בית הספר לבריאות הציבור ורפואה קהילתית
של האוניברסיטה העברית והדסה ע"ש בראון
Braun School of Public Health and Community Medicine
Hebrew University-Hadassah

המרכז למצויינות בחקלאות ובריאות הסביבה של האוניברסיטה העברית
HUCEAEH
The Hebrew University Center of Excellence in Agriculture and Environmental Health

Environment, Radiation and Sperm

IIAS/EHT 2017 Forum

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הקרן לבריאות וסביבה
Environment and Health Fund

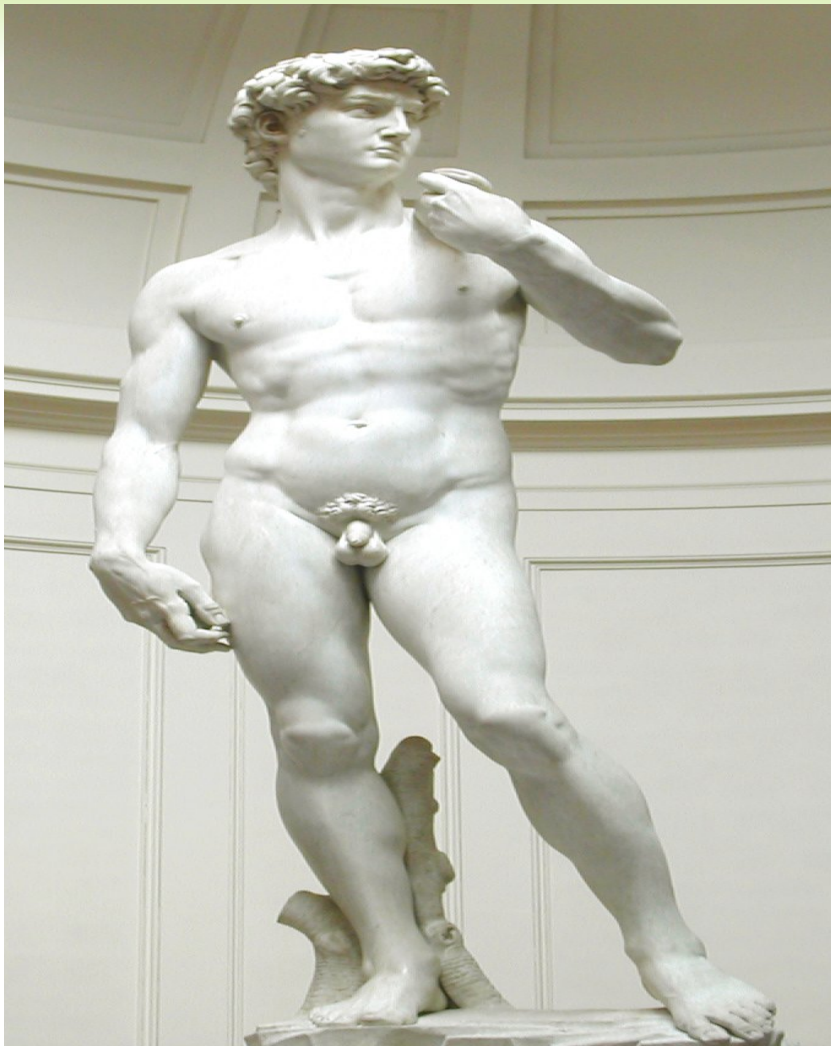
Mount Sinai

Outline

- Background
- Role of Radiation
- Future Directions and Implications

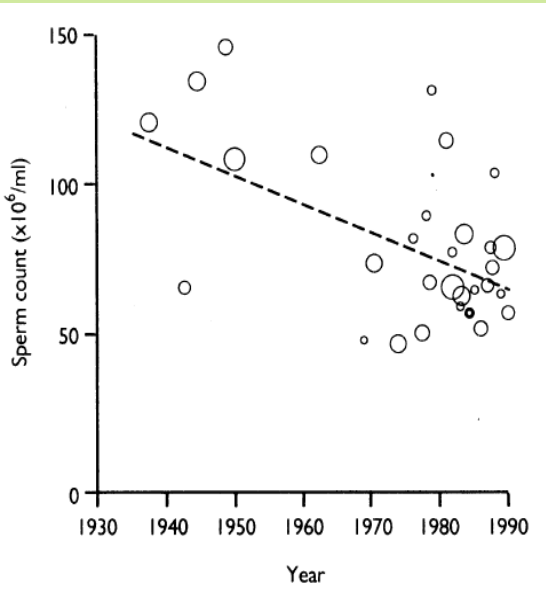
Why sperm?

- Male fertility
- Men's health
- Environment
- Science



Male reproduction trends

- Sperm concentration ↓
- Male factor infertility ↑
- Testicular cancer ↑
- Urogenital malformations ↑
- Male Pubertal time ↓
- Testosterone ↓



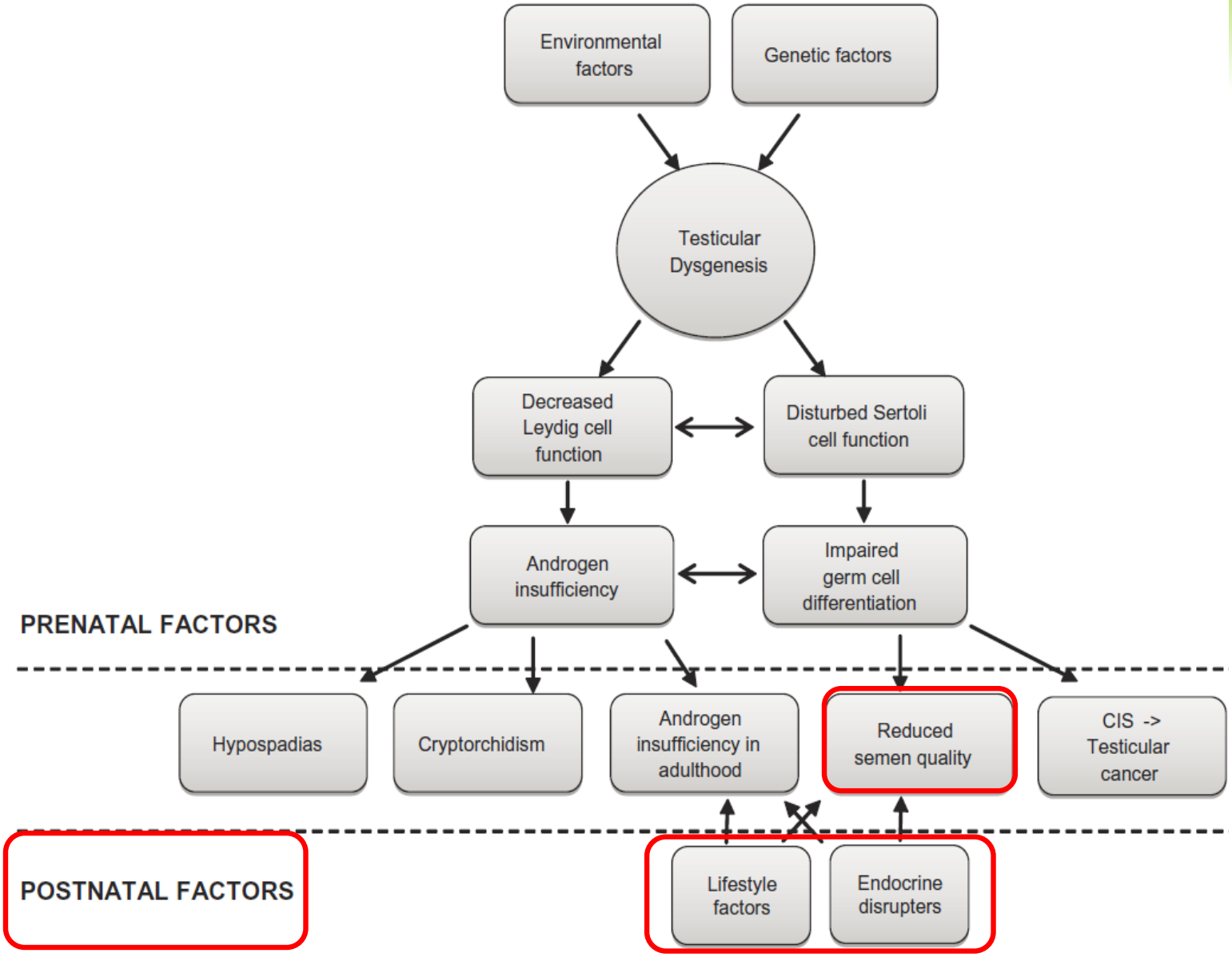
Carlsen *et al*, 1992; Skakkebaek et al 2016

Trends - Israel

- Sperm counts ⇩
- Male factor infertility ⇧
- Testicular cancer ⇧
- Urogenital malformations ?

Berman *et al*, 2012; Haimov-Kochman *et al*, 2012; Levine *et al*, 2013

Testicular Dysgenesis Syndrome



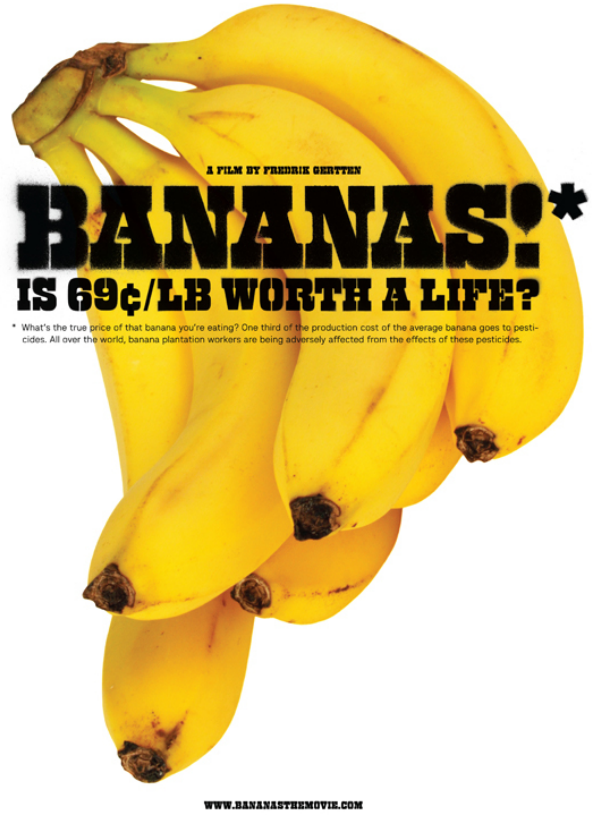
Nordkap *et al*, 2013

DBCP

Preliminary Communication

INFERTILITY IN MALE PESTICIDE WORKERS

DONALD WHORTON
University of California, Berkeley



Possible causes

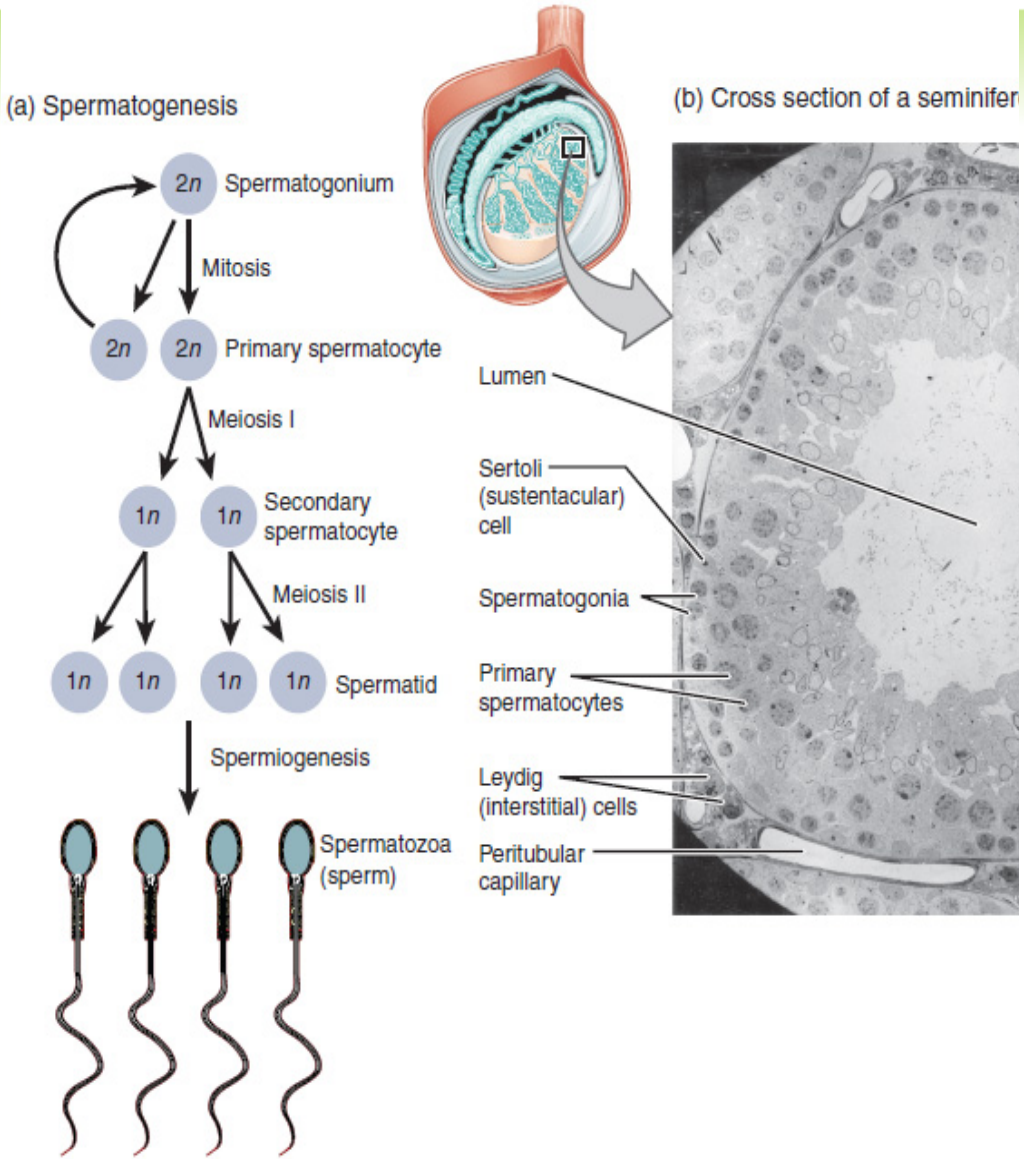
- Endocrine disrupting chemicals
- Pesticides
- Heat
- Diet
- Stress
- Smoking
- Obesity
- **Non-ionizing Radiation?**

Spermatogenesis

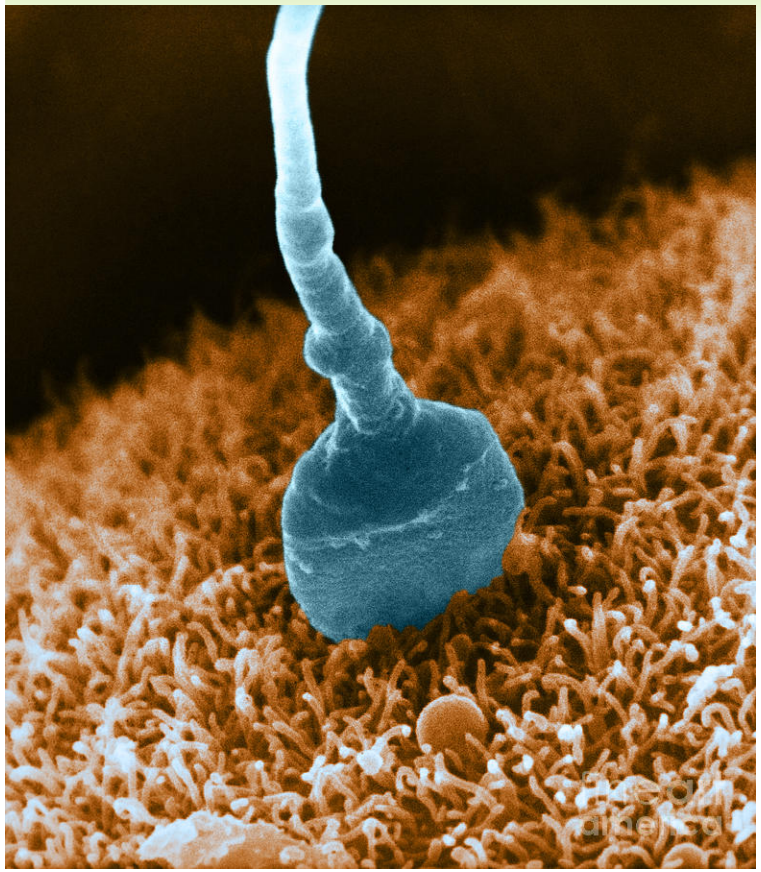
200-300 million spermatozoa/day

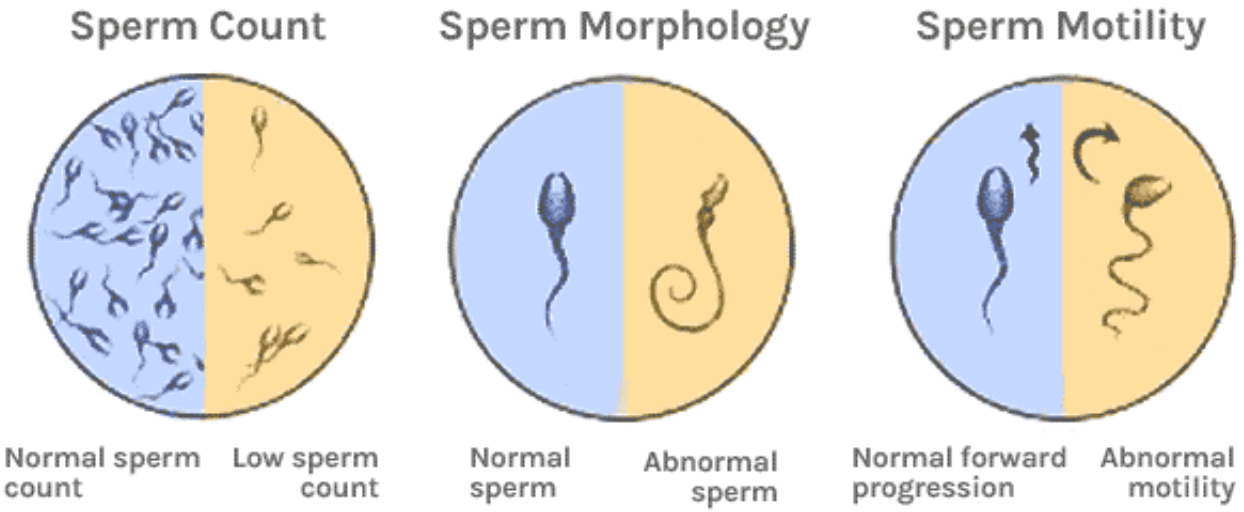
74 days

Sensitive - exposed

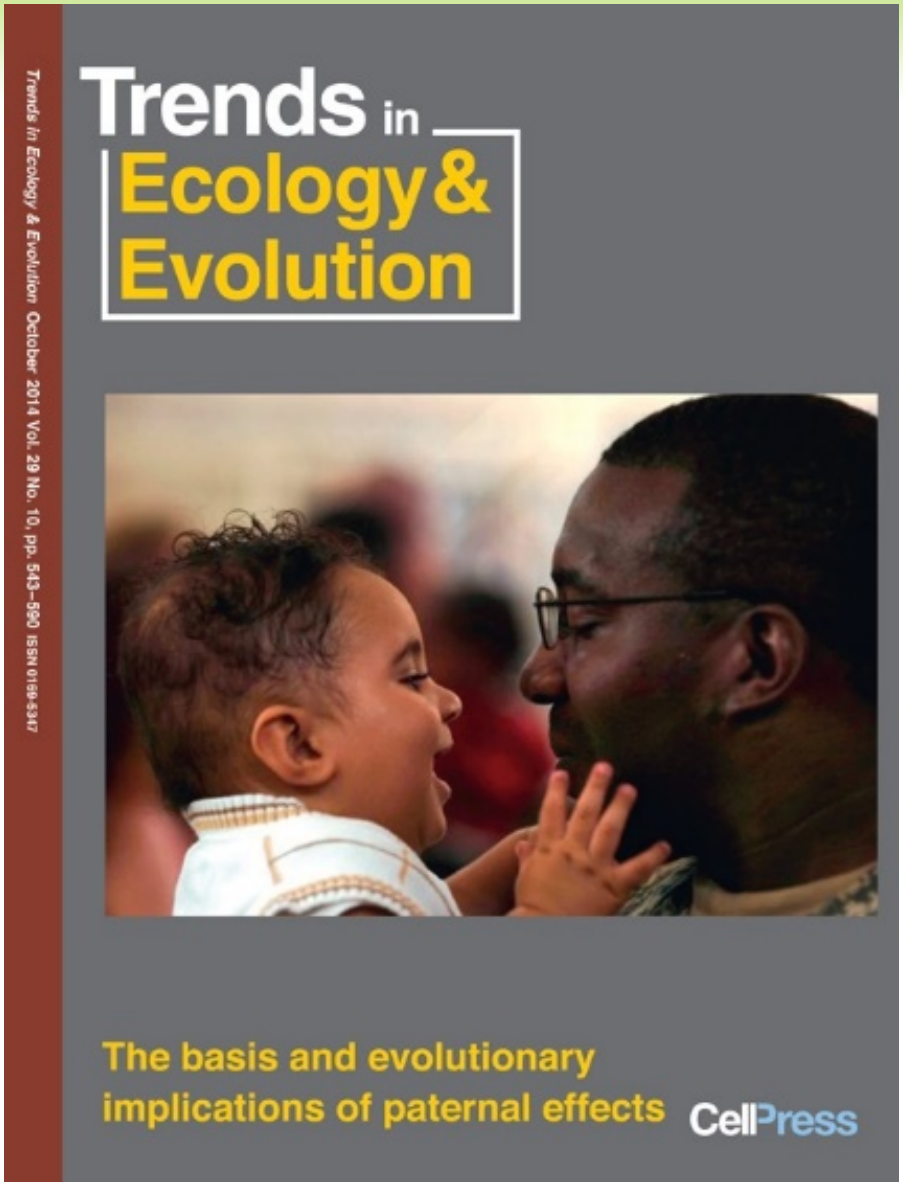


“Semen quality and sperm function”

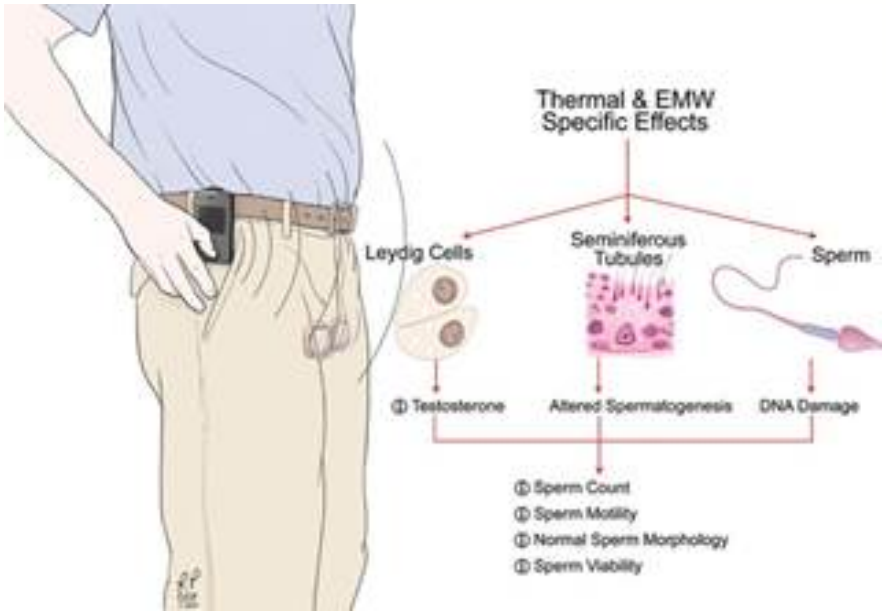




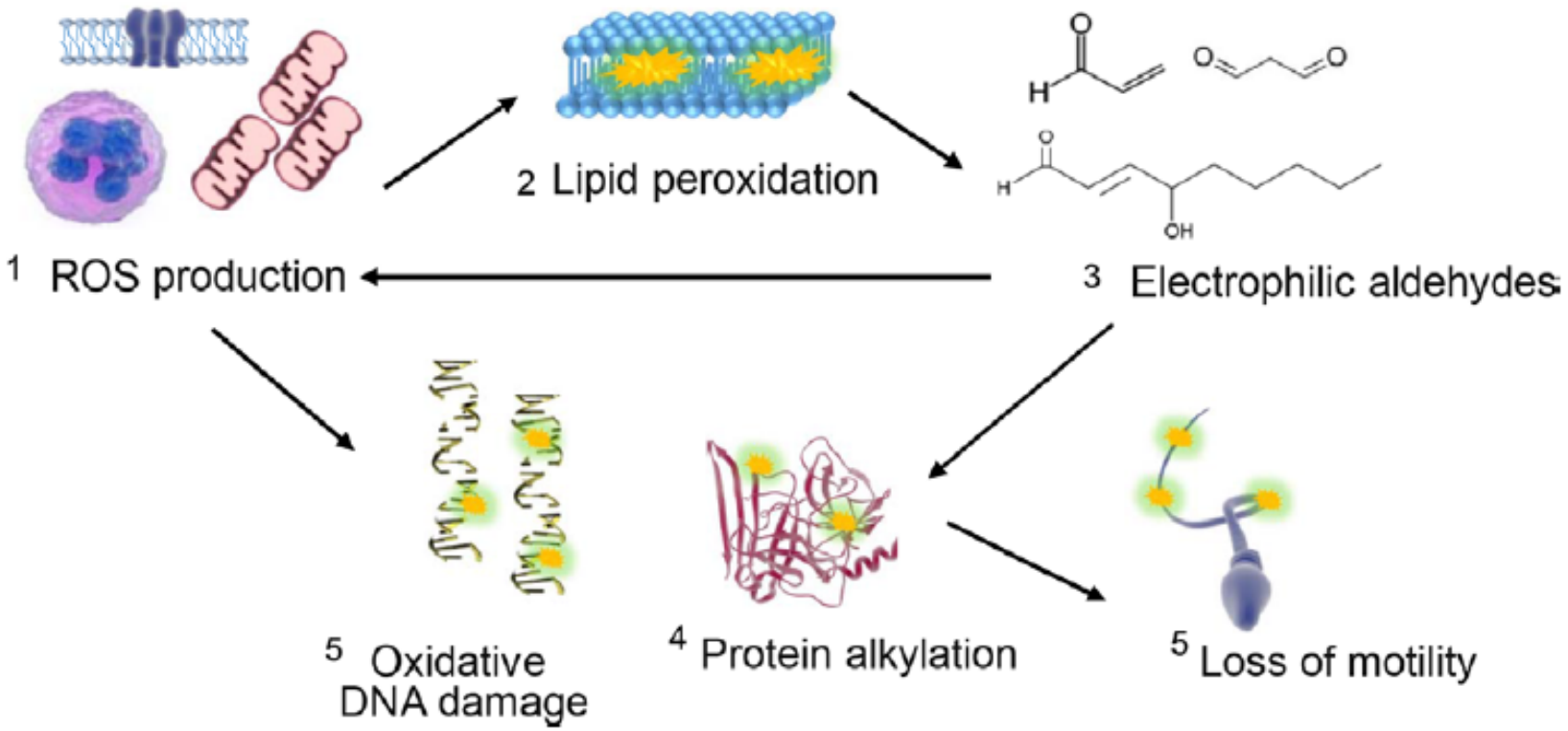
Paternal effects



Public concern



Oxidative stress - spermatozoon



Houston *et al*, 2016

Mobile phone and sperm quality

Table 1
Study characteristics from mobile phone exposure and sperm quality meta-analyses. (– denotes information not provided).

Sperm parameters										
Reference	Sample size	Study design	Participant group	Motility	Viability	Concentration	Radio-frequency (MHz)	SAR (W/kg)	Exposure time	Comments
Agarwal et al. (2008)	361	*In vivo*	Fertility clinic	✓	✓	✓	–	–	–	Exposed to commercially available mobile phones
Agarwal et al. (2009)	64	*In vitro*	Fertility clinic	✓	✓	✓	850	1.46	60 min	Exposed to Sony Ericsson w300i
Ahmed and Baig (2011)	44	*In vitro*	Population	✓			900	1.3	60 min	Exposed to Nokia 112 in talk mode
Dkhil et al. (2011)	40	*In vitro*	Population		✓		850	1.46	60 min	Nokia 73 in talk mode
De Iuliis et al. (2009)	8	*In vitro*	Population	✓	✓		1800	1	16 h	Exposed using a waveguide, connected to a function generator and RF amplifier.
Erogul et al. (2006)	54	*In vitro*	Population	✓		✓	900	–	5 min	Exposed to commercially available mobile phones
Falzone et al. (2008)	24	*In vitro*	Population	✓			900	2	60 min	RF-EMR chamber
Feijo et al. (2011)	343	*In vivo*	Fertility clinic	✓	✓	✓	–	–	–	Exposed to commercially available mobile phones
Fejes et al. (2005)	254	*In vivo*	Fertility clinic	✓		✓	–	–	–	Exposed to commercially available mobile phones
Sajeda and Al-Watter (2011)	300	*In vivo*	Fertility Clinic	✓		✓	–	–	–	Exposed to commercially available mobile

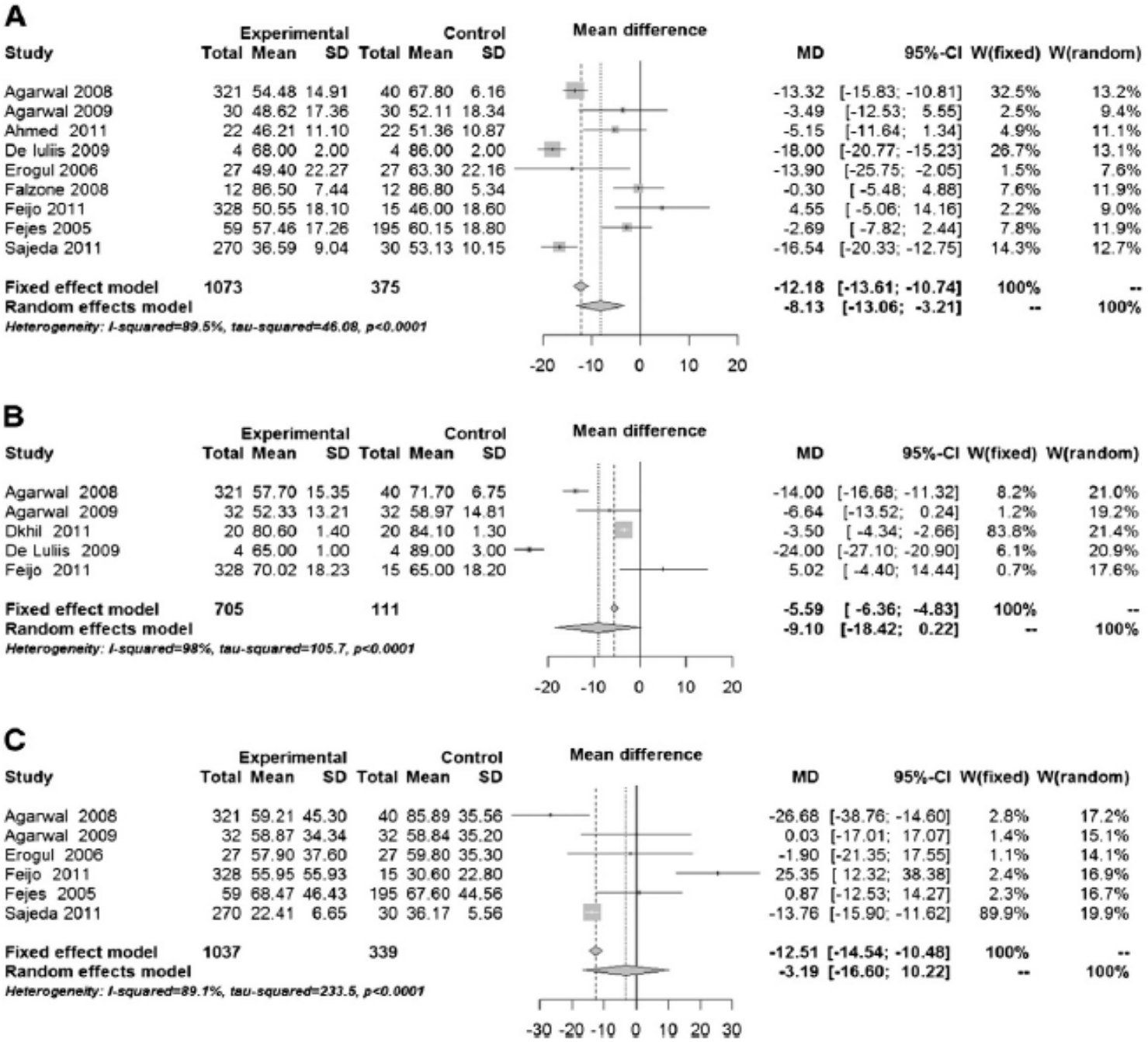


Fig. 1. Forest plot showing the effect of mobile phone exposure on human sperm motility (A), viability (B) and concentration (C). A. FEM −12.2 (95% CI −13.6, −10.7) REM −8.1 (95% CI −13.1, −3.2); B. FEM −5.6 (95% CI −6.4, −4.8) REM −9.1 (95% CI −18.4, 0.2); C. FEM −12.5 (95% CI −14.5, −10.5) REM −3.2 (95% CI −16.6, 10.2).

Study methods

- Interventional (Reducing exposure, Increasing exposure)
- Observational (Cross-sectional, Cohort, Case-control, other?)
- Animal studies
- Basic science

Research directions

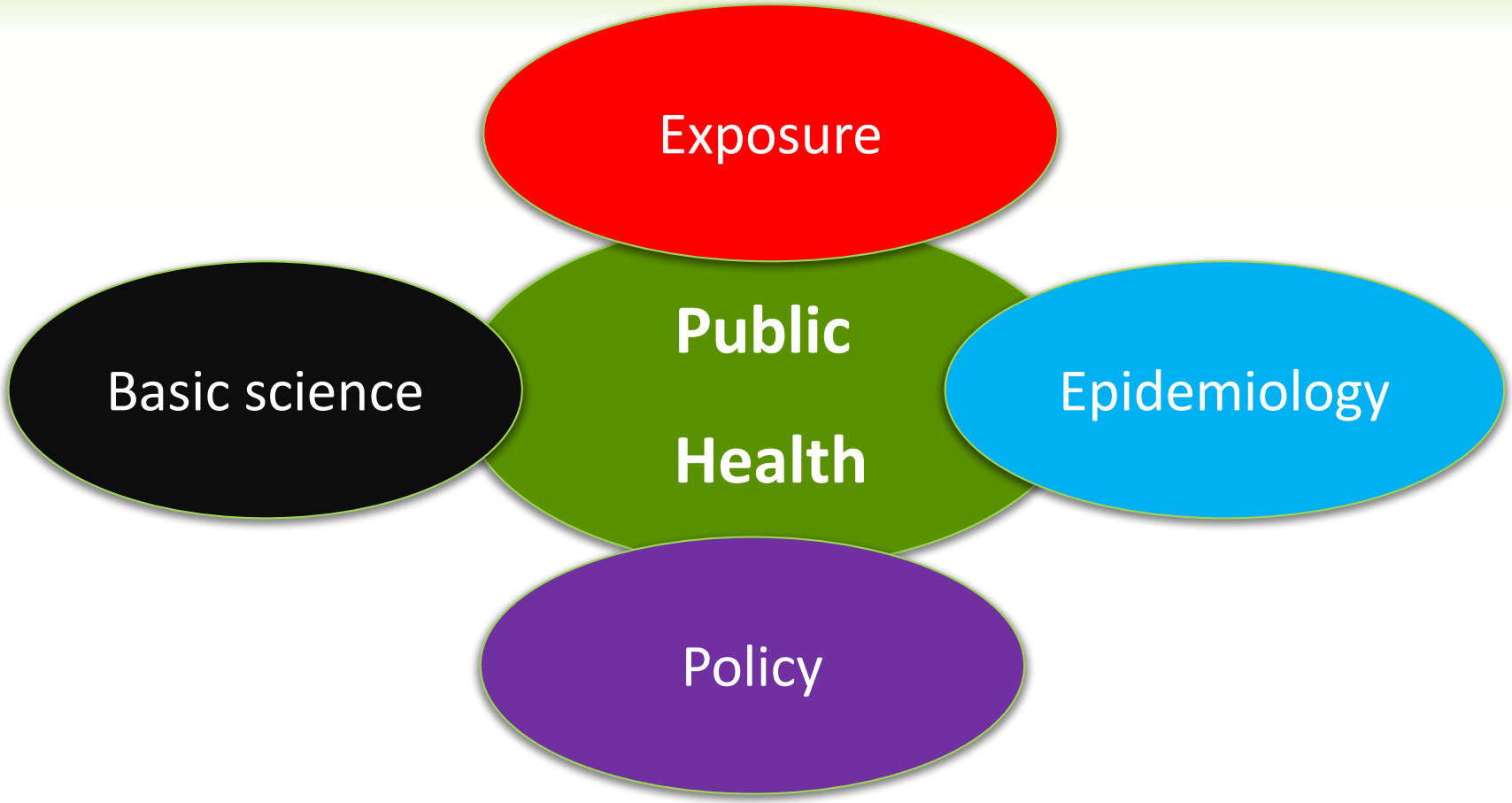
- Paradigm shift
- Evolving scientific tools
- Methodological issues
- Combining study methods
- Multi-disciplinary teams (Training)!
- **Sperm as a model**

New Wireless Technologies need much more attention

WiFi ac
Schools
IOT
5G

Courtesy of Prof. Ely Levine

Integration



What can we do?