

CHE Fertility call: Effects of BPA on *in vitro* Fertilization

Michael S. Bloom, Ph.D.

Assistant Professor

Departments of Environmental Health Sciences and Epidemiology & Biostatistics

School of Public Health

University at Albany, State University of New York

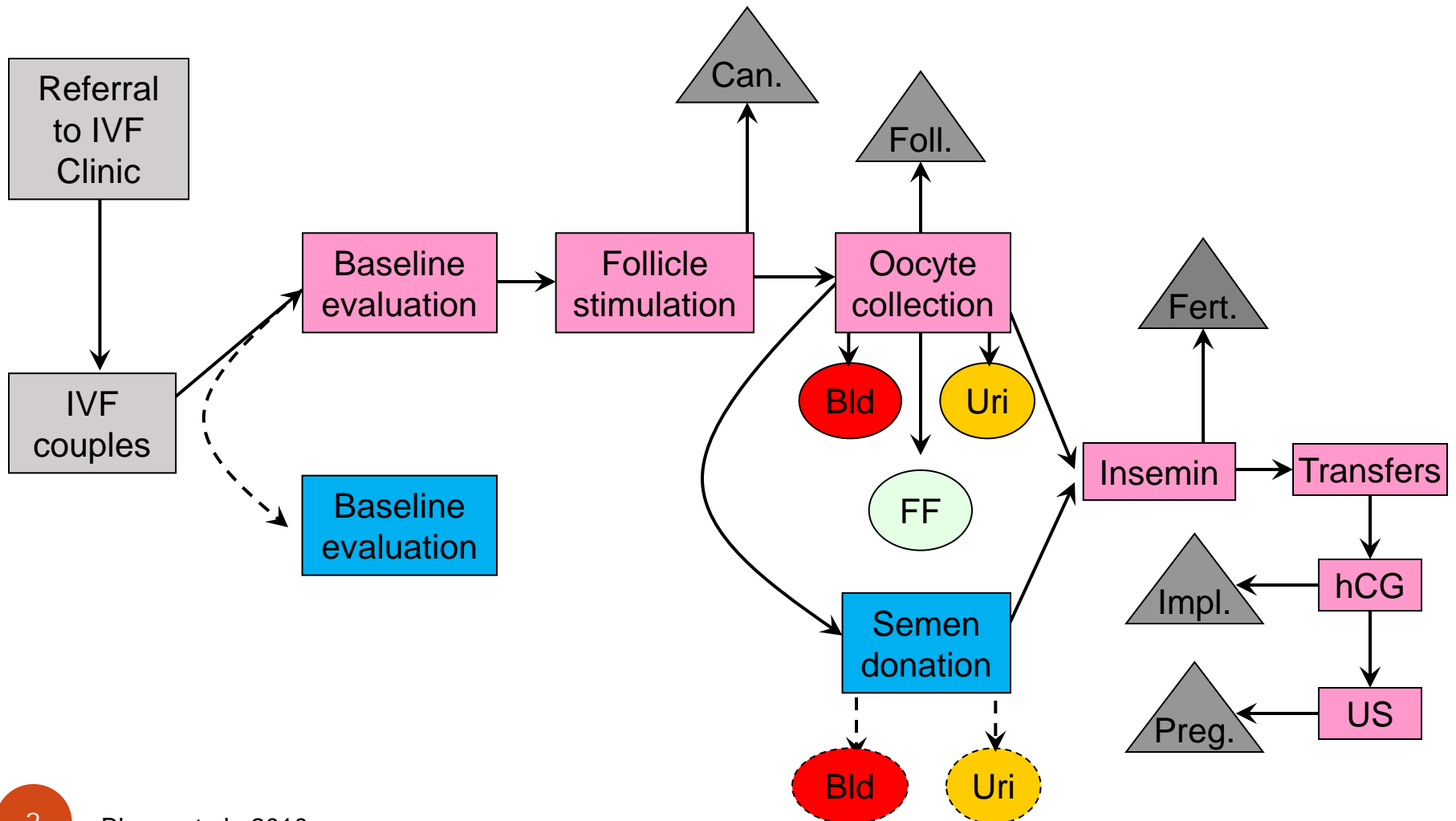
Rensselaer, NY USA

mbloom@albany.edu

Study of metals & assisted reproductive technologies (SMART)

- In an effort to respond to the knowledge gap concerning environmental contaminants & periconceptual events, we initiated a prospective cohort of couples undergoing treatment at the Center for Reproductive Health at the University of California at San Francisco:
 - The aim of this pilot study is to generate specific testable hypotheses concerning associations between background exposures to environmental toxicants suspected to interfere with human reproduction & proximal IVF endpoints

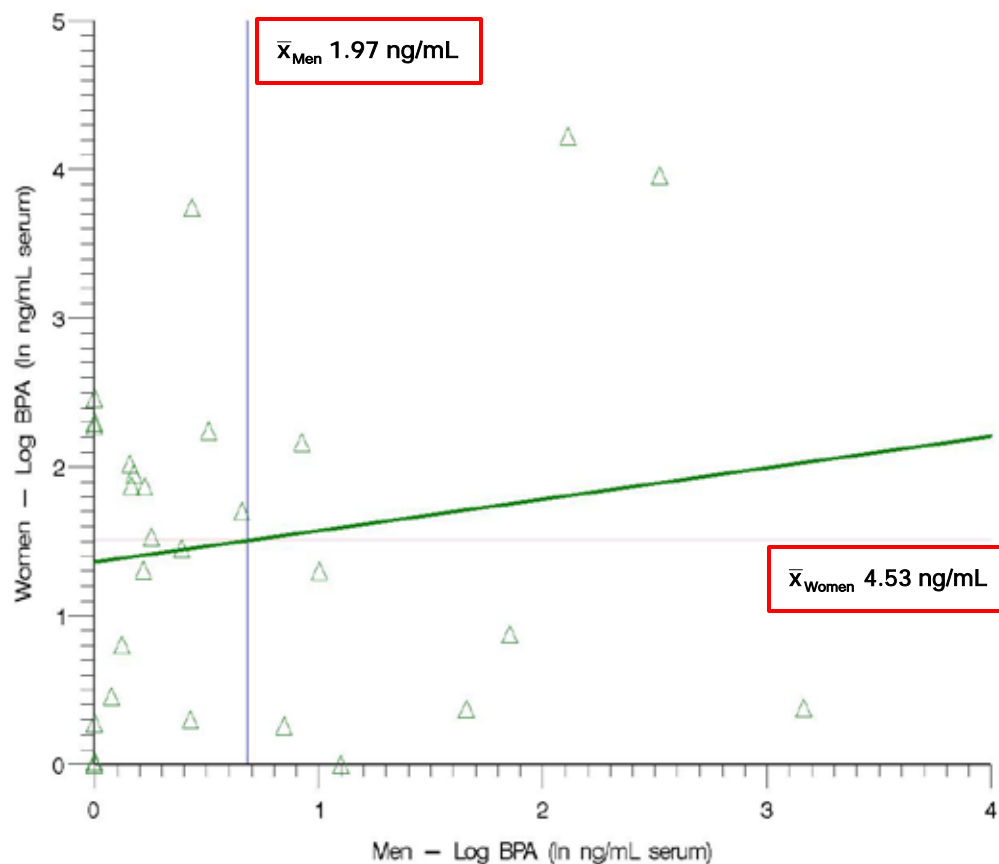
Study protocol



Approach

- Collection of biologic specimens for assessment of environmental exposures at the time of oocyte retrieval from female patients & their male partners:
 - Laboratory analysis for serum unconjugated BPA concentrations using HPLC with Coularray Detection
- Biomarkers of internal dose correlated with endpoints at the:
 - Follicle level
 - Oocyte level
 - Embryo level
- Analysis conducted using the person unit of measurement & using the oocyte/embryo unit of measurement

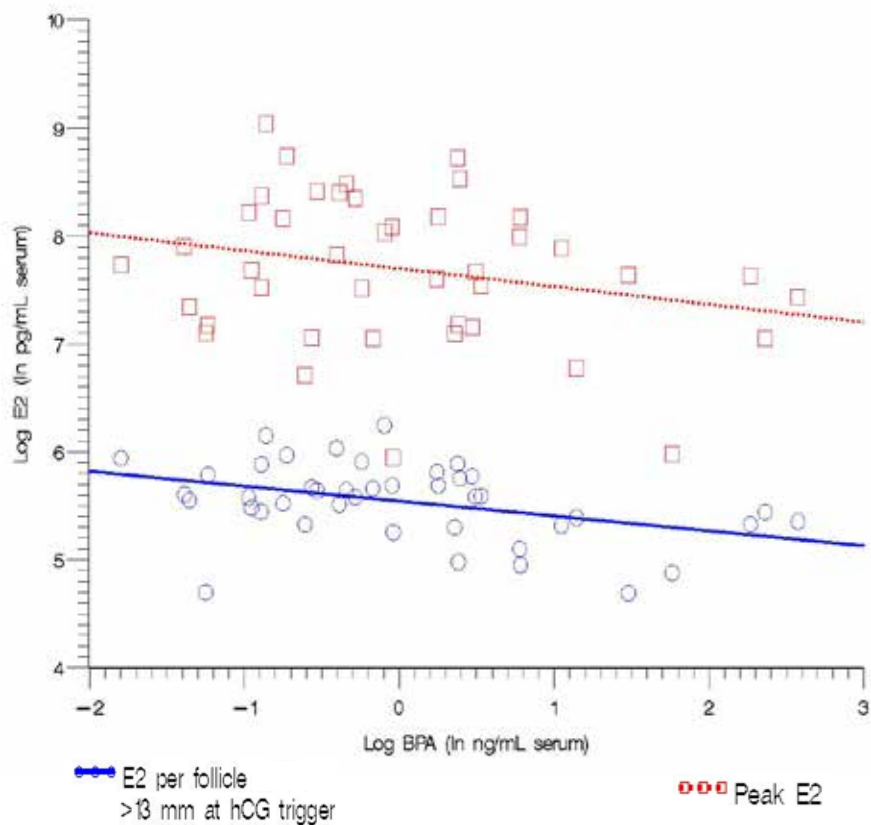
No association between BPA in women & BPA in men, comprising 28 couples



- Linear correlation for BPA in women & men:
 - 0.15 (95% CI -0.24, 0.49)
 - No substantial change when adjusted for age, race/ethnicity, or cigarette smoking
- Fasting vs. non-fasting specimens?

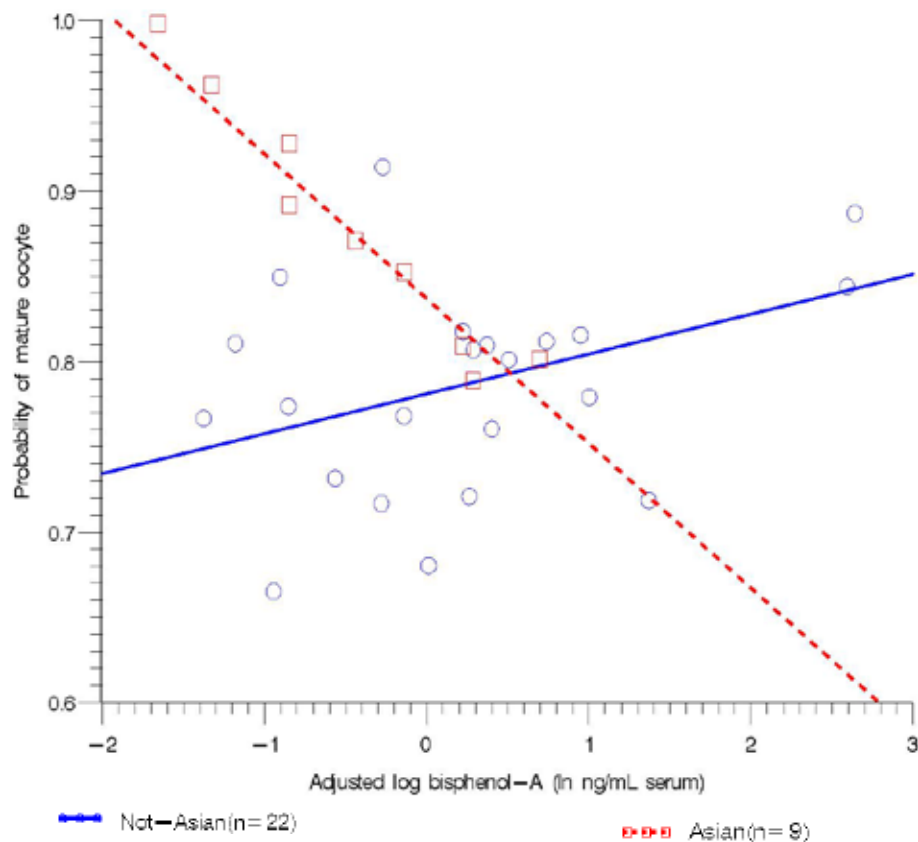
Increased BPA is associated with decreased peak estradiol (E_2) in 42 women

Note log scale ↓



- Doubling of BPA:
 - Reduction in peak E_2
 - -11% (95% CI -89%, 27%)
 - Reduction in peak E_2 per mature-sized follicle
 - -9% (95% CI -15%, -2%)
- Adjusted for AFC, cigarette smoking, & race/ethnicity
- BPA interfere with E_2 synthesis?

Increase in female BPA associated with decreased oocyte maturity in ICSI cases



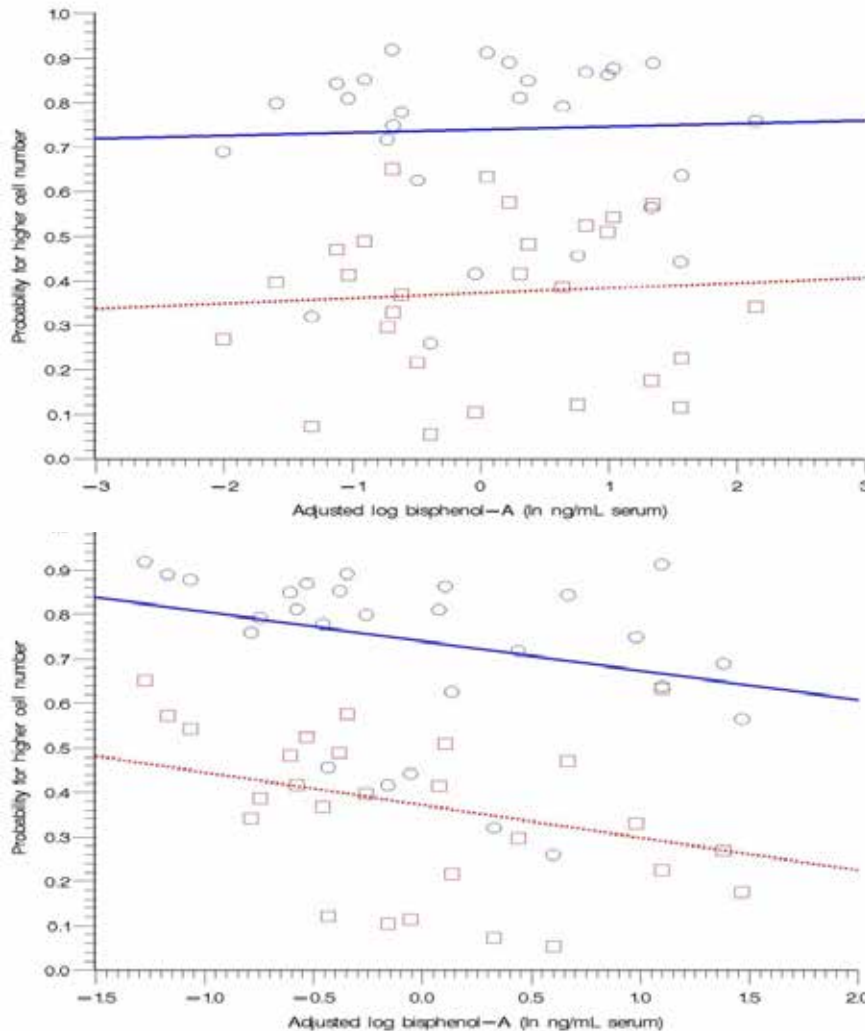
- Doubling of BPA:
 - A reduction in probability for a mature oocyte among Asian women
 - -9% (95% CI -17%, 0%)
 - No effect on probability for mature oocyte among not-Asian women
 - 3% (95% CI -4%, 10%)
- Adjusted for age & cigarette smoking
- BPA interfere with 1st meiotic division?

Increase in female BPA associated with decreased oocyte fertilization

Predictor variable	Model for oocyte fertilization			
	aRR	Low 95% CL	High 95% CL	P value
BPA-female (ng/mL serum)	0.45	0.31	0.66	<.0001
BPA-male (ng/mL serum)	0.96	0.88	1.04	.308
Age-female (y)	0.98	0.95	1.02	.261
Age-male (y)	0.96	0.94	0.99	.008
Race-female (not Asian/Asian)	1.17	0.70	1.97	.547
Race-male (not Asian/Asian)	1.25	0.75	2.08	.386
Smoking-female (never/ever)	1.15	1.03	1.28	.014
Smoking-male (never/ever)	0.82	0.69	0.98	.028
BPA-female × race-female	—	—	—	—
BPA-female × age-female	1.02	1.01	1.03	<.0001
BPA-female × BPA-male	1.06	1.02	1.10	.001
BPA-male × race-male	0.88	0.79	0.98	.022

- Doubling of BPA:
 - Reduced probability for normal fertilization for women
 - 55% (95% CI -69%, 34%)
 - Affected by age & race/ethnicity
 - Reduced probability for normal fertilization for Asian men only
 - 12% (95% CI -21%, -2%)

Increased male BPA associated with decreased embryo cleavage rate



- Doubling BPA:
 - No effect for women
 - 4% (95% CI -19%, 33%)
 - Reduced odds for men
 - -71% (95% CI -40%, 2%)
- Adjusted for partner BPA, age & race/ethnicity
- BPA in male partner interfere with early embryo cleavage?

Summary of BPA findings from the SMART Study

- Male BPA exposure may influence embryo quality in couples undergoing IVF
- A doubling of female BPA exposure is associated with a 50% reduction in normally fertilized oocytes with IVF
- There may be a race/ethnicity-specific association between female BPA exposure & reduction in mature oocytes retrieved during IVF
- Increasing female BPA exposure alters the E₂ response during gonadotropin stimulation during IVF
- Non-dietary sources of BPA exposure may be important