HUMAN SEMEN QUALITY IN THE NEW MILLENIUM: A MATTER OF CONCERN?

Semen quality a matter of concern

• Lower than two-three generations ago

• In European countries
  • Only 25% have optimal semen quality
  • 20-30% at risk of prolonged waiting time to pregnancy
  • 10-15% at risk for need of fertility treatment

• Other implications
  • Marker of reduced general health status?
Evidence for decreasing quality of semen during past 50 years

Historical data
- Mainly European and US
- 50% decrease in 50 yrs

Carlsen et al: BMJ, 1992
Men from infertile couples (1940-1943)

Men from general population (1996-2010)

Morphologically normal spermatozoa (%)


Men from the general population (1996-2010)

Sperm concentration (million/mL)

Total sperm count (million)
Probability of pregnancy within one menstrual cycle

4,867 men from Copenhagen area in Denmark

Results compatible with decrease since early 1940’s

Slight increase in sperm concentration and total sperm count 1996-2010

Only 23% had sperm concentration >40 mill/ml AND >9% morphologically normal spermatozoa

Approx. 15% had a sperm concentration that indicate a high risk of needing future fertility treatment, and another 27% will be at risk of a prolonged waiting time to pregnancy
Normal young men
Sperm conc. (mill/ml)

Richthoff et al (2000),
Axelsson et al (2011)
Punab et al (2002),
Tsarev et al (2003),
Fernandez et al (2010)
Semen quality studies

Decrease in Finnish men (and maybe also in French)

Geographical differences, lowest levels in Norway, Denmark, Germany (and maybe Switzerland)

High frequency of men with low sperm counts in all (investigated) European countries

Many men at risk of impaired fertility

Also low among young Americans?
Other male genital health problems
Testicular Cancer

"Association of Nordic Cancer Registries" and "Cancer in Germany"
Impaired Leydig Cell Function in Infertile Men: A Study of 357 Idiopathic Infertile Men and 318 Proven Fertile Controls

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Semen quality

• Reduced semen quality may cause fertility problems and have an impact on fertility rates

• Semen quality is a risk factor for
  • reduced capacity for testosterone production
  • testicular cancer
  • morbidity and mortality?

Should reduced semen quality be seen as a warning of general health problems?
Testicular Dysgenesis Syndrome

Prenatal period

Environmental factors incl. endocrine disrupters

Genetic defects incl. 45,X/46,XY and point mutations

TESTICULAR DYSGENESIS

Postnatal period

REDUCED SEMEN QUALITY

CIS TESTICULAR CANCER

HYPOSPADIAS

TESTICULAR MALDESCENT

DISTURBED SERTOLI CELL FUNCTION

DECREASED LEYDIG CELL FUNCTION

IMPAIRED GERM CELL DIFFERENTIATION

ANDROGEN INSUFFICIENCY
Prenatal vs. adulthood exposures

Prenatal period:

- Environmental factors *incl. endocrine disrupters*
- Genetic defects *incl. 45,X/46,XY and point mutations*

Postnatal period:

- REDUCED SEMEN QUALITY
  - **CIS** TESTICULAR CANCER
  - HYPOSPADIAS
  - TESTICULAR MALDESENT

Adulthood:

- Environmental factors *incl. endocrine disrupters*
- Occupational events (toxic events)
- Chemotherapy
- Irradiation
Conclusions

• Semen quality has approached levels that may impair fertility
• Testicular cancer incidence is increasing in many European countries
• Genital malformations of newborn boys have increased in some European countries
• May all be symptoms of a Testicular Dysgenesis Syndrome (TDS) of fetal origin