Science Topic Paper: WEBSITES AND QUESTIONS

What are the pro's and con's of having plastic available for humanity
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https://www.capenews.net/sandwich/news/sandwich-health-board-again-weighs-pros-cons-of-plastics-ban/article_b06d4a6a-406c-5014-b87e-82551a5bec7d.html
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Is paper better than plastic?
http://www.allaboutbags.ca/papervplastic.html
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What health problems have occured from plastic?
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Are uses of plastic even needed?
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What are some products made to replace plastics?
https://www.forbes.com/sites/elizabethmacbride/2015/04/30/avocado-seeds-into-plastic-a-mexican-chemical-engineer-aims-at-5-8b-market/#1cdbc2665482
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What percentage of plastics are recycled?
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http://sciencenordic.com/why-so-little-plastic-actually-recycled

Are we able to make plastics biodegradable?
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What percentage of plastics are in the ocean?
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What industries promote plastics?

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Chemistry in the STEM classroom

2/26/2019

Plastics in Society; the Crisis

In our modern society, plastics can be found in the cities, parks, rural, suburban areas, the countryside, the mountains, the depths of ocean and every place inbetween. When it comes to convenience and ease of use, plastics can accomplish our day-to-day tasks with little expenditure. One-use plastics may be convenient, but where the plastic forks, straws, cups, plates, bags and bottles end up on Earth, isn't the next thought on the average mind. It is easy to forget plastic when it's thrown away; out of sight, out of mind. The hard truth is, the plastic you used yesterday may end up in the ocean or down the throat of wildlife. Unless there is a massive change, plastics are here to stay.

Imagine how many times a day you use your phone. Now imagine if every time you looked at your phone, was a one-use of your phone. How many phones would you have throughout the day? Would you stop to think that perhaps it isn't necessary to have all these phones? We use one phone, and that's good enough to accomplish what we need it for. Perhaps, thinking about plastics another way; mark a tally on yourself with a permanent marker for every piece of plastic you use and throw away throughout the day. How many tallies do you have? By the end of the week, are you covered in tallies? These procedures may be unrealistic, but perhaps it what our society is needing to understand the severity of our plastic crisis.

Mass production of plastics began six decades ago; this is the amount of time it has taken to accumulate 8.3 billion metric tons of plastic (National Geographic, 2018). If you think about it, an entire generation has been raised on plastic convenience, and we are continuing to teach children today that one-use plastics are no problem to use. Plastics take 400 years to

degrade and 91% of plastics are not recycled (2018). In the ocean, there are 8 billions tons of plastic, this is the equivalent of 5 plastic bags per foot of coastline around the globe (2018). If one-use plastic continues unabated, the coastlines will see 100 bags of plastic per foot of coastline in the world by 2025; this is an increase of twenty fold! (Plastic-pollution, 2017)

So the first obvious question is, why isn't plastic recycled more? The most pronounced answer is it is not profitable enough to make new products from used plastics. New plastic is cheaper to produce than it is to recycle and sell because there are different types of plastics (Science Nordic, 2018) Most people do not separate their plastics correctly, and trash ends up in the bin to which it costs money to sort the trash properly. It is also more profitable to burn plastic to produce energy than it is to recycle it. The idea of recycling sounds, to the average mind, like the answer to our crisis. Why not get people to recycle more? One must think of the average American consumer. Americans are about convenience (Green America, 2018); and they behave this way to meet the needs of their high demands. It is not because Americans are lazy or entitled, the change of the time makes it so. In order to effectively combat global warming a direct impact must be made.

How can Americans make an impact if we simply cannot with the high demand our society needs? One could argue, a new type of extra convenient plastic needs to be made. It must be cheap, it must be sturdy, and it must meet the needs that society demands. If Americans can easily see this new material to handle their needs that produces a minor nuisance, ...and let me stress the nuisance must be minor, then I think they can adapt. Americans aren't going to go from carrying milk in their fridge with plastic, to a carton with paper that, if not drunken in a few weeks time, will begin to leak. In fact, paper to replace plastic seems to be a worse alternative. Paper bags need 3.4 times more non-renewable energy than plastic bags to be created, and because paper comes from trees, paper demands 17 times the amount of what that plastic needs to be created (All about bags, 2012). To top it off, paper bags emit twice the amount of greenhouse over plastic production (2012).

So if paper isn't the answer to the plastic crisis, what could be? Americans have their needs, and the needs will not be decreasing any time soon. What could replace plastic? What could replace America's left-hand convenience man? There are actually a multitude of new "plastic alternatives" in the works right now. If fact, many are already on the market. Turning avocado seeds into plastic is already a business; now a Mexican entrepreneur is aiming to turn 300,000 pounds of avocado into 5.8 billion in revenue, or the average global bioplastic revenue (Forbes, 2015). The average avocado seed is much like a corn molecule used to make plastic, and Mexico produces half of the worlds avocados (2015). Imagine a country where the plastic comes from something that is normally thrown away? Another plastic alternative is to use something Americans use every single day liberally: coffee grounds. Instead of throwing away your coffee grounds every morning, save them to produce biodegradable plastic. A PHD student in Australia named Dominik Kopp is developing way to change sugar in coffee grounds, primarily mannose, into lactic acid, which can then be used to produce the biodegradable plastics (Create, 2018). His method involves coffee sugars fermented with microbes. His process required developing a synthetic pathway, which meant manipulation of DNA sequences to produce an enzyme that acts as a natural catalyst to transform the sugar. The resulting lactic acid acts as the base material for polylactic acid (PLA) biodegradable plastics (2018). Then there is the entrepreneur Vegar Ottesen, who has developed an edible and biodegradable substance called nanocellulose (Gemini, 2017). This substance can be extracted from forestry and agricultural waste products. It is stronger than steel per weight and is a stronger barrier to oxygen over plastic (2017). These plastic alternatives seem promising, however, it is still cheaper to produce plastic in its current form than these new methods. For example, the nanocellulose contains 99 percent of water that needs to be removed; this requires a lot of energy (2017).

So what comes next? Big companies need to buy in, and in order for this to happen, consumers must make the shout and demand. Nothing will hurt a business more than

consumers refusing to buy their products. When you go grocery shopping, look for companies that show they have gone green and STRONGLY encourage your friends to do the same. Vote for politicians that believe in global warming and demand change. Don't use one-use plastics. Bring a reusable fork or straw with you when you eat on the go. Counties are slowly making the change from banning straws due to plastic harming the coastlife (Tampa Bay Times, 2018). Encourage changes like this. Do not buy from companies that promote or lobby plastics. A list of them are here:

Dow Chemical
Lyondell Basell
Exxon Mobile
Sabic
INEOS
BASF
ENI
LG Chem
Chevron Phillips
Lanxess
Source: Polymer Properties Database

Although this is a good list, there are others out there that is are difficult to uncover. Plastics are a multi billion dollar business, so lobbyists are very much out there. I'd like to know which major familiar companies promote plastics. Do grocery stores promote plastic? It is far cheaper to wrap produce in plastic than other means. Hospitals already charge an astronomical amount of money for care… if plastics were changed or taken out, how much would hospital prices go up? The majority of Americans don't have healthcare or decent healthcare so how badly would this impact the lower-income population? Plastics may even be in our digestive system already and may be causing cancer (Harvard, 2010). This study suggests more studies about the long term effects of plastics on the body need to be conducted. Also, how much would inflation go up in general if we did away with plastics and went for a greener alternative? These are questions that are not easily answered until something gets started or more research is concluded. The general american conclusion about plastic must change. It's not a "hippie" change, it's not to pester-people-over-no-reason change. Plastics are a real issue choking our

world. Unless you want to be swimming in plastic by 2050 and choking away your planet's life and resources, an alternative must be made. If not for you or the wellbeing of our only planet, then at least think for our future generations; they do not deserve a world of plastic.

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