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PRODUCT REPORT

Plastic Containers

Introduction

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Take a look at the shelves of packaged food items at your local grocery store and you'll notice that most of the food we buy comes in contact with plastic. Margarine, yogurt, cream cheese and ice cream packaged in plastic cartons; frozen dinners on plastic trays and frozen vegetables in plastic bags; cheese, deli sandwiches and fruits and vegetables wrapped in cling wrap; juice, water and oil in plastic bottles; even food packaged in paper is often wrapped up in plastic first. In fact, since 1976 plastic has been the most widely used material in the United States. No wonder *Newsweek* chose plastic as one of the greatest innovations of the millennium. However, not all plastics are created equal, and some are safer to use than others, especially when it comes to food packaging and storage.

Plastics are typically classified by one of seven recycling codes, indicating the type of resin used (the code is usually found at the bottom of containers and bottles), as follows:

#1 polyethylene terephthalate (PET or PETE)

Products: Soft drink bottles, medicine containers

#2 high density polyethylene (HDPE)

Products: Toys, bottles for milk, water, detergent, shampoo, motor oil

#3 polyvinyl chloride (V or PVC)

Products: Pipe, meat wrap, cooking oil bottles

#4 low density polyethylene (LDPE)

Products: Wrapping films, grocery bags

#5 polypropylene (PP)

Products: Syrup bottles, yogurt tubs, diapers

#6 polystyrene (PS)

Products: Coffee cups, clam-shell take-out containers

#7 other (usually polycarbonate)

Products: Medical storage containers, some Nalgene water bottles

While plastic food wraps and containers play an important role in protecting us against the dangers of food-borne illnesses, recent studies show that when certain plastics come into contact with foods, some questionable chemicals migrate from the packaging to the foods they contain. In addition because of the chemicals used during the manufacturing process, plastic poses threats to our environment and to the

health of the workers who produce it.

The Problems

Environmental

Pollution

While most industrial processes are associated with certain byproducts, manufacturing plastic resin creates more toxic emissions than manufacturing glass--producing a 16-oz. PET bottle generates more than 100 times the toxic emissions to air and water than making the same size bottle out of glass.

The Berkeley Plastics Task Force stated in a 1996 report that the plastic industry contributed 14 percent of the most toxic industrial releases--including styrene, benzene and trichloroethane--into the air. Other major emissions from plastic production processes include sulfur oxides, nitrous oxides, methanol, ethylene oxide and volatile organic compounds (VOCs).

Furthermore, plastic polymers never fully biodegrade. Instead they photo degrade into dust, and in bodies of water, that dust can absorb other toxins such as polychlorinated biphenyls (PCBs) and the pesticide DDT, which is banned in the U.S. but is still used in developing countries. The toxins are concentrated even more strongly in this toxic dust, which is consumed by the fish that humans eventually eat.

Petroleum--A Non-Renewable Resource

Plastics are made of petroleum, a non-renewable resource that requires new fossil reserves to be extracted all the time. Because fossil fuels take millions of years to form, they are a finite and, ultimately, an exhaustible energy resource. The U.S., the world's second largest oil extractor, has only four percent of the world's oil reserves but uses nearly 30 percent of all oil extracted each year. By choosing to use non-plastic packaging, we can conserve this valuable resource and reduce our dependence on oil.

Recycling

According to the Environmental Protection Agency (EPA), plastics are the fourth largest category of municipal solid waste. In 2001, the U.S. disposed of just over 25 million tons of plastic. While plastic recycling continues to grow, increasing 580 percent from 1990 to 2001, with 1,591 million pounds recycled annually the reality is that recycling budgets for many state and local agencies have been significantly reduced. In addition, consumers often believe the coding symbols on plastic containers mean the item is recyclable when, in fact, the symbols only identify the resin base of the plastics, not all of which are accepted by all recycling programs. Companies need to be urged to use easily recycled plastics and citizens should encourage their states to pass and enforce bottle bills, since these have demonstrably increased recycling rates in the 11 states where they exist.

Personal Health

Dioxins

Substantial threats to health arise during plastic manufacturing, both from ethylene monomers, the basic building block for plastic, and from the problem chemicals added to give plastic products their desirable performance properties.

Dioxins, which are highly toxic even at low doses, are produced when plastics are manufactured and

incinerated. While dioxin levels in the U.S. environment have been declining for the last 30 years, they break down so slowly that some of the dioxins from past releases will still be in the environment many years hence. In its 2000 final draft reassessment of the health effects of dioxins, the EPA concluded that dioxins have the potential to produce an array of adverse health effects in humans. The agency's report estimated that the average American's risk of contracting cancer from dioxin exposure may be as high as one in 1,000--1,000 times higher than the government's current "acceptable" standard of one in a million. Dioxins are also endocrine disruptors, substances that can interfere with the body's natural hormone signals. Dioxin exposure, moreover, can damage the immune system and may affect reproduction and childhood development. The most common health effect in people exposed to large amounts of dioxin is chloracne, a severe skin disease with acne-like lesions that occur mainly on the face and upper body. Other effects of exposure to large amounts of dioxin include skin rashes, skin discoloration, excessive body hair, and possibly mild liver damage.

Phthalates

Most cling-wrapped meats, cheeses and other foods sold in delis and grocery stores are wrapped in PVC. To soften #3 PVC plastic into its flexible form, manufacturers add various toxic chemicals known as "plasticizers" during production. Traces of these chemicals, known as adipates and phthalates, can leak out of PVC when it comes in contact with foods.

In a National Institutes of Health (NIH) report published in 2000, di-2-ethylhexyl phthalate (DEHP), commonly found in PVC plastics, was found reasonably anticipated to be a human carcinogen. While DEHP is not expected to cause harmful health effects in humans at the levels found in the environment, harmful effects did occur in animals with prolonged exposure or in those that were administered high amounts of the chemical. These effects include reproductive problems, birth defects and damaged sperm and liver in mice.

The same year, however, the International Agency for Research on Cancer (IARC) reclassified DEHP as non-carcinogenic to humans. According to NIH, blood transfusions and other procedures requiring the use of disposable PVC medical devices expose infants to high levels of DEHP, but another 2004 study of adolescents exposed to significant levels of DEHP during infancy found that there was "no significant adverse effects of on their physical growth and pubertal maturity."

Bisphenol A

Many #7 polycarbonate bottles (including baby bottles), microwave ovenware, eating utensils and plastic coating for metal cans are made with bisphenol A (BPA), a chemical invented in the 1930s during the search for synthetic estrogens. BPA can leach into food from the epoxy linings in cans or from polycarbonate bottles as they age.

Many studies have evaluated BPA as a hormone disruptor, a chemical that alters the body's normal hormonal activity. A March 1998 study in *Environmental Health Perspectives* (EHP) found that BPA simulates the action of estrogen when tested in human breast cancer cells.

A more recent study published in EHP shows a significant decrease of testosterone in male rats exposed to low levels of BPA. The study concludes that the new data is significant enough to evaluate the risk of human exposure to BPA.

Antimony

#1 PETE plastic water bottles have been shown to leach antimony into water. A recent study conducted by University of Heidelberg researcher Bill Shotyk, and published in the January 2006 *Journal of Environmental Monitoring*, found antimony levels in PETE water bottles were higher than levels found

where the water was sourced. According to Shotyk, consumers should not be concerned about drinking water bottled in PETE plastic, as the levels found in water are below safe drinking standards. Nonetheless, it's important to remember that leaving water in any plastic bottle for a prolonged period of time allows for chemical leaching to occur.

The Solutions

What to look for

Safer plastics--#2HDPE, #4LDPE, and #5PP

When choosing plastic containers, even those you'll use over and over again, choose those that are accepted for recycling in your area. Although #1 PETE is one of the most commonly recycled types, there are no containers designed for re-use made from it, and one should never re-use single-use #1 plastic bottles because their design doesn't lend itself to proper cleaning and the bottles can harbor bacterial growth. There are, however, a number of reusable containers made from another commonly recycled plastic, #2 HDPE.

Number #4 LDPE and #5PP plastics, although not as widely recycled, are also good choices since, as with #2, most research has not shown leaching of any carcinogens or endocrine disruptors. Some bread and frozen food bags and squeezable bottles are made out of #4 plastic and some ketchup bottles and yogurt and margarine tubs are manufactured from #5 plastic.

Biodegradable plastic

Recent technological developments have led to the developments of plastics made from corn. These corn-based resins are derived from various chemicals, one of them being polylactide (PLA), which is decomposed by bacteria when composted. While bags made of PLA look, feel and smell like normal plastic bags, in about twelve days, more than half the bag will have broken down, unlike conventional plastic bags, which can take up to 100 years to decompose.

The range of biodegradable plastic storage products is expanding within the commercial sector, and companies and consumers are quickly realizing the cost and environmental benefits of this type of packaging. In the States, the Wild Oats Market chain has replaced conventional plastic containers used for bulk foods with PLA containers. Recently, Biota water, Naturally Iowa dairy, Newman's Own and the natural foods retailer Earth Fare have begun using the PLA produced by Cargill Dow-offshoot NatureWorks LLC. While use and availability of these products is primarily in the commercial sector, their initial success suggests we can look forward to home products like food storage containers and plastic wrap in the near future. Currently, biodegradable garbage bags, disposable dinnerware--plates, cups, flatware and straws--are available for home use. For online retailers of biodegradable plastics, see "Resources."

For more information on biodegradable plastic, please see ["How Safe are the New Green Plastics?"](#) and ["Plastics Graduate to Green."](#)

Glass, Ceramic and Stoneware

Glass, ceramic and stoneware are the safest options when it comes to food packaging and storage because they do not leach any questionable chemicals when in contact with food. Unlike plastic recycling, which produces toxic chemicals, glass recycling is more environmentally friendly.

Seek out these glass, ceramic and stoneware products instead of plastic to ensure that your food will not

come in contact with toxic chemicals when stored or heated:

**Anchor Hocking Barrel Jar with Aluminum Lid Anchor Hocking Blue Cracker Jar
Anchor Hocking Georgian Canister
Anchor Hocking Heritage Hill Canister
Anchor Hocking Penny Candy Canister
Bormioli Fido Storage Jar
Bormioli Pitcher
Bormioli Round Storage Container
Bormioli Square Storage Container
Bormioli Rectangular Storage Container
Bormioli Storage Cylinder
Bormioli Save & Serve Plate
Clay Design Coffee Canister
Clay Design Popcorn Canister
Libbey Storage Bowl
Libbey Pumpkin Candy Jar
Pyrex Glass Food Storage Containers
Resourceful Products Mini Jar Canister**

Aluminum and Stainless Steel

Food storage containers made of aluminum are an alternative to plastics because aluminum is recyclable, relatively inexpensive and offers even heating capability. However, aluminum extraction is extremely energy intensive, so reusing old pots is encouraged. Aluminum can sometimes react with certain foods or impact a metallic taste, so use them for storing foods with a low acid content.

Containers made from stainless steel are an environmentally friendly choice not only because the material is 100-percent recyclable but also because stainless steel is easy to clean without any harsh chemicals. Stainless steel is also inexpensive, attractive and will not react with foods during cooking.

When storing or heating foods, look for the following aluminum and stainless steel products. However, never use a microwave to heat food in metal containers. Doing so could spark a fire.

**Corning Bowls
Correlle Bowls
Emily Henry Bowls
Gear County Bowls
Ingleman Bowls
Johnson Brothers Storage Jars
Johnson Brothers Bowls
Klean Kanteen's Stainless Steel Water Bottles
Klean Kanteen's To-Go Ware
Pillsbury Storage Jars
Pfaltzgraff Storage Jars
Reston Lloyd Bowls
Sigg's Stainless Steel Water Bottles
Wedgewood Bowls**

What to look out for

Risky Plastics--#3 PVC, #6 PS, and #7 Other (Usually Polycarbonate)

Sometimes found in clear food packaging, #3 PVC, the second most commonly used plastic in the world, is a toxic plastic dangerous both to our health and to the environment. Its manufacture and incineration releases dioxins, a potent carcinogen and hormone disruptor. Vinyl chloride, the primary building block of PVC, is a known human carcinogen that also poses a threat to workers during manufacture.

In contact with foods, especially hot, fatty foods, PVC can also leach chemicals such as adipates and phthalates, which have been shown to cause birth defects and damage to the liver, kidneys, lungs and reproductive systems in mice. In addition, most community recycling programs do not accept PVC, so the vast majority of vinyl ends up in landfills or incinerators. While many companies have agreed to restrict or phase out PVC, we still have a long way to go before this "toxic" plastic is banned from use.

Polystyrene, #6 PS, is usually found in foam containers and cups and sometimes in clear disposable takeout containers, plastic cutlery and cups. It's best to avoid this plastic because PS may leach styrene into food it comes in contact with. Styrene, considered a possible human carcinogen by IARC, may also disrupt hormones or affect reproduction.

Polycarbonate (marked as #7), usually found in baby bottles, 5-gallon water bottles and the epoxy lining in food cans can leach BPA into liquids and foods. A study conducted at Prefectural University of Kumamoto, Japan, concluded that polycarbonate bottles containing hot liquids leach more BPA than new bottles.

Since 95 percent of all baby bottles currently on the market are made of polycarbonate, parents have a right to be concerned. The National Environmental Trust recommends switching to polycarbonate-free baby bottles, like those manufactured from glass or from #5 PP.

Plastics in the Microwave

While a "microwave-safe" or "microwavable" label on plastic containers only means that they shouldn't melt, crack or fall apart when used in the microwave, the label is no guarantee that containers don't leach chemicals into foods when heated. The USDA also warns on its website against microwaving in single-use containers not intended for that purpose, such as takeout platters and margarine tubs. According to the FDA, microwave-safe plastic wrap should be placed loosely over food so that the steam can escape and should not directly touch your food.

For safety's sake, it's best not to heat foods in plastic and use ovenproof glass or ceramic containers with covers. Never use plastic storage bags, grocery bags, newspapers or aluminum foil in the microwave.

Shopping Suggestions

Food Packaging and Storage, Cups, Plates, Utensils, Water Bottles

Look for		Avoid	
Code	Brand Name	Code	Brand Name
#2 HDPE	Betras USA Sport Bottles	#3 PVC	Arrow Clear View Pitcher
	Betras USA Nestable Quart		Arrow Sip-A-Mug (base only)
	Betras LongNeck Bottles		Arrow Sip-N-Stor Cups

	<p>Carlisle Store 'N Pour 4 Quart square FMP Quart Bottle with lid and spout</p> <p>Impact Stackrack Jug 5 Gal.</p> <p>Nalgene Wide Mouth Round 1 Quart</p> <p>Playtex Straw Cups</p> <p>Tupperware FreezeSmart</p> <p>Tupperware Ice Cube Tray</p> <p>Tupperware Ice Tups Set</p> <p>Tupperware Jel-Ring Mold</p>		<p>Arrow Translucent Sip-A-Tumbler (base only)</p> <p>Betras USA Clear Sport Bottles</p> <p>Betras USA Swirl Bottles</p> <p>Polyvinyl Films stretch-tite All-Purpose Food Wrap</p> <p>Polyvinyl Films freeze-tite All-Purpose Food Wrap</p> <p>Reynolds Wrap</p>
#4 LDPE	<p>BestYet Clear Plastic Wrap</p> <p>Bell Brand Athletic Squeeze Bottles (colors) Brita Fill & Go Water Filtration Bottle</p> <p>Glad Cling Wrap</p> <p>Glad Food Storage Bags</p> <p>Glad Freezer Bags</p> <p>Glad-Lock Bags</p> <p>Glad Sandwich Bags</p> <p>Hefty Baggies</p> <p>Hefty OneZip Slider Bags</p> <p>Saran Cling Plus</p> <p>Ziploc Bags</p> <p>Ziplock Double Guard Freezer Bags</p>	#6	<p>All Styrofoam Cups and Containers</p> <p>Arrow Clear Measuring Cups</p> <p>Kingsmen Plastic Cutlery (Maryland Plastic)</p> <p>Sweetheart Plastic Cutlery</p> <p>Sweetheart Translucent Storage Containers</p> <p>Sweetheart Translucent Plastic Cups</p> <p>Ullman Bowls and Platters (all)</p> <p>Wandas Expanding Bread Box</p>
#5 PP	<p>Arrow Canteen</p> <p>Arrow Colored Measuring Cups</p> <p>Betras USA Monster Mugs</p> <p>Betras USA Insulated Travel Mugs</p> <p>Betras USA Thermo Mugs</p>	#7	<p>5-Gallon Bottles for Water Coolers (most)</p> <p>Ashton Green Pitchers and Plastic Drinkware</p> <p>Camwear Pitchers</p> <p>Carlisle VersaPour Pitcher</p>

C&K Manufacturing Flash Chill 2 Liter Plastic	Click Clack Classic White Storage Containers
The Container Store Tellfresh Snack Box	Click Clack Airtight Accents Storage Containers
The Container Store Tellfresh Screw-Top	Rubbermaid Bouncer Rugged Plastic Pitcher
The Container Store Tellfresh Oblong Gladware Containers (all)	Rubbermaid Stain Shield Storage Containers
Playtex Spill-Proof Cups (lids #2)	Strahl DaVinci Pitcher
Rubbermaid (all food storage containers)	Strahl Plates
Rubbermaid Sipper Seal	Sweetheart Clear Storage Containers
Rubbermaid Chuggables Bottles	Tango Pitchers and Glassware
Rubbermaid Pitchers (colors)	Terrazza Unbreakable Plastic Tableware
Rubbermaid Sippin' Sport Bottles	Wombat Ware Pitchers and Glassware
Sterilite (all containers, bowls, pitchers, tumblers)	Tupperware Rock 'n Serve Containers
Sweetheart Round Storage Containers	
The Container Store Stack-N-Store Containers	
The Container Store FreshDate Containers	
The Container Store Rectangular Bulk Food Storage	
Tupperware Bowls (all)	
Tupperware Crystal Wave Microwave Containers	
Tupperware Modular Mates	
Tupperware Quick Shake Containers	
Tupperware One Touch Reminder Canister	
Ziploc Containers (all)	
Ziploc Table Tops Bowls	

Baby/Kids' Items

Look for		Avoid	
Code	Brand Name	Code	Brand Name
Glass	Lamby Glass Baby Bottles Evenflo Glass Baby Bottles	#3	Evenflo Soft Bite Spoon "Vinyl, PVC-free"
#4	Playtex Disposable Baby Bottle Liners Evenflo Baby Bottles (opaque, pastel)		
#5	Arrow Sip-A-Bowl Avent Soft Spout Training Cups Gerber Fashion Tint Bottles (colored) Gerber Fun Grips Spill Proof Cups Gerber 'Lil Sport Bottles Spill Proof Cups Medela Baby Cups Medela Baby Bottles and Feeders Sassy E-Z Grip Cups Sassy E-Z Grip First Feeding Bowls Sassy Ideal Temp Feeding Spoons Sassy Less Mess Toddler Bowls Sassy Less Mess Toddler Spoons Sassy MAM Spill-Proof Cups Sassy Temperature Sensitive Forks and Spoons The First Years Peek-A-Boo Cups The First Years Tumble Mates The First Years Winnie the Pooh Trainer Cups	#7	Avent Baby Bottles Evenflo Baby Bottles (clear, untinted) Gerber Baby Bottles (clear) Gerber Looney Tunes Spill Proof Cups Gerber Suzy's Zoo Spill Proof Cups First Sipster Trainer Cup Playtex Kinder-Grip Bottles Sassy MAM 3-Step Baby Bottles The First Years Baby Bottles Tuppercare Baby Bottles VentAire Bottle

Tips and Alternatives

Here are a few suggestions you can follow to reduce plastics and toxic exposure in your home:

- **Avoid single-use, disposable packaging**
- **Buy food in glass or metal containers**
- **Avoid heating food in plastic containers**
- **Avoid storing fatty foods, such as meat and cheese, in plastic containers or plastic wrap**
- **Bring your own containers to salad bars, yogurt shops, etc.--anywhere you'll be served in plastic**
- **Avoid plastic cutlery and dinnerware, especially when cooking or heating food; use stainless steel or wooden utensils and look for recycled paper products.**
- **Use wood instead of plastic cutting boards and spray your wooden board with a mist of vinegar, then with a mix of hydrogen peroxide, to kill bacteria**
- **When purchasing cling-wrapped food from the supermarket or deli, slice off a thin layer where the food came into contact with the plastic and store the rest in a glass or ceramic container, or non-PVC cling wrap (see Shopping Suggestions)**
- **You can also write a letter to manufacturers of food and drink packaged in plastics, indicating your concern about plastics--especially if their packaging is #3, #6 or #7. Tell them you are actively seeking products packaged in safe, reusable glass, metal and recycled paper. Ask manufacturers for a mailing address by calling their toll-free question/comment line, usually listed on the back of the product; alternatively, you can find their mailing address on their website.**

Resources and References

Resources

For kitchenware:

Cooking.com: 800-663-8810, www.cooking.com

Frye International: 866-573-3793, www.fyeintl.com

Green Earth Office Supply: 800-327-8449, www.greenearthofficesupply.com

Instawares Restaurant Supply: 800-892-3622, www.instawares.com

Kitchen Emporium: 888-858-7920 www.kitchenemporium.com

Kitchen Etc.: 800-232-4070 www.kitchenetc.com

Klean Kanteen: 550-342-3900, www.kleankanteen.com

Pampered Chef: 888-687-2433, www.pamperedchef.com

Reston Lloyd, Ltd.: 703-437-0003 www.restonlloyd.com

Reusable Bags (Sigg Water Bottles): www.reusablebags.com

Sur la Table: 800-243-0852, www.surlateable.com

The Container Store: 888-CONTAIN, www.containerstore.com

Tufty Ceramics: www.tuftyceramics.com

Tupperware: 800-366-3800, www.tupperware.com

For corn-based plastics:

BioBag: www.biobagusa.com, 727-789-1646

Green Earth Office Supply: www.greenearthofficesupply.com, 800-327-8449

Greenware: www.pladirect.com, 303-449-1876

Nat-Ur: www.nat-urstore.com

Simply Biodegradable: 866-782-2371, www.simplybiodegradable.com

For baby bottles and feeders:

Medela: 800-435-8316, www.medela.com

The Natural Baby Catalog: 888-373-4037, www.kidsstuff.com

Vermont Stone Gifts: 803-747-7744, www.vermontstonegifts.com

Baby SuperMall: 888-276-6654, www.babysupermall.com

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Agency for Toxic Substances and Disease Registry: 888-422-8737 www.atsdr.cdc.gov

American Plastics Council: 800-2-HELP-90, www.americanplasticscouncil.org

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www.ecologycenter.org/plastics/report1996/report1996_toc.html

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www.epa.gov/grtlakes/seahome/housewaste/src/plastic.htm

Environmental Protection Agency, "Municipal Solid Waste in the United States: 2001 Facts and Figures," www.epa.gov/epaoswer/non-hw/muncpl/pubs/msw-sum01.pdf

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www.ourstolenfuture.org/newscience/oncompounds/bisphenola/bpauses.htm