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ALTERNATIVES TO SINGLE-USE PLASTIC BOTTLES

BACKGROUND: Plastic may be considered both a vital component to modern life and an unintended menace to the environment and health. While its benefits include durability, convenience, lightweightness, and low cost, plastic's liability is that it contributes to solid waste generation, contamination of waterways, and eventually—adverse health effects. Globally, plastic production exceeds 320 million tons per year, 40% of which is used as single-use packaging. A proportion of this becomes plastic waste that eludes recycling streams, despite the prevalence and availability of recycling services in most developed countries. Each year, Americans buy and consume more containerized beverages, including the disposable plastic water bottle composed of polyethylene terephthalate (PET). In fact, U.S. bottled water sales increased 400% over the first 10 years of this century. However, nearly two out of every three single-use beverage containers sold in the United States are discarded in the trash or littered, including 2 million tons of plastic bottles per year.[1] The U.S. Environmental Protection Agency estimated that only 29% of PET containers were recycled in the United States in 2017, down slightly from the previous year. Compounding this issue is a weakened market for plastic recycling that might reach alarming levels due to China's increased restrictions on accepting our plastic discards. Prior to those restrictions, nearly 700 million metric tons of U.S. plastic waste were sent over for recycling each year, some of which now end up littered or in landfills.[2]

THE PROBLEM: The concerns with single-use plastics begin with the manufacturing process, in which the products are engineered to preclude reuse. This creates the need for products to be consistently replaced—requiring significant energy and creating pollutants amounting to millions of tons of greenhouse gas emissions each year.[1] Once consumed, plastic containers that go unrecycled often end up as environmental contaminants. Plastics have found their way into virtually every part of the planet, making headlines as a significant component of the ocean's floating "garbage patch," discovered within Arctic ice, and identified in the bodies of some 700 marine species.[3]

The initial weathering of plastic materials causes emission of greenhouse gases such as methane, leading to the eventual disintegration into micro-sized particles (called microplastics) that can persist in the environment for hundreds, perhaps thousands of years. Microplastics now represent a public health and environmental concern, due in part to plastics making their way into the food chain—including the seafood we consume.[4] Plastic debris and fibers have in fact been found in fish sold for human consumption. It is estimated that by 2025, about 250 million tons of accumulated plastic waste will find its way to aquatic and marine environments.[5] One estimate is that by weight, there will be more plastic in the ocean than fish by 2050 if we don't change our consumption and disposal habits.[6]

The worst culprit may be the single-use plastic bottle, which is the third most common item found in ocean debris and represents 15% of marine waste.[7] Our thirst for the convenience of throw-away goods may well cost us the health of our environment, and in turn, our own. Fortunately, small changes we can make every day can have an impact.

SOLUTIONS:

- *Purchase Less Plastic*. There are times, when due to convenience, the purchase of a single-use beverage bottle is simply unavoidable. However, if we make conscientious purchasing decisions, we can balance the factors of convenience, availability, and sustainability. One way to do this is to buy in bulk (larger container) or purchase aluminum or glass containers rather than plastic (as long as recycling is an option). Avoid single-use plastic bottles whenever possible. In general, consider buying products that

lessen or eliminate negative impacts to human health and the environment during the products' storage, use, and disposal.

- *Recycle Plastic Containers*. When you do purchase beverages in plastic containers, be sure the container gets recycled to reduce the possibility of the plastic ending up in the environment. Place in a recycling bin that is labeled for plastic waste, and make sure the bin is free of non-recyclable contaminants such as food waste. Follow any local requirements for preparing the material for recycling, such as rinsing or removing caps.

- *Switch to Reusable Water Containers*. The best way to reduce plastic waste is to not purchase it in the first place. Making the switch to reusable water containers will also decrease the demand for the single-use products and reduce their manufacture. You will want to consider a number of factors in choosing the right water bottle for the application and your preference, such as weight, compactness, material composition, washability, and the type of opening. You will also want to confirm the label identifies the absence of Bisphenol-A (BPA) or its derivatives, which are plastic contaminants that act as endocrine disruptors. These may be present in most plastics including polycarbonate bottles, which are labeled #7 plastic. Food-grade stainless steel containers are recommended because they are resistant to microbial growth, are easily washed, and don't impart flavor. Glass containers are reusable, recyclable, and will not transmit any chemicals or flavors; however, the container should have an outer covering (such as silicone) to prevent breakage. More lightweight solutions are BPA-free plastic or aluminum. Be mindful of bottles that contain liners that may be made of plastic and contain BPA or other contaminants. Some bottles have carbon-activated filters or claim to be self-cleaning.

One caution: reusable containers, if not properly washed between uses, can introduce a risk for bacterial growth and potentially foodborne illness. One study found microbial contamination on the interior surfaces of used plastic water bottles and suggested that the exterior bottle surfaces may also allow transmission of infectious organisms.[8] It is recommended that you wash reusable bottles (including the caps) after each use with soap and warm water. A 1:1 vinegar water solution can also be used to soak the bottle overnight.

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