 days of test (C). There was no significant effect of group in terms of number of correct responses made before the first error. n = 12 rats/group; *P<0.05, **P<0.01, ***P<0.001 vs. controls.

**Figure 2** Propofol anesthesia in pregnant rats does not affect spontaneous locomotor activity in offspring rats.

**CONCLUSIONS**
Offspring rats exposed to propofol in utero show neurocognitive deficits measured by pup’s performance in ARM. It appears that co-administration of DEX attenuates this effect.