

# SUMMARY TABLE

November 2018 • GULF WAR AND HEALTH: VOLUME 11:  
GENERATIONAL HEALTH EFFECTS OF SERVING IN THE GULF WAR

## Summary of Conclusions Regarding Categories of Association Between Gulf War Deployment Exposures and Reproductive Effects in Men or Women, Adverse Pregnancy Outcomes, or Developmental Effects

### Sufficient Evidence of a Causal Relationship

*Evidence is sufficient to conclude that a causal relationship exists between being exposed to a toxicant and a reproductive or developmental effect in humans. The evidence fulfills the criteria for sufficient evidence of a causal association in which chance, bias, and confounding can be ruled out with reasonable confidence.*

- None

### Sufficient Evidence of an Association

*Evidence suggests an association, in that a positive association has been observed between an exposure and a reproductive or developmental effect in humans; however, there is some doubt as to the influence of chance, bias, and confounding.*

- Leishmaniasis infection during pregnancy and adverse pregnancy outcomes
- Hexavalent chromium and reproductive effects in men
- Prenatal exposure to hexavalent chromium and developmental effects
- Prenatal exposure to organophosphate pesticides and neurodevelopmental effects
- Carbamate pesticides and reproductive effects in men
- Prenatal exposure to particulate matter and adverse pregnancy outcomes—low birth weight and preterm birth
- Prenatal exposure to benzene and childhood leukemia

### Limited/Suggestive Evidence of an Association

*Some evidence of an association between exposure and a reproductive or developmental effect in humans exists, but this is limited by the presence of substantial doubt regarding chance, bias, and confounding.*

- Sulfur mustard and reproductive effects in men
- Hexavalent chromium and adverse pregnancy outcomes
- Organophosphate pesticides and reproductive effects in men
- Pyrethroid pesticides and reproductive effects in men
- Lindane and reproductive effects in women
- Prenatal exposure to pyrethroid pesticides and developmental effects
- Prenatal exposure to particulate matter and pregnancy-induced hypertensive disorders
- Prenatal exposure to particulate matter and respiratory or neurodevelopmental effects in children
- Polycyclic aromatic hydrocarbons and reproductive effects in men
- Prenatal exposure to polycyclic aromatic hydrocarbons and adverse birth outcomes—low birth weight and preterm birth, or developmental effects—birth defects, childhood cancer, neurodevelopmental effects and respiratory outcomes in childhood
- Benzene and reproductive effects in men
- Trichloroethylene and reproductive effects in men, or adverse pregnancy outcomes
- Prenatal exposure to trichloroethylene and developmental effects
- Prenatal exposure to perchloroethylene and developmental effects
- Glycols and glycol ethers and reproductive effects in men
- Prenatal exposure to glycols or glycol ethers and birth defects

### **Inadequate/Insufficient Evidence to Determine Whether an Association Exists**

*The available studies are of insufficient quantity, quality, validity, consistency, or statistical power to permit a conclusion regarding the presence or absence of an association between an exposure and a reproductive or developmental effect in humans.*

- Deployment and reproductive or developmental effects
- Sarin/cyclosarin and reproductive or developmental effects
- Sulfur mustard and reproductive effects in women, adverse pregnancy outcomes, or developmental effects
- Leishmaniasis and reproductive or developmental effects
- Anthrax vaccination and reproductive or developmental effects
- Depleted uranium and reproductive or developmental effects
- Pryostigmine bromide and reproductive or developmental effects
- Hexavalent chromium and reproductive effects in women
- Organophosphate pesticides and reproductive effects in women, or adverse pregnancy outcomes
- Prenatal exposure to organophosphate pesticides and other developmental effects (other than neurodevelopmental effects)
- Carbamate pesticides and reproductive effects in women, or adverse pregnancy outcomes
- Prenatal exposure to carbamates and developmental effects
- Pyrethroid pesticides and reproductive effects in women, or adverse pregnancy outcomes
- Lindane and reproductive or developmental effects
- DEET and reproductive or developmental effects
- Particulate matter and reproductive effects in men and women
- Prenatal exposure to particulate matter and other developmental effects (other than respiratory and neurodevelopmental effects)
- Polycyclic aromatic hydrocarbons and reproductive effects in women
- Prenatal polycyclic aromatic hydrocarbons exposure and other developmental effects (other than birth defects, childhood cancer, neurodevelopmental effects and respiratory outcomes in childhood)
- Polychlorinated dibenzodioxins and polychlorinated dibenzofurans and reproductive or developmental effects
- Exhaust and reproductive or developmental effects
- Fuels and reproductive or developmental effects
- Benzene and reproductive effects in women, or adverse pregnancy outcomes
- Prenatal exposure to benzene and other developmental effects in children (other than childhood leukemia)
- Toluene and reproductive or developmental effects
- Xylenes and reproductive or developmental effects
- Trichloroethylene and reproductive effects in women
- Perchloroethylene and reproductive effects in men and women, or adverse pregnancy outcomes
- Glycols and glycol ethers and reproductive effects in women, or adverse pregnancy outcomes
- Prenatal exposure to glycols or glycol ethers and any other developmental effects (other than birth defects)

### **Limited/Suggestive Evidence of No Association**

*There are several adequate studies, covering the full range of levels of exposure that humans are known to encounter, that are consistent in not showing an association between an exposure and a reproductive or developmental effect.*

- None

*The National Academies of*  
SCIENCES • ENGINEERING • MEDICINE

The nation turns to the National Academies of Sciences, Engineering, and Medicine for independent, objective advice on issues that affect people's lives worldwide.

[www.national-academies.org](http://www.national-academies.org)