



Safer Plastics

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March 11, 2015**



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Contains portions of some materials initially prepared with support of the US Environmental Protection Agency Great Lakes Restoration Initiative in the amount of \$104,192 and by the NYS Pollution Prevention Institute through a grant from the NYS Department of Environmental Conservation.



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Deciphering Plastics

PREFERRED	PETE Polyethylene terephthalate	Soft drink & water bottles, detergent and cleaning containers, peanut butter jars	Recyclable	
PREFERRED	HDPE High density polyethylene	Milk & water jugs, shampoo bottles, some plastic bags	Recyclable	
AVOID	PVC Polyvinyl chloride	Cosmetics, pacifiers, shower curtains, teething rings, soft toys, portable electronics, detergent & window cleaner bottles, flooring	Can leach phthalates and lead Not recyclable Creates toxic dioxin during manufacture and disposal	
PREFERRED	LDPE Low density polyethylene	Food storage, soft and pliable parts, most plastic wraps, some bottles	Recyclable	
PREFERRED	PP Polypropylene	Reusable microwaveable containers, deli soup, syrup, yogurt, margarine containers, disposable diapers, clouded plastic containers, baby bottles	Recyclable	
AVOID	PS Polystyrene	Packing peanuts, disposable cups, plates, plasticware, Styrofoam, CD cases	Can leach styrene Recyclable, but rarely recycled Most end up in landfills	
UNCERTAIN	Other PC Polycarbonate PLA Polylactic acid	Reusable water bottles, baby bottles, electronics, canned food Disposable cups	Can leach bisphenol-A, not recyclable Not recyclable, can be composted	



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Which of these cups are NOT made from polystyrene?

A.



C.



B.



D.





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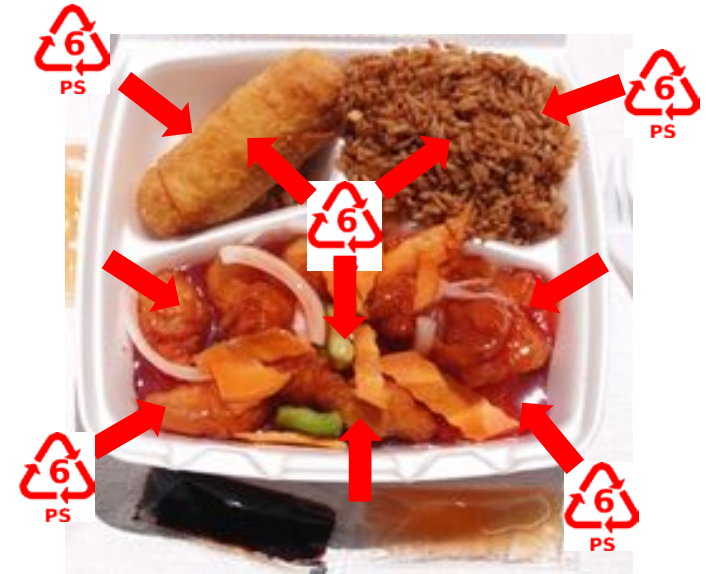


Polystyrene

What is the concern?

Styrene can leach from polystyrene, especially when hot. Over the long term, this can act as a neurotoxin.

Studies on animals report harmful effects of styrene on red-blood cells, the liver, kidney, and stomach organs



Styrene can be absorbed by food, and once ingested can be stored in body fat. It is thought that repeated exposure can cause it to build up in the body.

US Environmental Protection Agency "Styrene". Air Toxics Website.
WHO International Programme On Chemical Safety. "Styrene". Environmental Health Criteria 26.



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Polystyrene

Examples

- Styrofoam®
- Disposable plates & utensils
- Foam take out cups & containers
- Foam meat trays & egg cartons
- Yogurt cups & other opaque single serve containers



Polystyrene free alternatives:

- Reusable cups, plates, and utensils
- Wax lined paper cups & take out containers
- “eco” containers
- LDPE & PET single serve containers





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I have heard of bisphenol A –
also called BPA - and know
where it might be found.

- A. True
- B. False
- C. I don't know



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Bisphenol A

What is the concern?

- BPA is typically found in polycarbonate, shatter resistant plastic, resin used to line metal cans, and thermal receipt paper
- BPA is an **endocrine disruptor**
 - Linked to down's syndrome, obesity, hyperactivity, breast & prostate cancer
 - Causes breast cancer, testicular cancer, and diabetes in lab animals at low doses
- BPA can **leach out of containers into food/drink** and it is then ingested
 - Water soluble
 - Heating a container increases BPA leaching
- It is toxic to fish



Baby bottles & sippy cups containing BPA are banned in the US



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Bisphenol A

How can we be exposed?

- Eating/drinking **food contaminated from containers**
- **Metal can linings may contain BPA**
 - BPA leaches into the food and is ingested
 - Jul'13 FDA bans use of BPA in infant formula packaging
- Contact with **thermal receipt paper**



The US Food & Drug Administration (FDA) is concerned about potential effects on the **brain, behavior, and prostate gland of fetuses, infants and children**

Source: USFDA, Bisphenol A (BPA): Use in Food Contact Application, January 2010; updated March 30, 2012

Studies show that **99% of our exposure comes from food** and BPA has been found in both solid and liquid food.



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Bisphenol A

Actions you can take

Use	Good	Better
Infant formula	<ul style="list-style-type: none"> ✗ Avoid heating milk or formula in polycarbonate bottles 	<ul style="list-style-type: none"> ✓ Replace polycarbonate bottles
Children's containers, food storage containers, kitchen appliances, toys	<ul style="list-style-type: none"> ✗ Don't clean with bleach ✓ Replace when they start to degrade ✗ Don't let children chew on them 	<ul style="list-style-type: none"> ✓ Replace polycarbonate containers with PETE (#1), PET (#5), or PE (#2 & #4), or stainless steel (some metal containers are lined with epoxy resins, so choose wisely) ✓ Choose containers labeled "BPA free" ✓ Choose glass baby bottles & use with care
Canned foods	<ul style="list-style-type: none"> ✗ Limit the amount of canned foods you consume each day ✗ Avoid purchasing canned acidic foods ✓ Choose containers labeled "BPA free" 	<ul style="list-style-type: none"> ✓ Choose fresh foods when possible, followed by dried or frozen products over canned goods ✓ Choose products in glass jars or aseptic boxes (TetraPaks) ✓ Choose products in less toxic plastics ✓ Choose canned foods in "BPA free" cans



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Glass baby bottles are cheaper than plastic.

- A. True
- B. False
- C. I don't know



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The Cost of Going Green

Example Plastic Bottles



\$1.43

Evenflo Classic Light
Tint Nurser, 8 oz.



\$4.66

NUK Orthodontic
Trendline, 10 oz.



\$4.99

Dr. Brown's BPA Free
Polypropylene Bottle, 8 oz.

Example Glass Bottles



\$1.70

Evenflo Classic Glass Bottle, 8oz.



\$5.79

Born Free Glass Bottle
with Bonus Sleeve, 9 oz.

\$12.32

Lifactory Glass
Baby Bottle with
Silicone Sleeve, 9 oz.

Prices from Amazon.com, accessed 2/20/13. Prices may reflect multi-pack or bulk quantity containers.



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Phthalates

What is the concern?

- Group of chemicals commonly used as a **softener in PVC plastic & components of fragrance** in scented products
- Soft toys typically contain 15-20%
- Not bound to plastic so they can leach out
 - **Ingested** when children chew on plastic
 - **Breathe** in when it offgasses from plastic
 - Soluble in oils
- Controversial health effects, many are **known/suspected endocrine disruptors**



ASTDR, ToxFAQs, DEHP <http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=377&tid=65>

US EPA, Phthalates Action Plan, <http://www.epa.gov/oppt/existingchemicals/pubs/actionplans/phthalates.html>

Campaign for Safe Cosmetics, Phthalates, <http://safecosmetics.org/article.php?id=290>

USCDC, Fourth National Report on Human Exposure to Environmental Chemicals, 2009, <http://www.cdc.gov/exposurereport/pdf/FourthReport.pdf>



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PVC may contain lead.

- A. True
- B. False
- C. I don't know



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Phthalates

How can we be exposed?

- Products that may contain phthalates:
 - **Products made from PVC**, such as clothing/fabrics, vinyl, upholstery, floor tiles, food packaging, children's products
 - **Personal care products**, cosmetics & nail polish
 - **Scented products**
- Children are at **especially high risk as they mouth things**
- **Infants may have greater exposures** from ingesting **indoor dust**
- Phthalates can **be transferred through breast milk** from mom to baby

Studies have linked prenatal exposure to problems in children ages 3-9^{1,2,3,4}: **decreases** in psychomotor development, girl's mental development, masculine play in boys; **increases** in behavioral problems, aggression, depression, ADHD, and externalizing problems, reduced; and **poor** social cognition, communication, awareness

¹Engel, S, et. al., Prenatal Phthalate Exposure is Associated with Childhood Behavior and Executive Functioning, Env Health Persp, 118:4, April 2010.

²Swan, S., Prenatal phthalate exposure and reduced masculine play in boys, Int J Androl, 2010 April, 33(2): 2590269

³Miodovnik, A, et. al., Endocrine Disruptors and Childhood Social Impairment, Neurotoxicity, 2011 March; 32(2): 261-267.

⁴Whyatt, R., et. al., Maternal Prenatal Urinary Phthalate Metabolite Concentrations and Child Mental, Psychomotor, and Behavioral Development at 3 years of age, Env Health Persp, 120:2, Feb 2012



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What are some things you can do to reduce or avoid phthalates?



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Phthalates

Actions you can take

- ✗ Avoid plastic with **#3 or PVC identification**
- ✗ Avoid products labeled “**vinyl**”
- ✗ Avoid **unnaturally scented products that contain “fragrance”** as an ingredient
- ✗ Avoid children’s products that may contain vinyl
- ✓ **Air out vinyl products** before bringing them into your home
- ✓ Choose products labeled **phthalate, vinyl, and/or PVC free**
- ✓ Choose **toys made of safer plastics, wood, organic fabric, cloth**
- ✓ Choose **shower curtains** made from safer plastics (ie. EVA or PEVA) or fabric



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Perfluorooctanoic acid

What is the concern?

- Teflon® coated non-stick pans contain **small amounts of PFOA**
- PFOA has been **found in house dust, water, & food**
- PFOA **remains in people for a very long time**
- PFOA is **linked to**
 - Infertility, thyroid disease & higher cholesterol level
 - Increased risk of attention deficit hyperactivity disorder (ADHD) in US children aged 12–15
 - Earlier and later onset of puberty in girls
 - Signs of reduced fetal growth including lower birth weight



United States. Environmental Protection Agency. Long-Chain Perfluorinated Chemicals (PFCs) Action Plan. 2009.
US EPA, Perfluorooctanoic Acid and Fluorinated Telomers, <http://www.epa.gov/oppt/pfoa/>



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Perfluorooctanoic acid

What products contain PFOA & chemicals like it?

- These chemicals have been used for decades to make **products that resist heat, oil, stains, grease and water**

Products that may contain these chemicals:

- Stain resistant carpets & furniture
- Grease proof food papers
- Non-stick pans
- Cosmetics
- Cleaners
- Clothing



"PFCs: Global Contaminants: PFOA and other PFCs come from common products in every home." *Environmental Working Group*. April 2003.
United States. Environmental Protection Agency. Long-Chain Perfluorinated Chemicals (PFCs) Action Plan. 2009.
US EPA, Perfluorooctanoic Acid and Fluorinated Telomers, <http://www.epa.gov/oppt/pfoa/>



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Perfluorooctanoic acid

Actions you can take to avoid PFOA at home

- ✗ Avoid **overheating nonstick pans**
- ✗ Avoid **burning food in nonstick pans**
- ✓ Choose **non-reactive cookware** and cooking utensils, such as uncoated metal, silicone, glass, and cast iron
- ✓ **Vacuum and dust** your home frequently
- ✗ Avoid **stain resistant** carpets, furniture, clothes, and other fabrics



MICROBEADS

FACE TO FISH

**A TUBE OF FACEWASH
CAN CONTAIN OVER
330,000 MICROBEADS**

This means billions of plastic microbeads are flowing into our global waterways.



**1,147 PERSONAL
CLEANSING PRODUCTS
CONTAIN MICROBEADS**

1,147 personal cleansing products in the US and around the world contain micro-plastic particle abrasives (MICROBEADS), employed as exfoliant.

MICROBEADS ARE DESIGNED

TO WASH DOWN THE DRAIN

1

WASTE TREATMENT

Many sewage treatment facilities do not capture synthetic, floating particles the size of microbeads that are only about a .5 mm in diameter.



2

SEWAGE OVERFLOW

During heavy rains, some treatment facilities let sewage overflow go directly into our waterways.

3

663 SPECIES OF MARINE WILDLIFE ARE AFFECTED BY PLASTIC POLLUTION

Over 663 species of marine wildlife are affected by plastic pollution through ingestion or entanglement. Micro-plastics particles attract other pollutants in the environment including PCBs, flame-retardants, and other industrial chemicals.



43,000
PLASTIC
PARTICLES

5 Gyres found an average of 43,000 plastic particles /km² in Lake Erie.

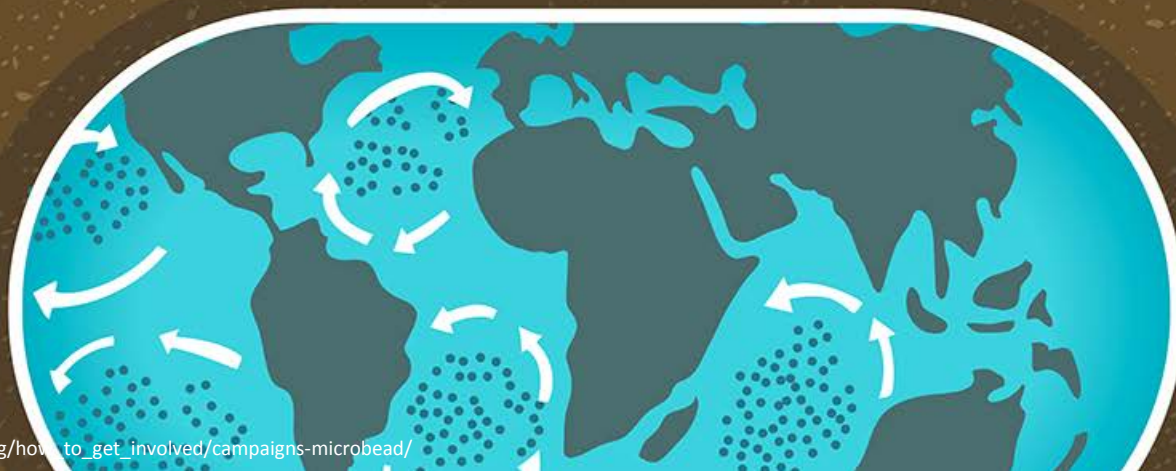


SLUDGE & FERTILIZER RUNOFF

Sewage sludge used as fertilizer, beads seep into soil, get into rivers/aquifers.

A SINGLE PLASTIC PARTICLE CAN ABSORB UP TO
1,000,000
TIMES MORE TOXIC CHEMICALS THAN THE WATER AROUND IT.

Micro-plastic particles are being found in all oceanic gyres, bays, gulfs and seas worldwide.



THE FIVE GYRES

ALTHOUGH NOT WIDELY DISCUSSED THERE ARE IN FACT 5 MAIN GYRES IN THE WORLD'S OCEANS AND SEVERAL SMALLER GYRES THROUGHOUT ALASKA AND ANTARCTICA. THE MOST COMMONLY DISCUSSED GYRE IS THE NORTH PACIFIC GYRE, KNOWN AS THE GARBAGE PATCH DUE TO THE MASS OF MARINE DEBRIS THAT HAS COLLECTED THERE.

COLOUR KEY
 FISH LIFE (blue circle)
 MARINE LIFE (pink circle)
 PLASTIC (orange circle)
 FOOD CHAIN (red circle)
 OCEAN HITCHHIKERS (green circle)

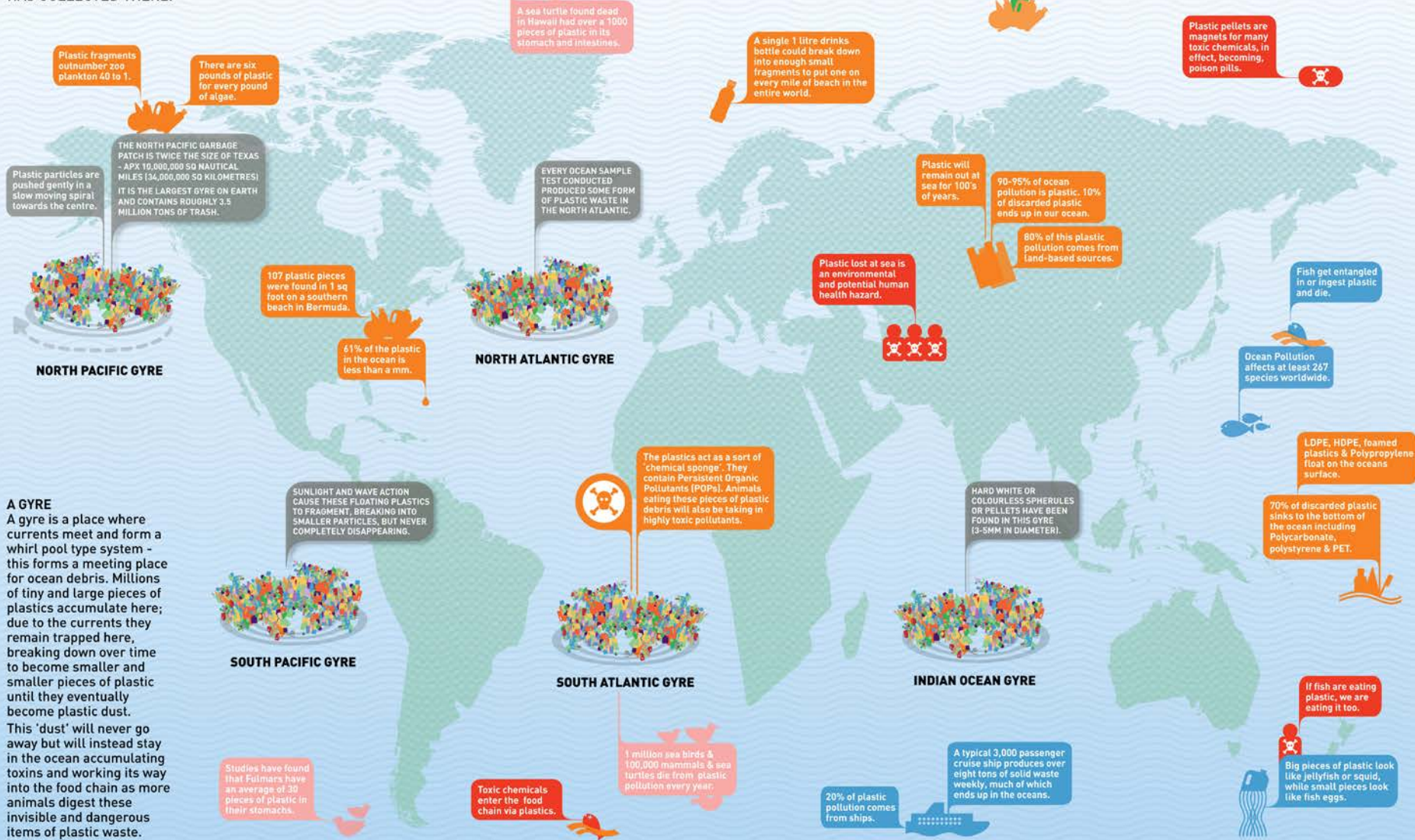
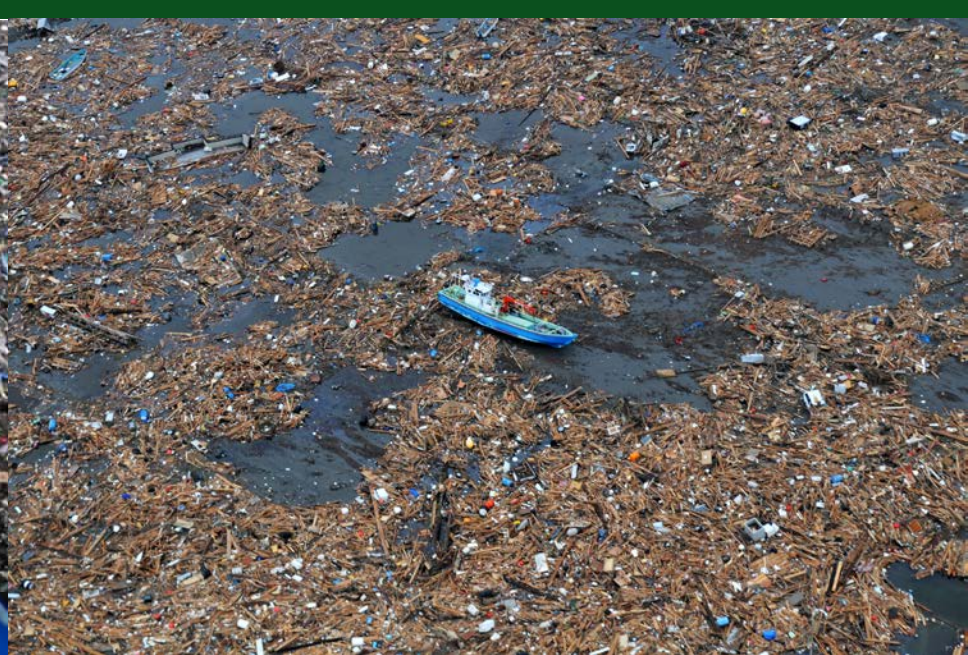




Figure 29-3 Biology: Life on Earth, 8/e
© 2008 Pearson Prentice Hall, Inc.







Midway Atoll, where these photos were taken, is more than 2,000 miles from the nearest land. These photos portray baby albatrosses, which are fed the plastic by their parents. A chick can have an ounce of plastic in its belly and remain healthy; the dead chicks have twice as much.

Photo Credit: Chris Jordan





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What are some things you can do to reduce plastic pollution?



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Children are Vulnerable

Children are at higher risk of suffering effects than adults

1. Children have a heightened sensitivity as their bodies are growing and developing
2. Children have greater pound-for-pound intake of air, water, and food
3. Children's skin is 30% thinner than adults' & can absorb more from the skin's surface
4. Children don't have the same ability to excrete toxins
5. The blood brain barrier that helps block chemicals from penetrating the brain isn't fully developed until 6 months of age
6. Children have more years of future life left
7. Children spend more time close to the ground
8. Children have a tendency to put things in their mouth



USEPA, Office of Children's Health Protection, <http://www.epa.gov/aboutepa/ochp.html>

Landrigan, et. al., Assessing the Effects of Endocrine Disruptors in the National Children's Study, Environmental Health Perspectives, 111:13, October 2003.