Reproductive Health and The Environment

リプロダクティブ・ヘルスと環境

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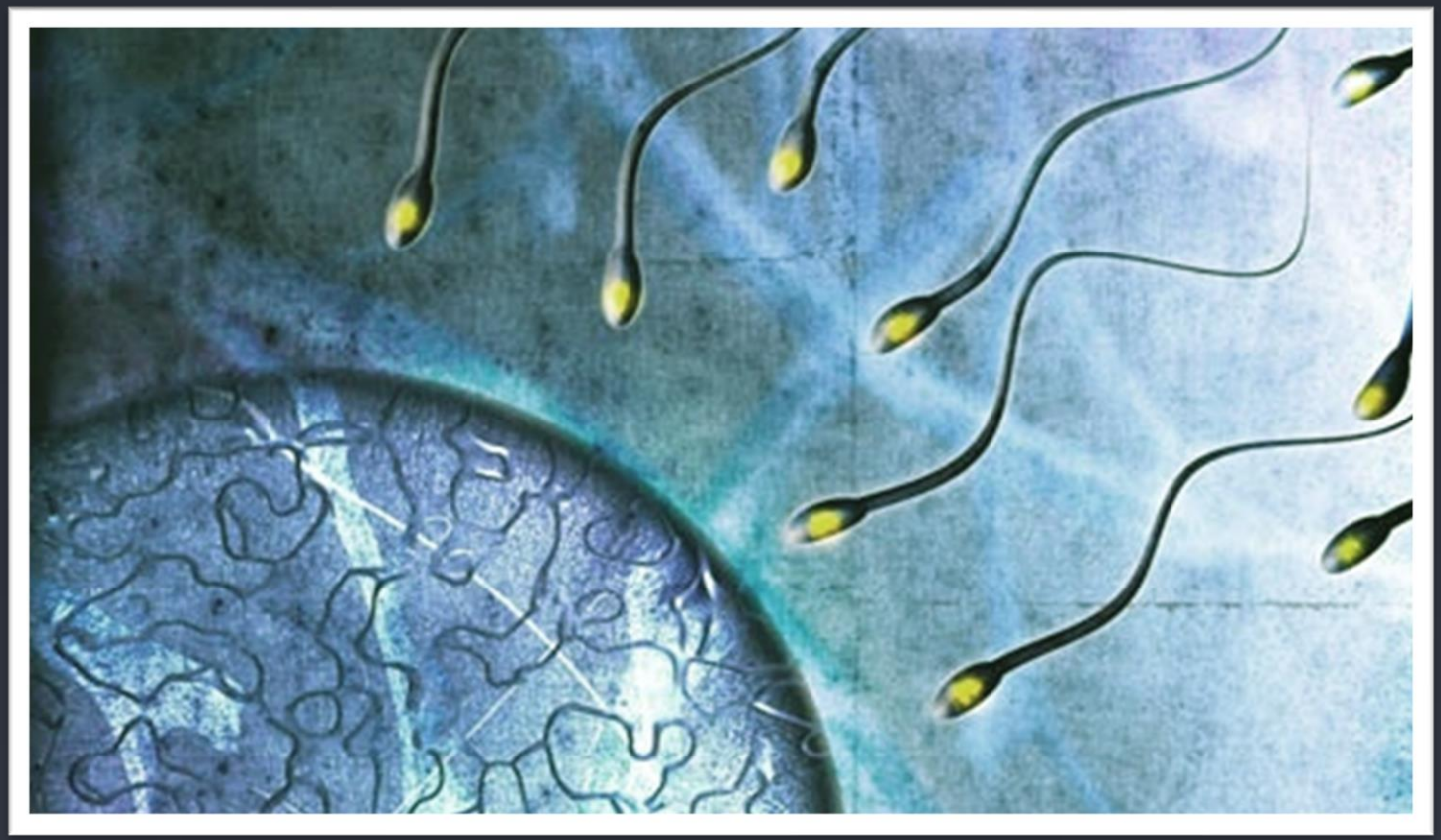
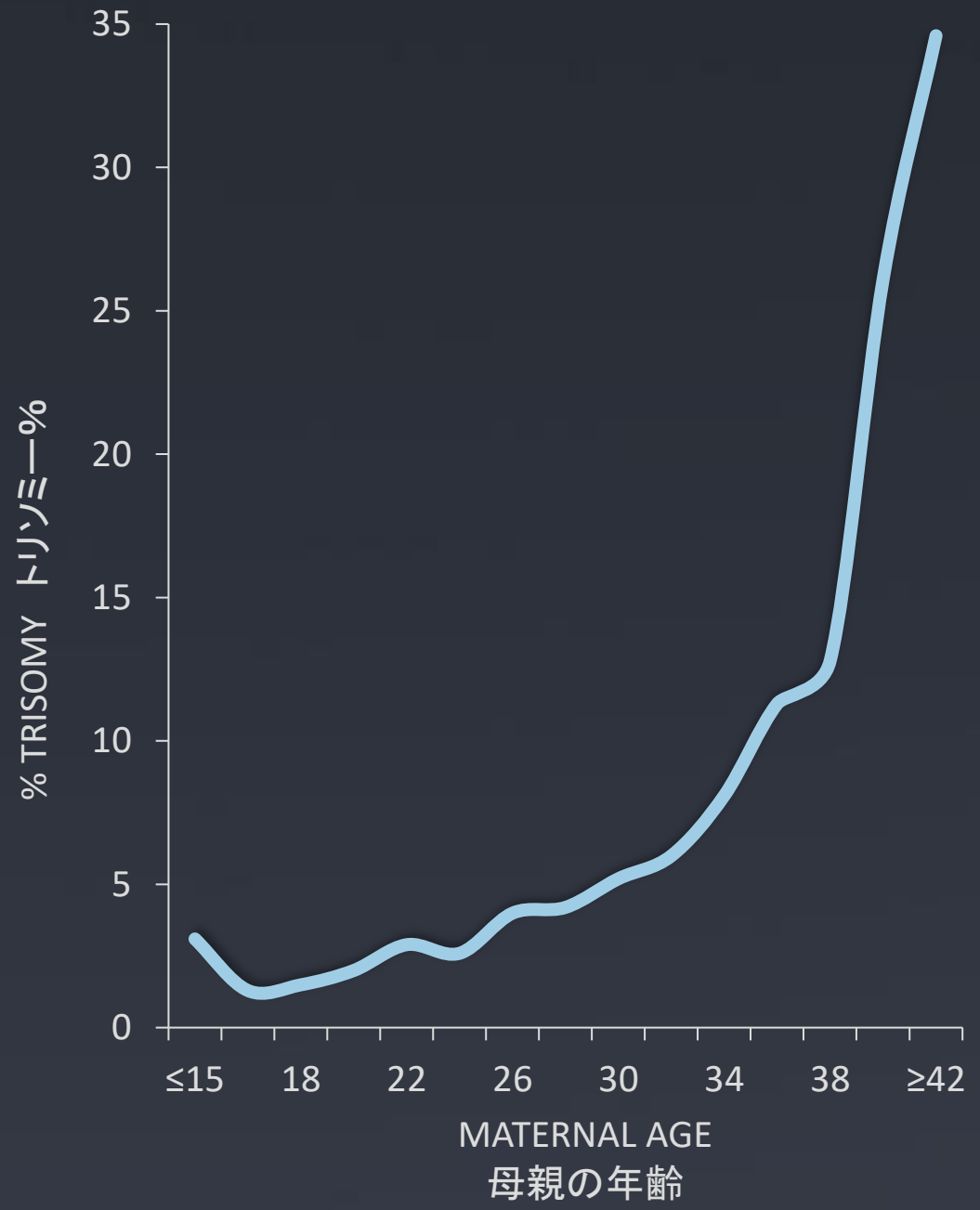
パトリシア・ハント
ワシントン州立大学



年齢と受胎率
AGE and FERTILITY

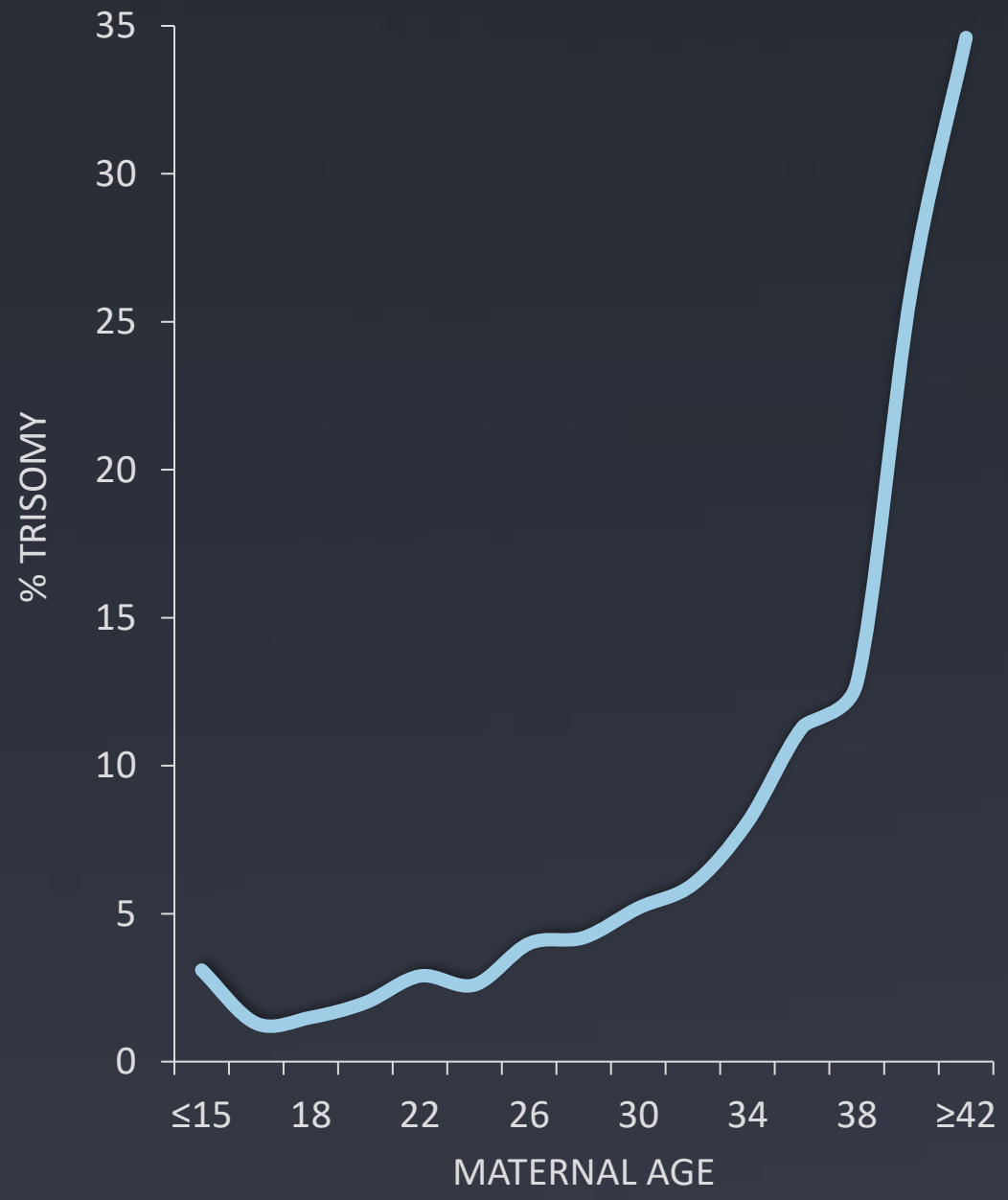
Chromosomally abnormal pregnancies increase with age

染色体異常の妊娠が年齢とともに増加



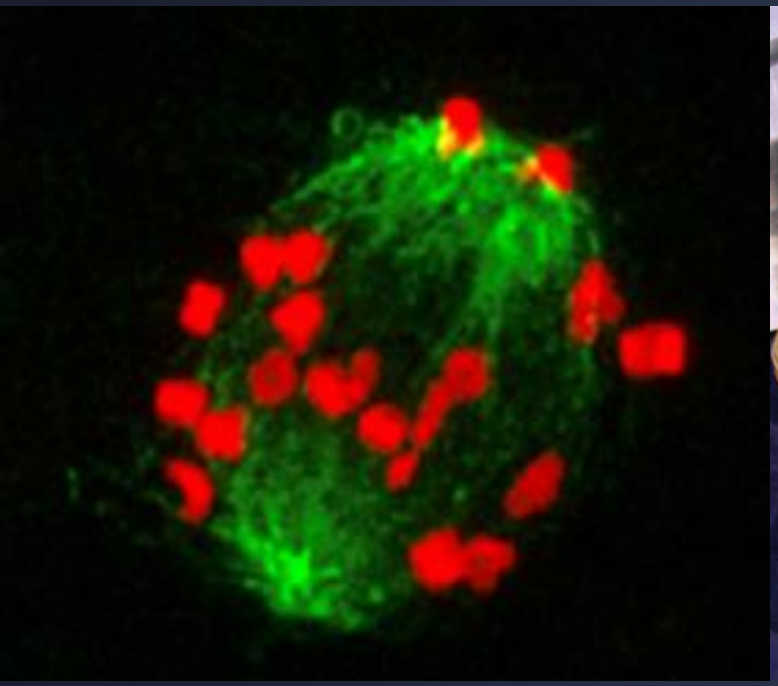
Do subtle hormonal changes affect the egg?

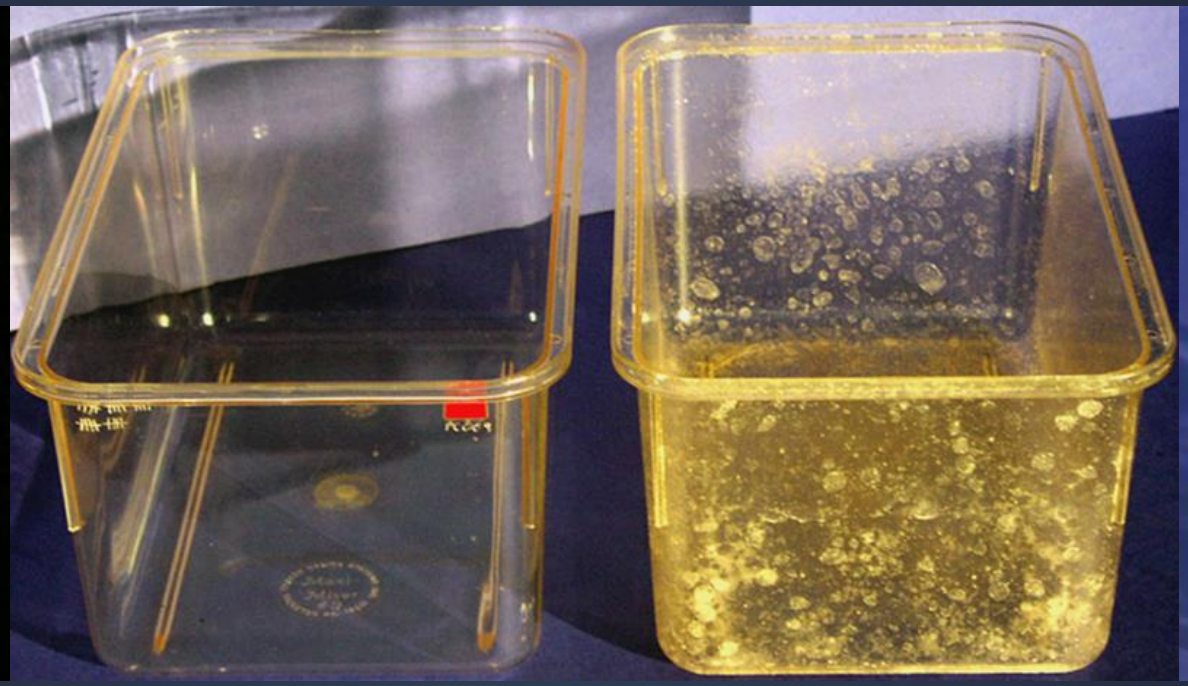
わずかなホルモンの変化は卵子に影響を与えるのか？



Experiments that made me an accidental toxicologist

私を偶然毒物学者にした実験





Hunt et al, 2003
Current Biology

BPA exposure = miscarriages, birth defects
BPAばく露＝流産、先天異常

Current Biology, Vol. 13, 546–553, April 1, 2003, ©2003 Elsevier Science Ltd. All rights reserved. DOI 10.1016/S0960-9822(03)00189-1

Bisphenol A Exposure Causes Meiotic Aneuploidy in the Female Mouse

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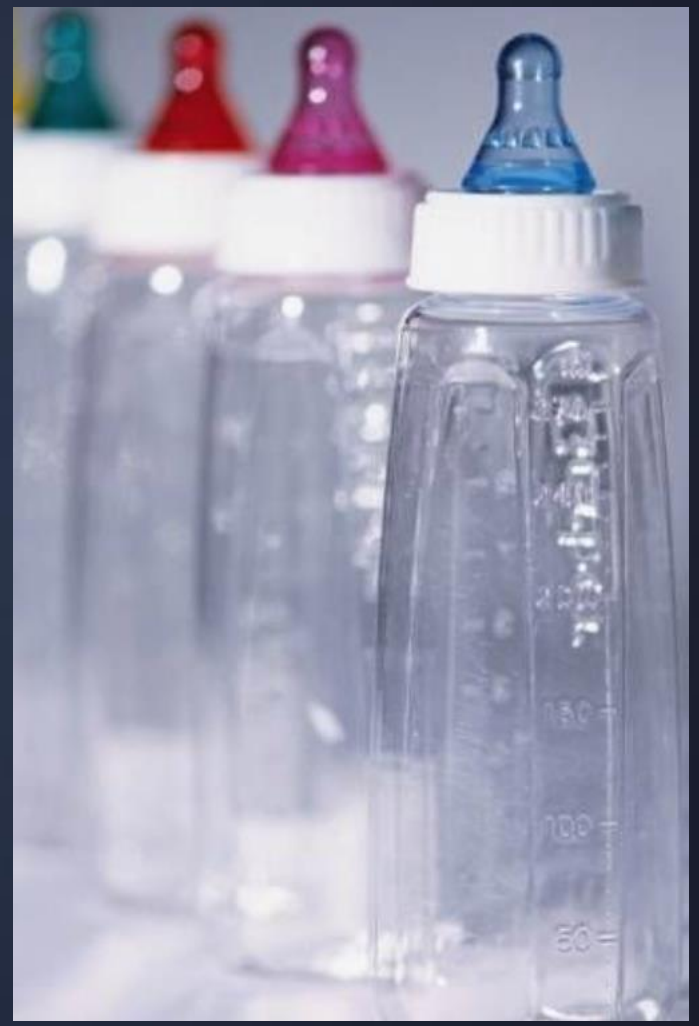
Summary

Background: There is increasing concern that exposure to man-made substances that mimic endogenous hormones may adversely affect mammalian reproduction. Although a variety of reproductive complications have

are the leading cause of miscarriage, congenital defects, and mental retardation [1]. Because almost all such aneuploidy derives from meiotic errors, considerable effort has been directed at identifying factors that increase meiotic nondisjunction. A number of potential risk factors, including irradiation (e.g., [2, 3]), smoking or drinking (e.g., [4, 5]), oral contraceptives and fertility drugs (e.g., [4, 6]), and environmental pollutants/pesticides (e.g., [7]), have been suggested. However, significant effects have been small and difficult to verify or disputed, making positive associations hard to establish. In part, this may reflect difficulties in detection. For example, the extraordinary effect of maternal age on aneuploidy may obscure less obvious associations. Further, previous studies may have focused on the "wrong" population; that is, most utilized liveborns, although virtually all aneuploidy terminates in miscarriage. Thus, the contribution of environmental insults to meiotic chromosome errors remains unknown.

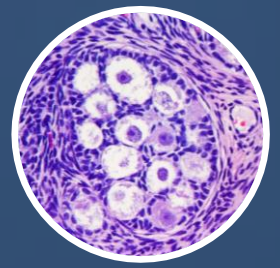
We recently experienced an inadvertent environmental exposure in our mouse colony to 2,2-(4,4-dihydroxydiphenol)propane, or bisphenol A. Bisphenol A (BPA) is



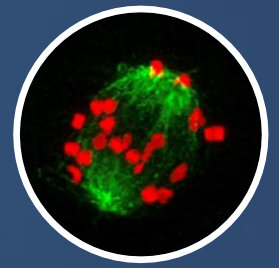
Making EGGS

Fetal
胎児

Perinatal
周産期



Adult
成人

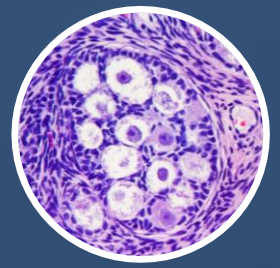


Making EGGS

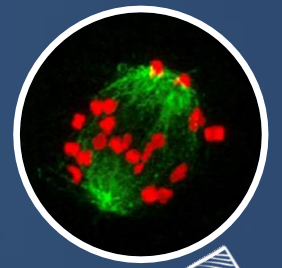
BPA

Fetal
胎児

Perinatal
周産期



Adult
成人



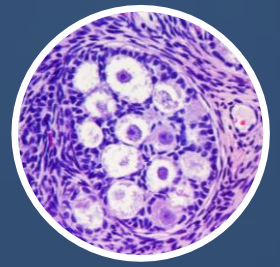
Abnormal Eggs
異常な卵子

Making EGGS

BPA

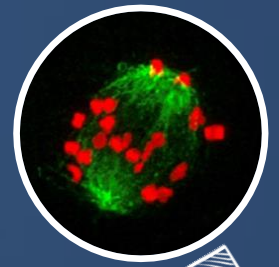
Fetal
胎児

Perinatal
周産期



BPA

Adult
成人



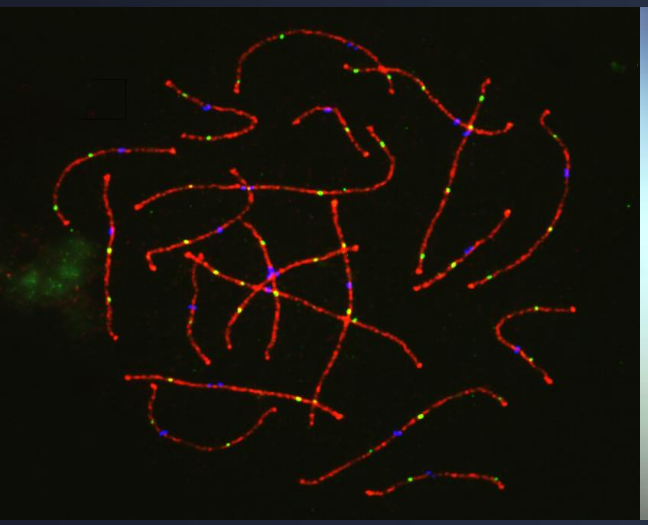
Abnormal Eggs
異常な卵子

Abnormal Eggs
異常な卵子

A Grandmaternal Effect
グランドマザー効果

Nicole Caldwell, photographer

The same effect in different SPECIES
異なる種における同じ効果




A large goup of **SUSPECTS**

大きなグループの

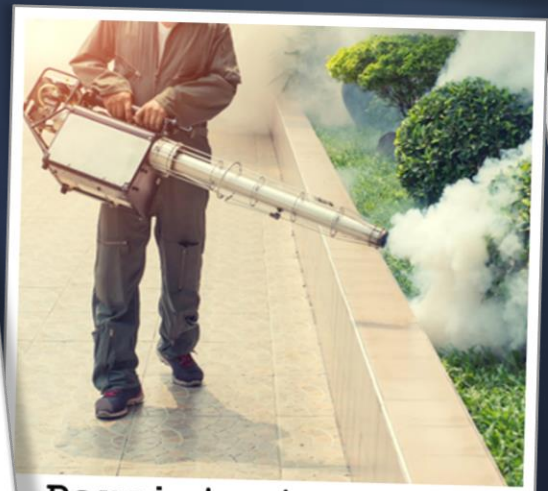
容疑物質

Bisphenol A

Bisphenol replacements

Pesticides/ Herbicides

Perfluorinated chemicals



Persistent organic pollutants(DDT, PCB)

Flame retardants

Heavy metals (Lead/mercury)

Our endocrine system

我々の内分泌系

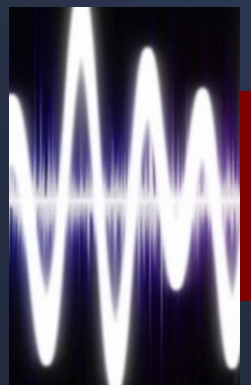
Metabolism（代謝）

Growth（成長）

Sexual function（性機能）

Sleep（睡眠）

Behavior（行動）



EDCs

Fetal development:
the most vulnerable stage

胎児の発育：
最も影響を受けやすい時期

EDCs represent
not just a public health problem
or indeed a global health problem,
but a planetary health problem.

EDCは
単なる公衆衛生の問題ではなく
世界的な健康問題 だけでもなく、
地球規模の健康問題である。

The Lancet Diabetes & Endocrinology
2019 Editorial

ランセット糖尿病・内分泌学
2019年 エディトリアル

Obesity
肥満

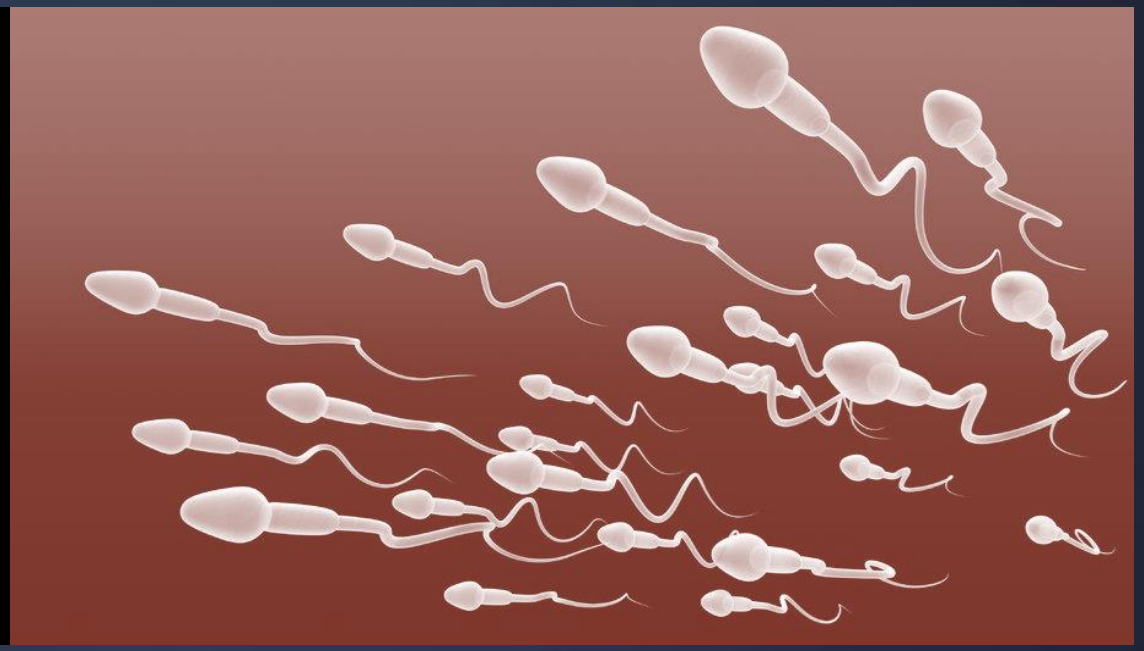
Heart disease
心疾患

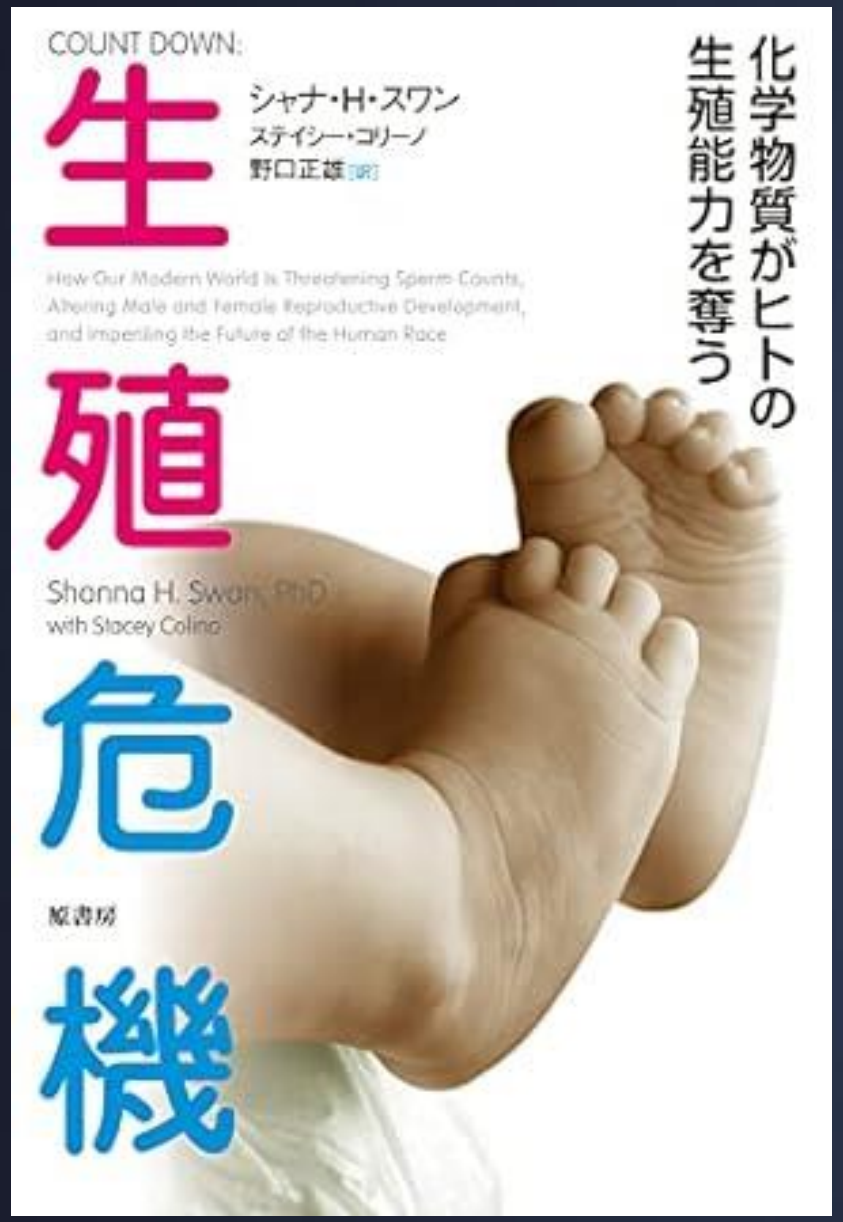
Infertility
不妊

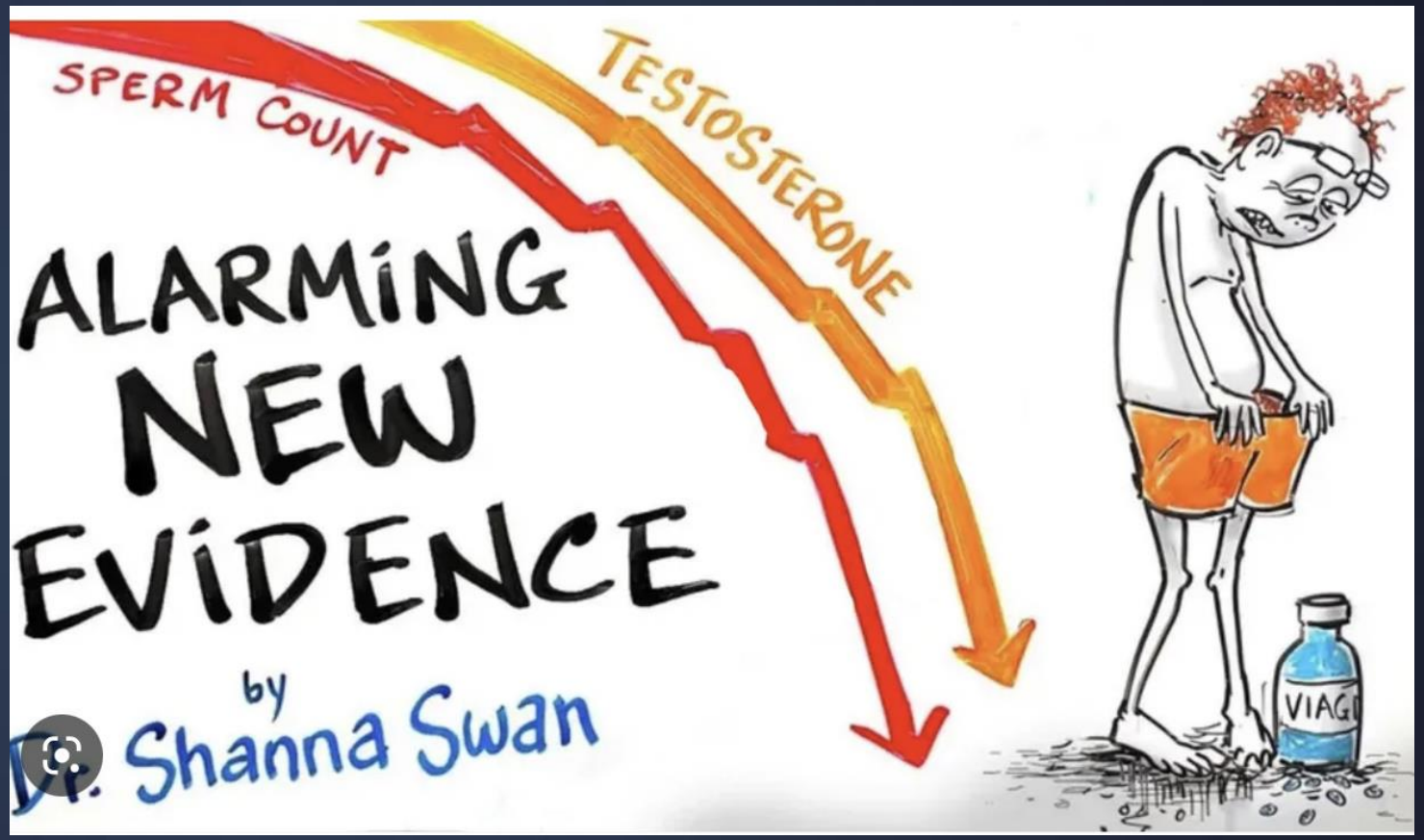
Diabetes
糖尿病

Autism
自閉症

What about the MALE?
男性はどうですか？



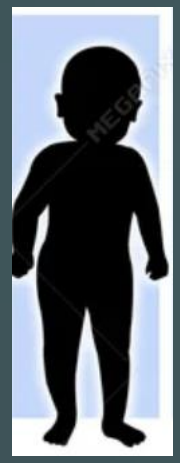

COUNT DOWN:
生殖危機
シャナ・H・スワン
ステイシー・コリーノ
野口正雄[訳]
How Our Modern World Is Threatening Sperm Counts, Altering Male and Female Reproductive Development, and Imperiling the Future of the Human Race
化学物質がヒトの生殖能力を奪う
Shanna H. Swan, PhD
with Stacey Colino
原書房


SPERM COUNT
TESTOSTERONE
ALARMING NEW EVIDENCE
by Dr. Shanna Swan
VIAG

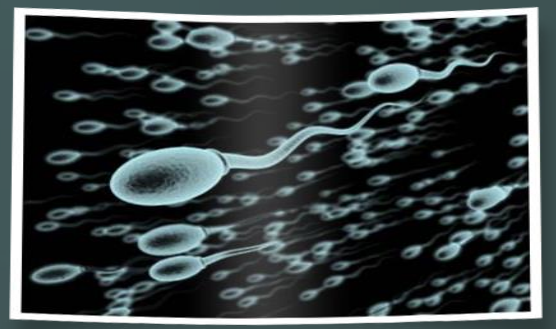
Making SPERM

Fetal
胎児

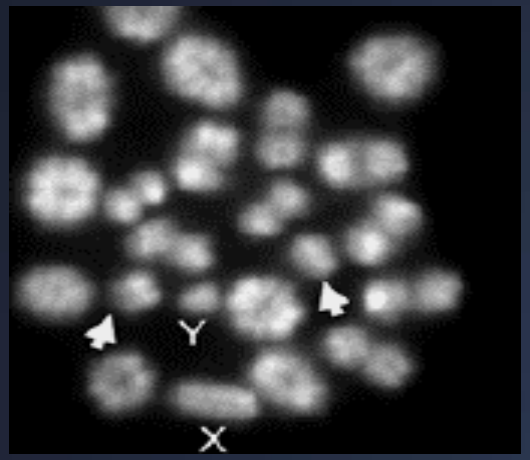
Neonatal
周産期



Adult
大人



DECLINING SPERM COUNTS
減少する精子数



Increased Errors
エラーの増加

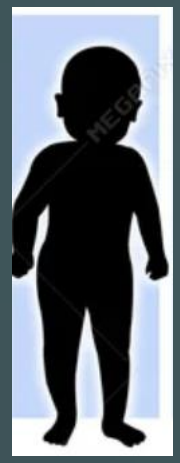
Fewer Sperm
精子の減少

Vrooman et al, 2015
PLoS Genetics

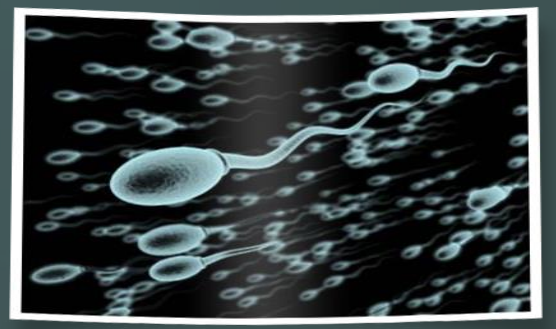
Making SPERM

Fetal
胎児

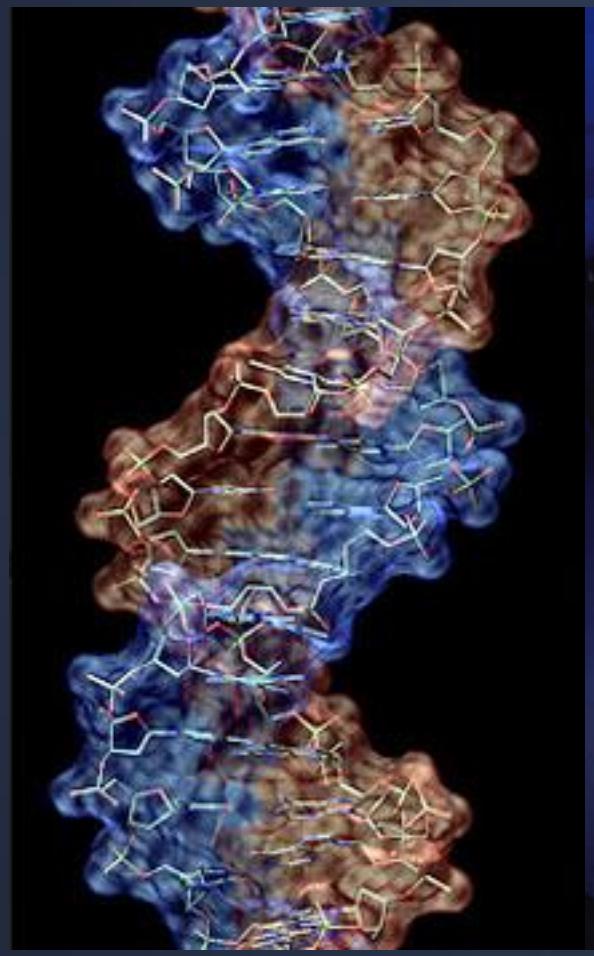
Neonatal
周産期

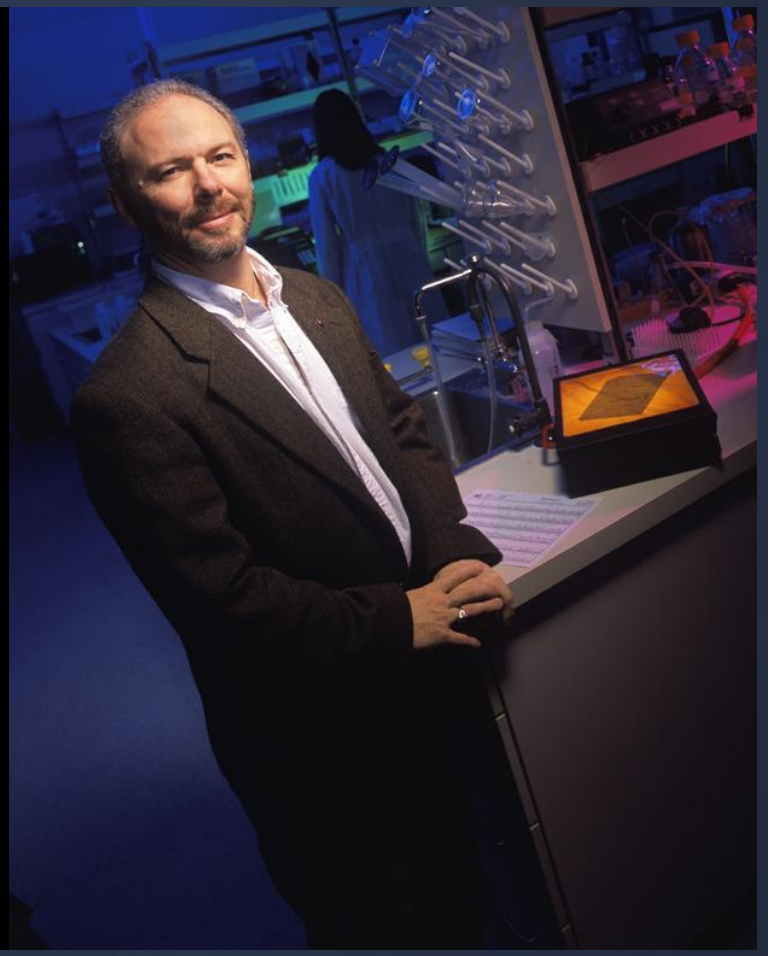


Adult
大人



“Transgenerational” EFFECTS
「世代を超えた」影響





Mike Skinner
Washinton State University

EXPERIMENTAL APPROACH
実験的アプローチ

Tegan Horan

Cornell University

REAL WORLD
現実の世界

CONTAMINATION
汚染

Estrogen exposed
エストロゲンばく露

↓

Sons　息子

↓

Grandsons　孫

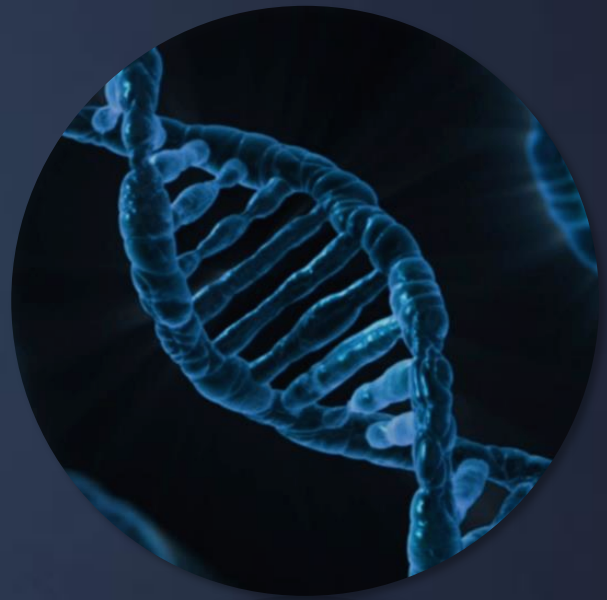
↓

Great Grandsons　ひ孫

Bisphenol S（BPS)

ビスフェノールS（BPS)

Bisphenol A (BPA)
ビスフェノールA（BPA)

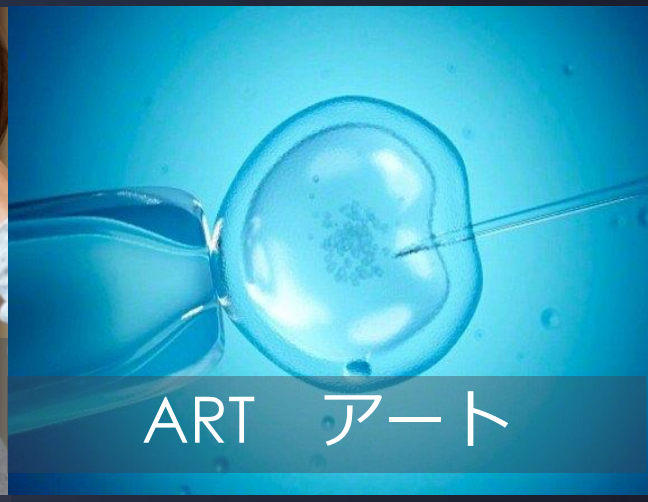


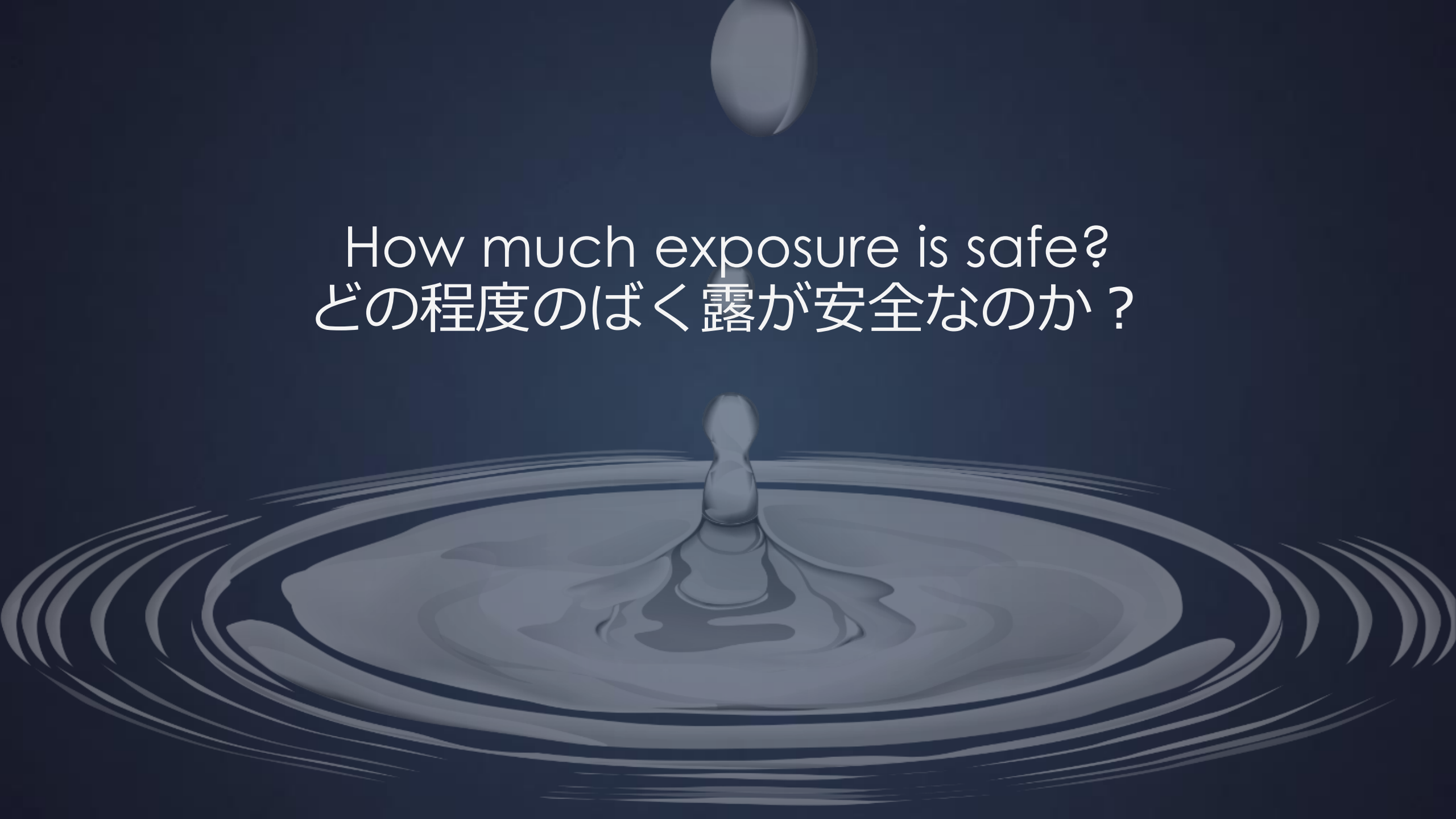
We are
environmentally
responsive
我々は
環境に
影響を受ける


Feast (obesity)
ごちそう（肥満）


Famine　飢饉

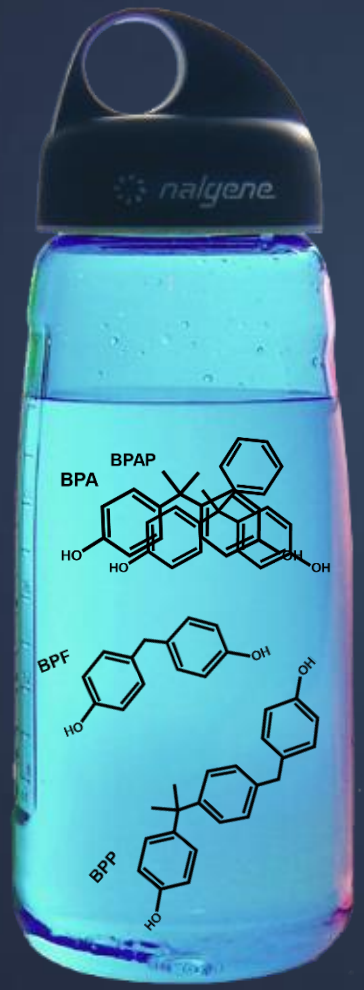

Emotional stress
感情的ストレス

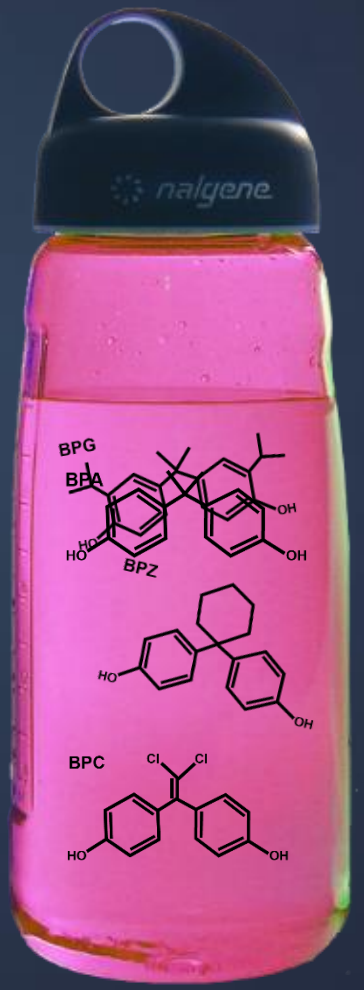

ART　アート

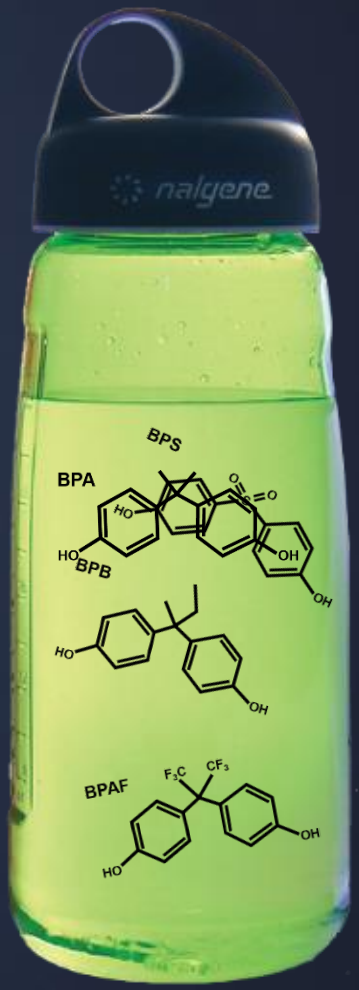

How much exposure is safe?
どの程度のばく露が安全なのか？


How exposed are we?
我々はどのようにばく露しているのか？


NO
BPA
NO BISPHENOL A

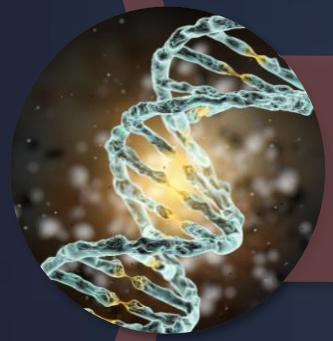

nalgene
BPA
BPAP
BPF
BPP


nalgene
BPG
BPA
BPZ
BPC


nalgene
BPS
BPA
BPB
BPAF


WHY AREN'T THESE CHEMICALS REGULATED?
なぜこれらの化学物質は
規制されないのか？

Toxins毒物



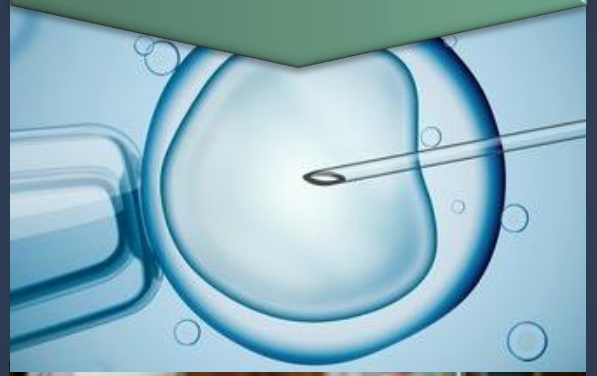
Mutagens
変異原物質

Carcinogens
発がん物質

Why this matters?
何故これが重要なのか

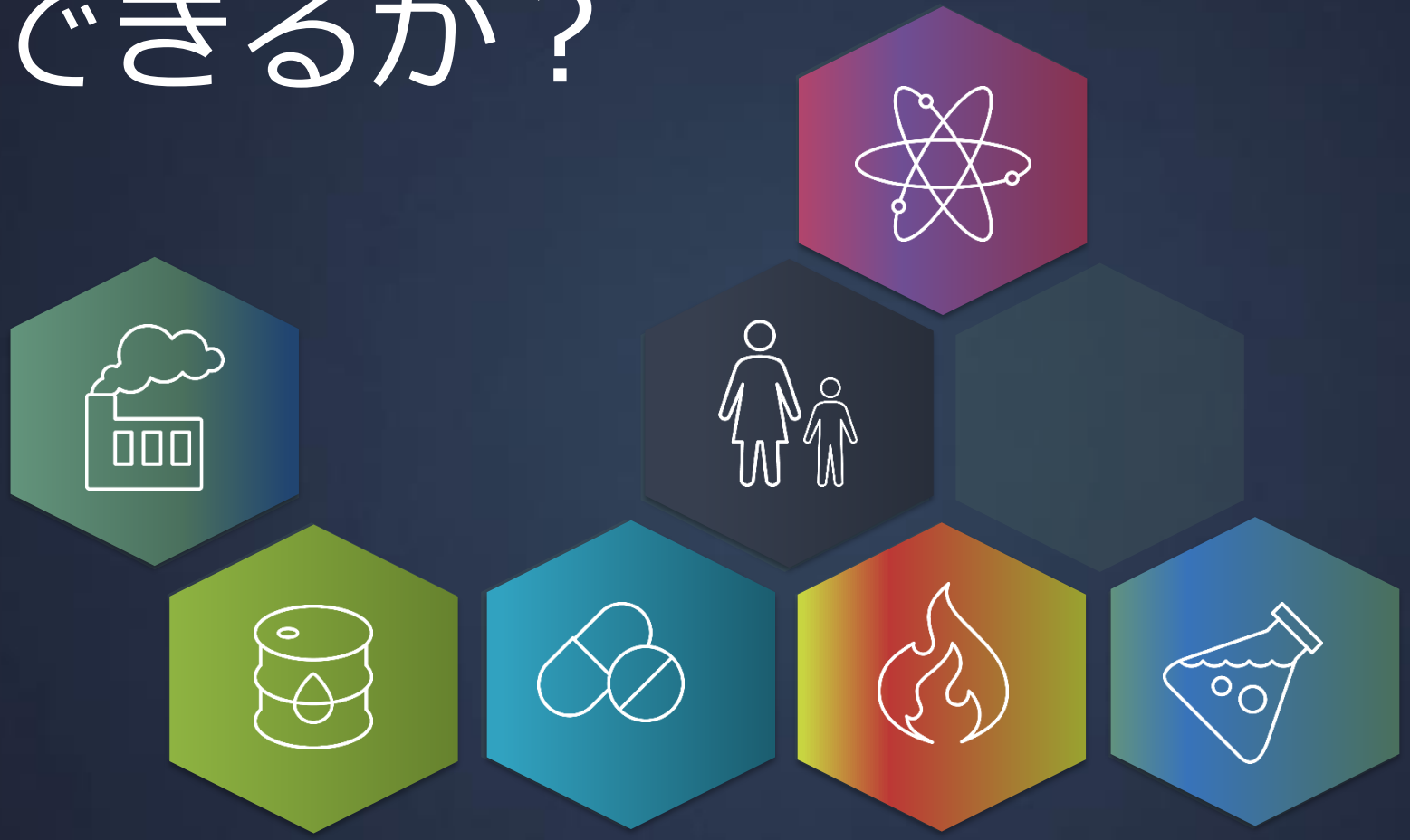
Research
研究

Patient care
患者ケア



Our lives
我々の生活

What can you do?
何ができるか？



Develop chemical awareness
化学物質に対する意識を高める

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WASHINGTON STATE UNIVERSITY

***NIEHS, NICHD**

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