

What's in Your Water?

The Impact of Chemical Pollution

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How Many Chemicals Exist in Our World?

- 🌐 According to the Chemical Abstract Service (CAS), a division of the American Chemical Council, their database contains more than **166 million** unique organic and inorganic chemical substances (cas.org/content/chemical-substances)
- 🌐 Updated daily with about **15,000 NEW** substances. That is equivalent to 625 new chemical requests/hour
- 🌐 EPA Toxic Substances Control Act (TSCA) identifies more than **86,000** substances (epa.gov/tsca-inventory/about-tsca-chemical-substance-inventory)

Health Implications (Air)

-  Diseases caused by “chemical” pollution were responsible for an estimated 9 million premature deaths in 2015 or 16% of all deaths worldwide
-  Three times more deaths than from AIDS, tuberculosis, and malaria combined
-  Fifteen times more deaths than from all wars and other forms of violence
-  In the most severely affected countries, pollution-related disease is responsible for more than one death in four

Health Implications

- 🌐 **Breast, endometrial, ovarian, prostate, testicular and thyroid CANCERS have been increasing over the past 40–50 years**
- 🌐 **The number of people with Obesity and TYPE 2 DIABETES increased from 153 million to 347 million between 1980 and 2008**
- 🌐 **Neurobehavioral disorders (ADHD) have increased over past decades as well as ASTHMA, MENTAL RETARDATION and CHILDHOOD CANCERS**
- 🌐 **WHO - “The speed with which the increases in disease incidence have occurred in recent decades rules out genetic factors as the sole plausible explanation”**

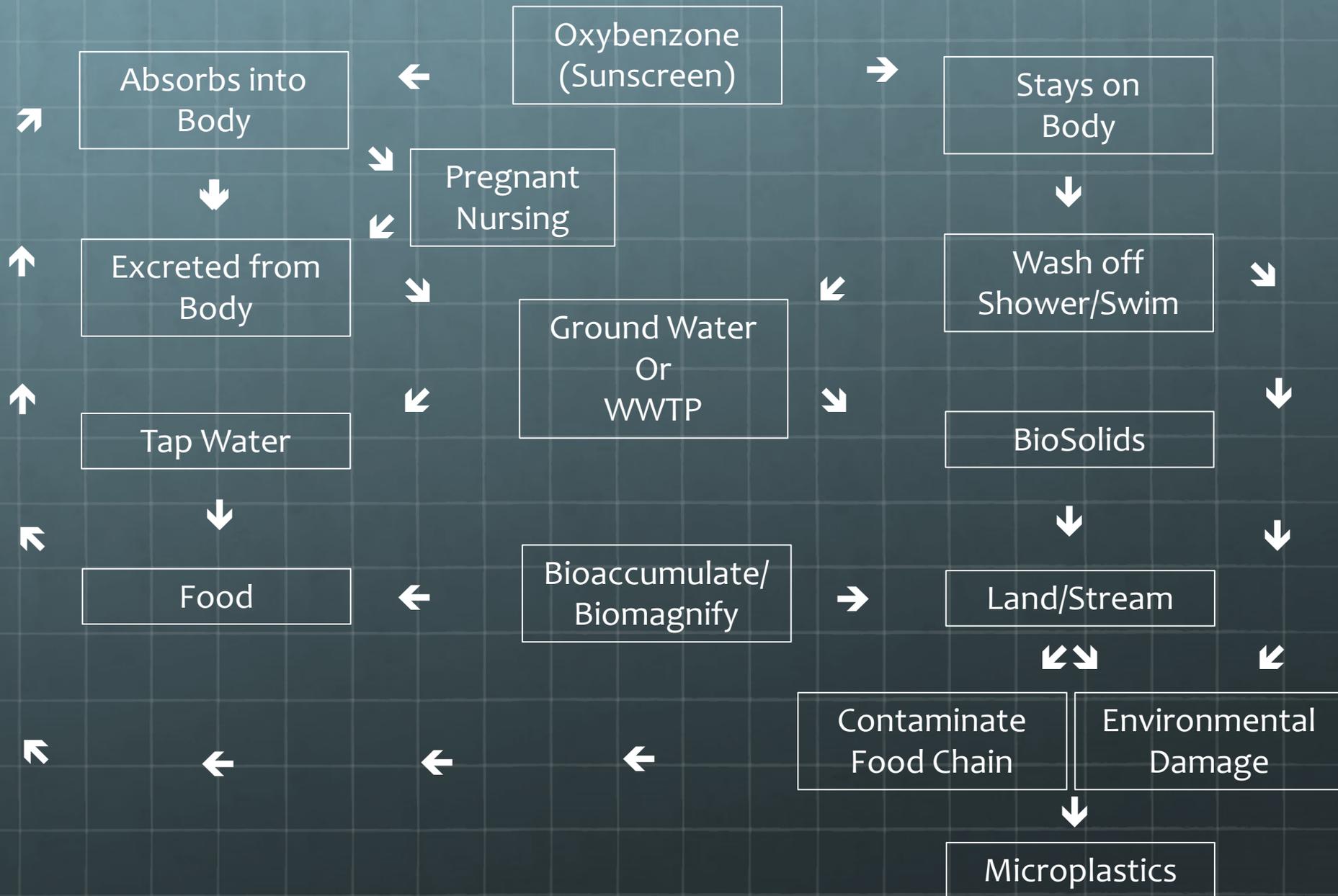
Exposure

(hundreds to thousands of chemicals daily)

- 🌐 Preservatives (nitrosamines & formaldehyde)
- 🌐 Flame/Stain Repellants (PFAS & PFOS)
- 🌐 Plasticizers (bisphenols & phthalates)
- 🌐 Prescription drugs (birth control & anti-depressants)
- 🌐 Over-The-Counter Drugs (sunscreen & antibacterial)
- 🌐 Cosmetics (parabens & fragrances)
- 🌐 Agricultural Chemicals (neonics & glyphosate)
- 🌐 Industrial “Forever Compounds” – POPs (PCB & 1,4-dioxane)

POPs - Half-life varies depending on environment = 2 - 12 years in soil. PCBs can persist in a mother's body for up to 7 years and 1,4-dioxane half-life = 2 - 5 years in groundwater

Life Cycle



Microplastics (MP)

- Polyethylene (PE) microplastics were tested “as-is” or where spiked with either benzopyrene (tires), perfluorooctanesulfonic acid - PFOS (scotchgard) or oxybenzone (sunscreen) for 12 days
- Fish exposed to untreated MP did not show toxic effects
- MP-PFOS decreased embryonic survival and prevented hatching
- MP-benzopyrene or MP-oxybenzone exhibited reduced growth, increased developmental anomalies and abnormal behavior
- Pollutant transfer by direct contact to MPs need to be included in ecotoxicological risk assessment because they extend exposure
- Microplastic particles get stuck when traveling through porous materials (soil and sediment) but later break free and often continue to move substantially further (FYI ... PE = 48-yr half-life in water)

Study - Bihanic et al. Marine Pollution Bulletin 154 (2020) 111059

Last bullet point - Bismark et al. Science Advances 13 Nov 2020: Vol. 6, no. 46

Home

- 🌐 Researchers measured levels of ubiquitous compounds in the blood and urine of 69 toddlers and preschoolers and then, using fecal samples, studied gut microbiomes
- 🌐 Phthalates (detergents, plastic raincoats, shower curtains, soap, shampoo, and hair spray)
- 🌐 PFOS and PFAS (stain & water-repellent fabrics, coatings for carpets and furniture, nonstick cooking products, polishes, paints, and cleaning products)
- 🌐 Reduction in the amount and diversity of bacteria and fungi populations
- 🌐 Children who had high levels of chemical compounds in their blood also had in their gut several types of “dehalogenating” bacteria that have been used to clean up toxic materials

Land

- 🌐 **BioSolids - human waste rich in Nitrogen, Phosphorous and hundreds to thousands of toxic chemicals; WWTP handle ~300 million pounds of feces daily (100+ billion pounds a year). Estimated that 60% of BioSolids were spread on farmland and gardens, as well as schoolyards and lawns**
- 🌐 **BioSolid Centers pollute air around them and farmlands using them report everything from well contamination to acute illness in humans to cows dying to algae blooms. Most concerns relate to PFAS and PCBs**
- 🌐 **Environmental official from Michigan recently said the state won't test for PFAS in milk because it doesn't want to put farmers out of business**
- 🌐 **WWTP treat sludge in several ways before labeling it fertilizer – air drying, pasteurization and composting are among common methods. Lime is employed to raise the pH level to eliminate odors, and about 95% of pathogens, viruses and other organisms are killed in the process**
- 🌐 **However, chemicals known to be in BioSolids are not removed**

Water

Arctic – Barrow's Alaska – Population 4,212

Compound	Hong Kong (n=60)	Tokyo (n=8)	New York (n=6)	Los Angeles (n=4)	Shantou (n=4)	Chaozhou (n=3)	Bangkok (n=2)	Arctic (n=14)
Avobenzene (BMDM)	24 - 721	78 - 104	70 - 87	67 - 109	53 - 100	LOD	36 - 38	18 - 70
Oxybenzone (BP-3)	39 - 5429	24 - 86	23 - 178	227 - 601	55 - 188	37 - 49	86 - 116	17 - 33
Octinoxate (EHMC)	89 - 4043	46 - 95	89 - 150	91 - 138	52 - 78	<LOD - 79	88 - 95	25 - 66
Octisalate (EHS)	61 - 1030	71 - 95	<LOD	53 - 120	<LOD	121 - 128	28 - 56	<LOD
Homosalate (HMS)	66 - 2812	65 - 110	91 - 114	142 - 270	<LOD	<LOD	29 - 59	<LOD
Octocrylene (OC)	103 - 6812	87 - 108	117 - 128	145 - 377	75 - 107	36 - 102	153 - 205	26 - 31

N= Number of Samples; <LOD = Below the Level of Detection

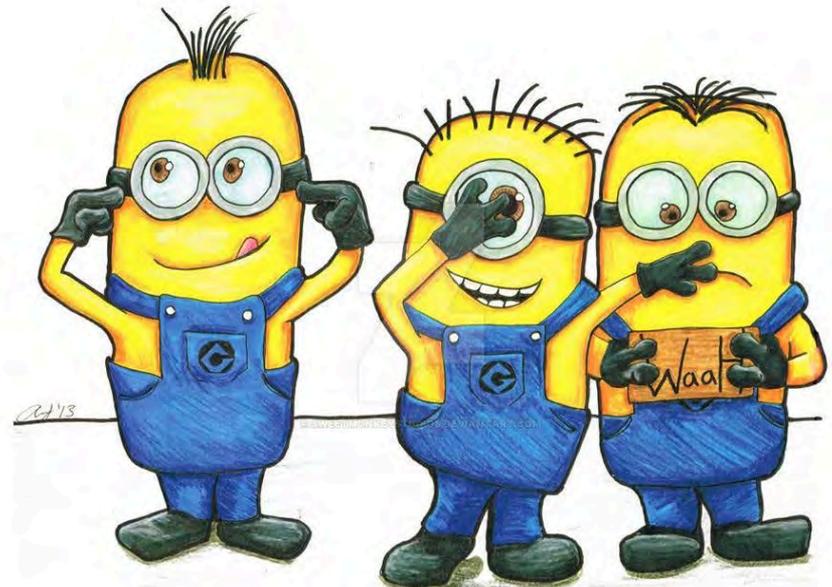
Tsui – Water Research 67 (2 0 1 4) 55-65

How Can We Protect Ourselves?



You Can Choose To Live
In a Bubble

You Can Choose To
Ignore Reality



What California Does!



Women
(18-49 Years)

Children
(1-17 Years)



Women
(50+ Years)

Men
(18+ Years)

1 TOTAL
SERVING
A WEEK

3 TOTAL
SERVINGS
A WEEK

OR

0 DO NOT
EAT

1 TOTAL
SERVING
A WEEK

A GUIDE TO EATING FISH *from* TOPAZ LAKE (MONO COUNTY)



**Eat the
Good Fish**
Eating fish that are
low in chemicals
may provide health
benefits to children
and adults.



**Avoid the
Bad Fish**
Eating fish with higher
levels of chemicals like
mercury or PCBs may
cause health problems
in children and adults.

**Choose the
Right Fish**
Chemicals may
be more harmful
to unborn babies
and children.



Rainbow Trout
♥ high in omega-3s



Sucker Species
Photo credit: Fisheries and Oceans
Canada, Douglas Mackinnon



Black Bass Species

Serving Size

A serving of fish is about the size and thickness of your hand. Give children smaller servings.

For Adults



For Children



California Office of Environmental
Health Hazard Assessment

web www.oehha.ca.gov/fish
email fish@oehha.ca.gov
phone (916) 324-7572

Eat only the
skinless fillet



Some chemicals are higher
in the skin, fat, and guts.

Eat only the meat



Updated 02/2020

What Industries Are Doing! Clean, Green or Blue Beauty

- 🌐 Clean at Sephora = Excluded Ingredients: Parabens, Sulfates (SLS & SLES), Phthalates, Formaldehydes, Oxybenzone, Coal Tar, Triclosan, Triclocarban, Benzophenone, Asbestos (Talc), Carbon Black, Lead, Lead Acetate, Mercury (Thimerisol) ... etc
- 🌐 Insoluble Plastic Microbeads (rinse off products only)
- 🌐 Synthetic Fragrances - in skincare, makeup, and hair products only (allowable at below 1%)
- 🌐 Brands need to conduct testing to ensure no contamination: Toluene, BHA, BHT (0.1%), DEA/TEA/MEA, Nanoparticles (defined by EU), Petrolatum (USP grade is ok), Paraffin (USP grade is ok), Phenoxyethanol (under 1% is ok)
- 🌐 1,4-Dioxane (thresholds below: 10 ppm for rinse off products and 3 ppm for leave-on products (NY State ruling))

Ideas

Steam Cleaner



Simple Cleaners



Reusable Products



Cloth Bags



What Can Be Done?

Education

-  Learn to protect yourself by limiting exposure

Consume Less

-  Reduce (minimize what you use)
-  Reuse (boxes, bottles, jars, bags - minimize waste)
-  Recycle (everything possible)

Restrict and/or Ban Toxic Chemicals

-  WHO - minimizing exposure, by banning substances, is a proven method to reduce the risk of toxicity