HARVARD T.H. CHAN
SCHOOL OF PUBLIC HEALTH

MASSACHUSETTS GENERAL HOSPITAL

ENVIRONMENT AND REPRODUCTIVE HEALTH
EARTH STUDY

Annual Newsletter

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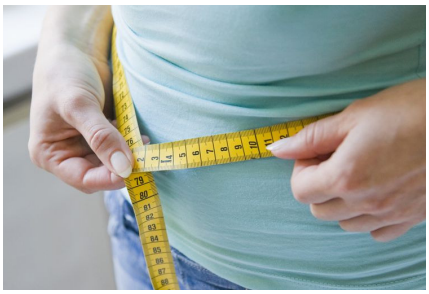
We are excited to share the 4th annual newsletter from the Environment and Reproductive Health (EARTH) Study! Thanks to your participation, we continue to learn about the impact of the environment and diet on fertility and pregnancy outcomes among couples recruited from the Massachusetts General Hospital (MGH) Fertility Center. In this newsletter, we describe recent findings and future research directions. I want to take this opportunity to sincerely thank you all for making this research possible. I would also like to recognize the outstanding work performed by our research team at the Harvard T.H. Chan School of Public Health and the continued support of the MGH faculty and Fertility Center staff.

Sincerely,
Russ Hauser, MD, ScD, MPH
Chair, Department of Environmental Health
Professor, Harvard T.H. Chan School of Public Health and Harvard Medical School

BOXERS OR BRIEFS? LOOSE-FITTING UNDERWEAR MAY BENEFIT SPERM PRODUCTION

Mínguez-Alarcón et al., Human Reproduction 2018.

Elevated scrotal temperatures are known to adversely affect testicular function. Although researchers have studied the relationship between men's underwear and sperm production, the EARTH Study is the first to investigate whether different types of underwear affect other markers of testicular function such as reproductive hormones and sperm DNA fragmentation. We found that on average among men who reported most frequently wearing boxers had higher semen quality and normal levels of hormones compared to men who did not wear primarily boxers. Since sperm production takes around 90 days, men could improve this function by changing to looser underwear such as boxers.



IMPACT OF WAIST CIRCUMFERENCE ON INFERTILITY TREATMENT OUTCOMES

Li et al., American Journal of Obstetrics and Gynecology 2019.

Infertility specialists have known for decades that body weight affects fertility. More recently, they have shown that it also affects the likelihood of having a successful IVF cycle. The most commonly used metric to assess a person's weight in relation to their height is the Body Mass Index (BMI). However, BMI does not distinguish between muscle and fat, so more toned people may appear to have a higher BMI. Since most people carry additional weight around the waist, measuring waist circumference can easily help differentiate between muscle and fat for a given BMI. The EARTH Study is one of the few studies to use this method and found that the chances of having a live birth using IVF were lower for women with larger waists than for women with smaller waists, independently of their BMI. Women with a waist under 30 inches had a 53% chance of success whereas women with a waist over 34 inches had a 38% chance of success. In terms of fertility, these findings show that BMI does not tell the whole story of body weight and that considering where the weight is distributed is just as important.

CHEMICALS IN CONSUMER PRODUCTS COULD AFFECT GLUCOSE LEVELS IN PREGNANCY

Bellavia et al., Environmental Research 2019.

Parabens are chemicals found in personal care products, food, and certain medications. They are used as preservatives and anti-microbials. They have endocrine disrupting properties. We evaluated paraben concentrations measured in urine samples collected during pregnancy and found that women with higher levels of a mixture of parabens have higher glucose levels in pregnancy. Higher butyl paraben—one of several parabens commonly used—appeared to affect pregnancy glucose levels the most. Women with higher glucose levels during pregnancy are at increased risk of developing gestational diabetes, having a preterm birth or Caesarean section. Higher glucose exposure during the prenatal period is associated with higher birth weight, as well as body fat and insulin resistance in mid-childhood.

EFFECTS OF DIETARY PATTERNS ON IVF OUTCOMES

Gaskins et al., American Journal of Obstetrics and Gynecology 2019.

Over the last 5 years, we have learned how specific dietary factors affect outcomes of in vitro fertilization (IVF). Using this data, we created an overall "Pro-Fertility" dietary pattern based on the foods and nutrients identified as being associated with IVF success. The "Pro-Fertility" diet promotes the consumption of higher amounts of supplemental folic acid, vitamin B12, vitamin D, low-pesticide residue produce, whole grains, dairy, soy foods, and seafood. This dietary pattern was then compared to more commonly recommended patterns such as the Mediterranean diet and alternate Healthy Eating Index 2010 to see which was the most beneficial for women undergoing IVF. Overall, the "Pro-Fertility" diet was associated with higher probability of live birth following IVF. Our data suggest that commonly recommended diets may not provide the most suitable guidance for women undergoing infertility treatment in the United States.

RESIDENTIAL PROXIMITY TO MAJOR ROADWAYS AND THE IMPACTS ON REPRODUCTION

Gaskins et al., Environment International 2018.
Nassan et al., International Journal of Hygiene and Environmental Health 2018.

Traffic emissions are a major source of air pollution with the highest risk of exposure occurring near major roadways. Proximity to major roadways also captures different traffic-related air pollutants in addition to associated exposures such as traffic-related noise. Over the past decade, exposure to traffic-related air pollution has become increasingly recognized as potentially detrimental to reproductive health in both females and males. This includes impacts on late pregnancy endpoints including preterm birth, low birth weight, gestational diabetes, and preeclampsia. Due to this concern, the EARTH Study explored the relationship between higher exposure to traffic-related air pollution and IVF outcomes. Overall, we found that women who resided within 50 meters of a major roadway had lower probability of embryo implantation and live birth following IVF. However, among men we did not find an association between the distance to major roadways and semen quality and reproductive hormones measured in blood.

AIR Study

AIR POLLUTION, IN VITRO FERTILIZATION, AND REPRODUCTIVE OUTCOMES

EARTH Study participants may be eligible to participate in a pilot study that examines how exposure to particulate matter air pollution is associated with reproductive outcomes of IVF.

What is particulate matter air pollution?

Particulate matter (PM) pollution is a complex mixture of extremely small particles and liquid droplets that get into the air. This type of pollution is made up of a number of components including acids, organic chemicals, metals, soil or dust particles, and allergens. Small particles less than 10 micrometers in diameter pose the greatest risk to human health, because they can get deep into the lungs and may get into the bloodstream. In the AIR Study, we are measuring these types of particles which are smaller than the width of human hair and not visible to the naked eye.

Why are we studying PM pollution?

There is some concern that higher exposure to fine particulate matter air pollution may be a risk factor for early pregnancy loss. However, more research is needed to determine if there is any link between PM pollution and miscarriage. The AIR Study is unique in that it measures women's personal exposures to particulate matter, as opposed to solely relying on ambient measures of air pollution.

If you are interested in enrolling or would like more information, please contact the EARTH Study Team.

EARTH STUDY

IF YOU HAVE ANY QUESTIONS, PLEASE CONTACT US AT:
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