MEN’S REPRODUCTIVE HEALTH AND THE ENVIRONMENT: DECLINING SPERM COUNTS ARE ONLY THE TIP OF THE ICEBERG

Shanna H Swan, MS, PhD

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Male Infertility Crisis in U.S. Has Experts Baffled

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“Sperm count declined 52.4% between 1973 and 2011 [38 years] among men from Western countries with no evidence of a ‘leveling off.’”
Goal of 2017 meta-analysis

To conduct a systematic review and meta-analysis of sperm counts published between 1981 and 2013
Comparison of sperm decline analyses

- CARLSEN 1992
- SWAN 2000
- LEVINE 2017
Reproductive development depends on hormonal input.

- Undifferentiated Sex Organs
- Testosterone
- Male
- No Testosterone
- Female

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What can interfere with testosterone levels?
Phthalate exposure during days 18-21 of gestation blocks the testosterone surge in rats.
Phthalate Syndrome

Males:
- Smaller penis
- Malformed penis
- Undescended testicles
- Shortened AGD
Male Anogenital distance (AGD)

- 50%-100% longer in males
- Reflects androgen exposure during fetal development
- Sex differences in rodent AGD known since 1912
- Not used to detect human toxicity till 2005
Hypothesis: Prenatal phthalate levels in moms of boys (but not girls) is linked to altered genital development
We found the “phthalate syndrome” in male infants in two pregnancy cohorts

“Phthalate syndrome” seen in boys born to mothers with higher phthalate concentration

- Reduced penile width
- Reduced AGD
- Reduced scrotal size

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In adults, shorter AGD is associated with lower sperm counts and greater infertility.

MENDIOLA ET AL., 2011, ENVIRON HEALTH PERSPECT.

AGD in childless men vs fathers

EISENBERG ET AL 2011
Bottom Line

- Sperm count is declining 1% per year in Western countries
- Phthalate exposure in early pregnancy causes the phthalate syndrome in humans
- Men with low sperm count have shorter AGD
- It’s not just phthalates: BPA, dioxins, PCBs, etc., also impair male reproductive function
Warning: Data limitations

- Most published studies of semen quality are from western countries
- Within western countries, most studies are in white/non-Hispanic men
- Many EDC exposures are higher in non-white and Hispanic populations
- Studies of male reproductive function in minority and non-Western populations are badly needed
What needs to be done?

To protect our reproductive health:

- **M**onitor reproductive health endpoints (as is done for cancer surveillance)
- **A**dvance the creation of safe alternatives to hazardous chemicals
- **D**evelop testing protocols that protect human and environmental health
- **E**ducate regulators, health care professionals and consumers about EDC risks

These changes have to be **MADE!**
Count Down

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