COUNT DOWN
How Our Modern World Is Threatening Sperm Counts, Altering Male and Female Reproductive Development, and Imperiling the Future of the Human Race
SHANNA H SWAN, PHD
The Roadmap

Its Problem

Its Causes

Its Consequences

Its Solutions
CARLSEN ET AL. 1992

“50 years over the past semen quality has been a genuine decline in year of publication.

Sperm concentration (10^6/ml)
Sperm Decline in Western Countries

Levine et al. 2017. Graph: Grantham Foundation

Year of sample collection

Sperm concentration (10^6/ml)

Legend:
- No Improvement
- Moderate Improvement
- Considerable Improvement

Estimated slope post-2011

52.4% decline

47
Reproductive Problems in Men and Women

**Females**
- Miscarriage
- Early pregnancy
- Premature eGg
- Endometriosis
- Menstrual problems
- Prematurity
- Low birth weight

**Males**
- Infertility
- ART
- DNA damage in sperm and egg
- Low libido
- Abnormalities in hormone and genetic
- Ambiguous genitalia
- Reduced testes and scrotum
- Small penis
- Short ACD count
- Low sperm

**Both**
- Defects
Reproductive Problems in Men and Women

- Males
  - Defects of the testes and sperm
  - Reduced testosterone
  - Small penis
  - Short ACD count
  - Low sperm count

- Females
  - Miscarriage
  - Premature puberty
  - Early depletion
  - Premature eG
  - Endometriosis
  - Problems
  - Prematurity
  - Low birth weight

- Both
  - Fertility
  - AMP
  - DNA damage in sperm and egg
  - Low libido
  - Hormone abnormalities
  - Ambiguous genitalia
  - Interstitial
The 1% Effect
Reproductive development depends on hormonal input.
What can interfere with testosterone levels?
Phthalate Syndrome

DEHP

- Shortened AGD
- Undescended testicles
- Malformed penis
- Smaller penis
DEHP

Phthalate Syndrome

- Shortened AGD
- Undescended testicles
- Malformed penises
- Smaller penises
testing since 1998
• Used in animal toxicity
published in 1972
• Rodent data on AGD
• Females longer than males
• 50%-100% longer in males

of Testis and Prostate
(AIDS): A Reflection
Anogenital distance
Urinary phthalate metabolites

testicular descent

scrotal size

AGD

penile width

? ?
Androgend exposure is a marker of fetal endocrine disruptors (antiandrogenic) in human males. Phthalates are the phthalate syndrome. Endocrine effects. Phthalate causes exposure causes prenatal phthalate exposure.

Research | Children's Health

In two human studies (2005 & 2015), we confirmed this hypothesis.
Shorter AGD is associated with lower sperm count.
MPCW = Male Programming Window

Embryonic day

Critical window (MPCW) for rodent AGD

19.5
18.5
15.5
13.5

MPCW

MPCW Treatment

Window

MACLEOD ET AL 2010
Change in ACD by trimester of exposure to 3 DEHP metabolites (alpha-tocopherol equivalents) by trimester of exposure to DEHP.
Prenatal exposure is more important than postnatal exposure.
Sperm Concentration (milli/ml)

Relative risk of death

JENSEN ET AL. 2009

Poor reproductive health has lifelong consequences

With Children

Without Children
Population of Japan

2018
126 Million

1950
84 Million

WWW.THEYCNWS.COM
not directly exposed

Generation that was
reported in the F³
Health effects

Reproductive cells (F²)

Fetus (F¹)

Mother (F⁰)

Exposure
Adapted from Pa Hunt

Exposure → Grandchild → Child → Parent → Successive

Exposure → Transgenerational

Exposure → Grandchild → Child → Parent → Transgenerational
Recovery of testicular function several generations after direct exposure to an EDC

Lowest

Great Grandson: Unexposed

Grandson: Unexposed

Son: Indirectly EDC Exposed

Father: Directly EDC exposed

Highest

Most functional

Testicular health

Most impaired

ADAPTED FROM PA HUNT

Shanna H Swan, PhD
Reproductive Health and the Environment
THE ROADMAP

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Its Solutions
Chemical for another hazardous substitution (swapping) is regrettable.
Only 250 of the more than 60,000 existing chemicals have been directly tested by the EPA.
Chemicals that are:

- Untested for toxicity
- Persistent
- Environmentally
- Low doses
- Cause harm at
- Hormonally active
Replacing marketing with chemicals: Shown to be safe prior to persistent effects of low dose adverse disrupting effects without endocrine.
Risks in untested chemicals
Environmental persistence
Mixture effects
Low dose effects

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