November 15, 2022

Petition submitted via e-mail and UPS

PETITION TO REQUIRE HEALTH AND ENVIRONMENTAL TESTING AND REGULATION ON POLYVINYL ALCOHOL UNDER THE TOXIC SUBSTANCES CONTROL ACT AND THE REMOVAL OF POLYVINYL ALCOHOL FROM THE EPA'S SAFER CHOICE AND SAFER CHEMICAL INGREDIENTS LISTS

Michael S Regan, Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W. Washington, D.C. 20460
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Dear Administrator Regan,

Please accept the following petition on behalf of Blueland and Plastic Pollution Coalition joined by leading nonprofit organizations fighting plastic pollution and climate change; Beyond Plastics, Plastic Oceans International, The Shaw Institute, Lonely Whale, 5 Gyres, GAIA (Global Alliance for Incinerator Alternatives), Oceanic Global Foundation, The Last Beach Cleanup, Rio Grande International Study Center, Inland Ocean Coalition, Occidental Arts and Ecology Center, Turtle Island Restoration Network, Friends of the Earth, Surfrider and Made Safe. This petition is submitted under section 21 of the Toxic Substances Control Act and the EPA Safer Choice Standards and Safer Chemical Lists from the EPA Safer Choice Program. This petition requests that the EPA conduct requisite human and environmental health and safety testing for Polyvinyl Alcohol, also known as PVA or PVOH as it is used in consumer-packaged goods, with particular attention to the use of PVA in laundry and dishwasher detergent pods and sheets. The petition also requests that until such testing is completed, the EPA remove polyvinyl alcohol from its Safer Choice Program in order to curb plastic pollution.

Thank you for your consideration.

Signed on behalf of our Blueland, Plastic Pollution Coalition and our co-signed partners.

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Section 1: Executive Summary

This petition is filed under section 21 of the Toxic Substances Control Act (TSCA) and the Safer Choice Standards and Safer Chemical Lists from the EPA Safer Choice Program[1]. The petition requests that the Environmental Protection Agency (EPA) require health and environmental safety tests of Polyvinyl Alcohol (PVA, also known as PVOH), as it is used as a plastic film in consumer-packaged goods and used in all dishwasher and laundry pods and sheets. This petition also requests that PVA be removed from the Safer Choice List and Safer Chemical Ingredients List until the EPA can complete the requested health and environmental safety testing. PVA is a synthetic, petroleum-derived polymer that is theorized to contribute to plastic pollution in oceans, waterways and soil, and recent research suggests that it may negatively impact ecosystems and the food and water supply.[2] PVA also has the potential to exhibit bioaccumulative properties that could carry toxic chemicals and carcinogens up through the food chain.[3] A recent study has even showed Polyvinyl Alcohol particles to be present in human breastmilk.[4]

PVA has many applications, but one fast growing use for PVA, and particular concern for the EPA Safer Choice program, is its use in dishwasher and laundry detergent pods and sheets. Detergent pods are wrapped in a thin layer of PVA plastic film and detergent sheets are woven together with PVA. Laundry and dishwasher pods are a popular format for consumers, with over 20 billion PVA wrapped laundry and dishwasher pods used every year in the U.S. alone. Regardless, few consumers realize that the PVA film surrounding pods is actually a petroleum-based plastic.[5] For many, once the plastic pod is put into the washing machine or dishwasher, it is out of sight and out of mind; however, there are potential health and environmental implications. Consumers look to initiatives like the EPA Safer Choice program to evaluate whether their products are safe for themselves and the environment.[6] EPA Safer Choice analyzes ingredients, product performance and packaging to ensure that products with an EPA Safer Choice label are safer for individuals and pets, as well as workers health and the environment.[7]

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[1] 15 U.S.C. 53 §2603. Testing of chemical substances and mixtures
http://uscode.house.gov/view.xhtml?path=/prelim@title15/chapter53&edition=prelim

[2] Rolsky C, Kelkar V. Degradation of Polyvinyl Alcohol in US Wastewater Treatment Plants and Subsequent Nationwide Emission Estimate. *International Journal of Environmental Research and Public Health*. 2021; 18(11):6027. https://doi.org/10.3390/ijerph18116027

[3] *Ibid*.

[4] Ragusa, Antonio, Valentina Notarstefano, Alessandro Svelato, Alessia Belloni, Giorgia Gioacchini, Christine Blondeel, Emma Zucchelli, et al. "Raman Microspectroscopy Detection and Characterisation of Microplastics in Human Breastmilk." *Polymers* 14, no. 13 (June 30, 2022): 2700. https://doi.org/10.3390/polym14132700.

[5] Rolsky C, Kelkar V. *2*.

[6] US EPA, OCSPP. "Safer Choice Standard and Criteria." Overviews and Factsheets, March 7, 2014. https://www.epa.gov/saferchoice/standard

[7] *Ibid*.

PVA is currently on the Safer Choice Program's Safe Ingredients List, suggesting to consumers that the PVA plastic film encasing laundry and dishwasher pods is safe for people and the environment, and does not have any adverse impacts on the planet. Nevertheless, research shows that ~75% of plastic pods just from laundry and dishwasher detergents remain intact throughout conventional, wastewater treatment, and may persist in our environment, waterways, oceans and soils.[8] PVA is a water-soluble thermoplastic polymer that has the ability to biodegrade in a set of specific conditions and, when used in washing machines and dishwashers, is designed to go down drains.[9] PVA dissolves and is flushed into municipal wastewater but does not fully biodegrade due to the conditions in most wastewater treatment plants (WWTPs).[10] From there, it flows from municipal wastewater into our water systems and soils.[11] For PVA to completely biodegrade, it requires extremely specific conditions to be met in WWTPs, including a particular length of time spent in WWTPs and the presence of certain, acclimated microorganisms needed to degrade PVA completely.[12] If all conditions are not met, intact PVA plastic is released into wastewater effluent which goes into soil, waterways, oceans and beyond. Since these conditions are rarely met, if ever, studies estimate that over ~75% of intact PVA plastic is released back into the environment[13]. Given PVA's potential for persistence, and the unknown impacts it has on the environment, PVA should be removed from the Safer Choice Program's Safe Ingredients List until extensive health and environmental safety testing can be completed, and PVA's effect on the environment is determined.

Section 2: The Petitioners

This petition is submitted by Blueland and Plastic Pollution Coalition, and co-signed by Beyond Plastics, Plastic Oceans International, The Shaw Institute, Lonely Whale, 5 Gyres, GAIA (Global Alliance for Incinerator Alternatives), Oceanic Global Foundation, The Last Beach Cleanup, Rio Grande International Study Center, Inland Ocean Coalition, Occidental Arts and Ecology Center, Turtle Island Restoration Network, Friends of the Earth, Surfrider and Made Safe. Blueland is a consumer-packaged goods company that aims to eliminate single-use plastic packaging from everyday products, including cleaning and personal care products. Plastic Pollution Coalition is a non-profit communications and advocacy organization that collaborates with an expansive global alliance of organizations, businesses, and individuals to create a more just and equitable world free of plastic pollution and its toxic impacts. Beyond Plastics, Plastic Oceans International, The Shaw Institute, Lonely Whale, GAIA (Global Alliance for Incinerator Alternatives), Oceanic

[8] Rolsky C, Kelkar V. 1
[9] Doble, Mukesh, and Anil Kumar. "CHAPTER 9 - Degradation of Polymers." In *Biotreatment of Industrial Effluents*, edited by Mukesh Doble and Anil Kumar, 101–10. Burlington: Butterworth-Heinemann, 2005. https://doi.org/10.1016/B978-075067838-4/50010-5.
[10] *Ibid. 1*
[11] *Ibid. 1*
[12] *Ibid. 1*
[13] *Ibid. 9*

Global Foundation, The Last Beach Cleanup Rio Grande International Study Center, Inland Ocean Coalition, Occidental Arts and Ecology Center, Turtle Island Restoration Network, Friends of the Earth, Surfrider and 5 Gyres are non-profit organizations dedicated to eliminating plastic pollution and protecting the planet from the harms of plastic and other destructive activities on the environment. Made Safe is a third-party certification organization that aims to help businesses achieve high standards in their practices and with their products as it relates to human and environmental health.

Section 3: Relevant Background Information on Plastic Pollution

In the last 30 years, plastic consumption has quadrupled.[14] In 2019, 2.6 million tons of plastic waste ended up in oceans and waterways.[15] Studies show by 2050, there will be more plastic, by weight, in the ocean than fish.[16] Plastic pollution can inflict substantial harm to aquatic and marine environments – globally, 800 species of animal are impacted by marine debris, 100% of marine turtle species have been found to ingest plastic pieces along with 59% of whale, 36% of seal and 40% of seabird species examined.[17]

Microplastics are tiny pieces of plastic debris. There is no universally agreed upon size definition for microplastics, though many use plastics less than 5mm in diameter as the guidance.[18] Microplastics have been linked to environmental and human health concerns.[19] Recently, microplastics have been found in the human bloodstream and even in human placentas and breastmilk.[20] These tiny pieces of plastic, as well as nanoplastics (which are even smaller), are recognized as a harmful ocean contaminant.[21] Due to their tiny size, they are easily ingested by marine animals, and they also have been found in human food and water sources.[22]

Section 4: PVA Treatment, Pollution and Potential Harms on The Environment

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[14] "Plastic Pollution Is Growing Relentlessly as Waste Management and Recycling Fall Short, Says OECD." Accessed July 21, 2022. https://www.oecd.org/newsroom/plastic-pollution-is-growing-relentlessly-as-waste-management-and-recycling-fall-short.htm.
[15] *Ibid*
[16] *Ibid*.
[17] MBRCtheocean. "Shocking Plastic Statistics." Accessed July 21, 2022. https://www.mbrctheocean.com/pages/shocking-plastic-statistics.
[18] US Department of Commerce, National Oceanic and Atmospheric Administration. "What Are Microplastics?" Accessed July 22, 2022. https://oceanservice.noaa.gov/facts/microplastics.html.
[19] *Ibid*.
[20] Ragusa, Antonio, Alessandro Svelato, Criselda Santacroce, Piera Catalano, Valentina Notarstefano, Oliana Carnevali, Fabrizio Papa, et al. "Plasticenta: First Evidence of Microplastics in Human Placenta." *Environment International* 146 (January 2021): 106274. https://doi.org/10.1016/j.envint.2020.106274.
[21] Ibid.
[22] Lim, XiaoZhi. "Microplastics Are Everywhere — but Are They Harmful?" *Nature* 593, no. 7857 (May 4, 2021): 22–25. https://doi.org/10.1038/d41586-021-01143-3.

PVA is a synthetic, petroleum-based plastic polymer found in many, everyday products and has become a popular plastic used in cleaning and personal care products.[23] PVA is often found in household items as a thin plastic wrapping, encasing single-dose detergents or woven into laundry detergent sheets. PVA is also increasingly being used in other cleaning and personal care products, such as body washes and toilet cleaners, and is designed to go down drains and into water systems. A recent study published in the *International Journal of Environmental Research and Public Health* titled, "Degradation of Polyvinyl Alcohol in US Wastewater Treatment Plants and Subsequent Nationwide Emission Estimate", shows that while PVA does solubilize, it does not necessarily biodegrade. In the U.S., an estimated 61% of PVA goes to WWTPs, and an estimated 37% remains untreated. In total, Rolsky and Kelkar estimate that ~75% of PVA from dishwasher and laundry pods persists through conventional wastewater treatment, passing into waterways and ecosystems beyond.[24] In addition to environmental persistence, similar to other petroleum-based plastic, PVA could bioaccumulate and has the potential to absorb dangerous contaminants and move them up the food chain. This requires further research.[25]

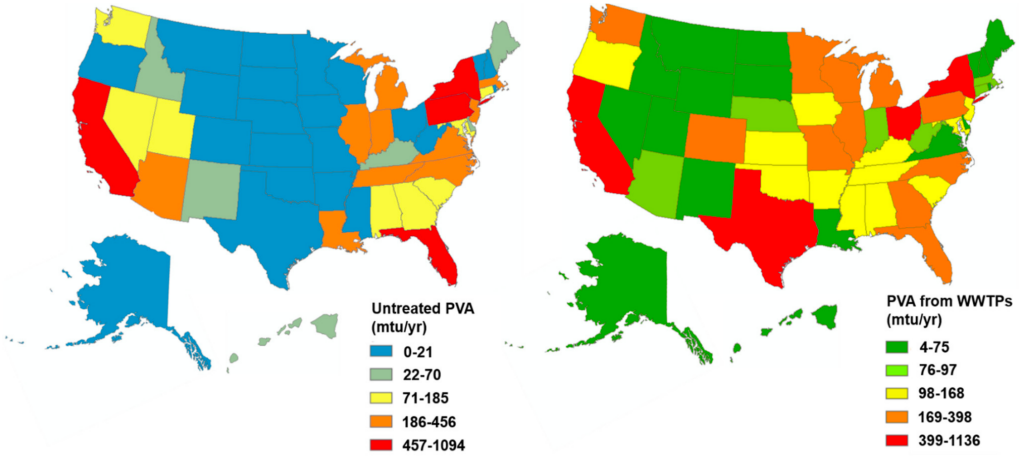

Figure 3. from Degradation of Polyvinyl Alcohol in US Wastewater Treatment Plants and Subsequent Nationwide Emission Estimate showing the amount of treated and untreated PVA released into the environment in the U.S. in metric ton unit/ year

PVA Degradability Process

PVA from laundry and dishwasher pods and sheets goes from consumer households to WWTPs. Dissolved PVA enters WWTPs but ~75% exits WWTPs intact, which is thought to pollute waterways and soil beyond.[26] This estimate is based on a conventional WWTP process. Facilities

[23] Rolsky and Kelkar, "Degradation of Polyvinyl Alcohol in US Wastewater Treatment Plants and Subsequent Nationwide Emission Estimate." 2
[24] *Ibid. 1*
[25] *Ibid. 12.*
[26] *Ibid.*

with advanced treatment processes may have different degradation rates. PVA goes through the following phases in conventional wastewater treatment plants:

Phase 1: Primary treatment:
In the primary treatment phase, large solids are separated from the wastewater that has entered the facility. In this phase, dissolved PVA is not typically separated from the wastewater due to its hydrophilic properties.[27]

Phase 2: Secondary treatment
If PVA were to biodegrade, it would likely take place in the secondary treatment phase. During the secondary treatment phase, PVA interacts with bacteria and microbes that typically break down biological waste in the wastewater. In conventional WWTPs within the U.S., specific PVA-adapted bacteria and microbes are needed to aid in the near to complete degradation of PVA, though they are not likely present.[28]

If those microbes are present, the PVA in wastewater rarely encounters the microbes for long enough for the PVA to fully degrade. It is estimated that PVA needs to interact with the proper microbes for seven days, and typically wastewater remains in a conventional WWTP for two to three days.[29]

Phase 3: Tertiary treatment

Once the wastewater has gone through the secondary treatment phase, the final phases are disinfection and filtration. In the disinfection phase, it is possible for remaining PVA to be degraded.[30] However, the technology to execute that degradation is expensive, and hence assumed to be rarely employed in WWTPs within the U.S.[31]

After the three treatment phases, wastewater is released from WWTPs. According to the study, PVA can travel into the environment via effluent or released within biosolids. If released with water, it has the potential to impact our waterways and environment. If released within biosolids, it will travel into landfills, onto soils or be incinerated.[32]

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[27] *Ibid*
[28] *Ibid*.
[29] *Ibid*
[30] *Ibid*
[31] *Ibid*.
[32] *Ibid*.

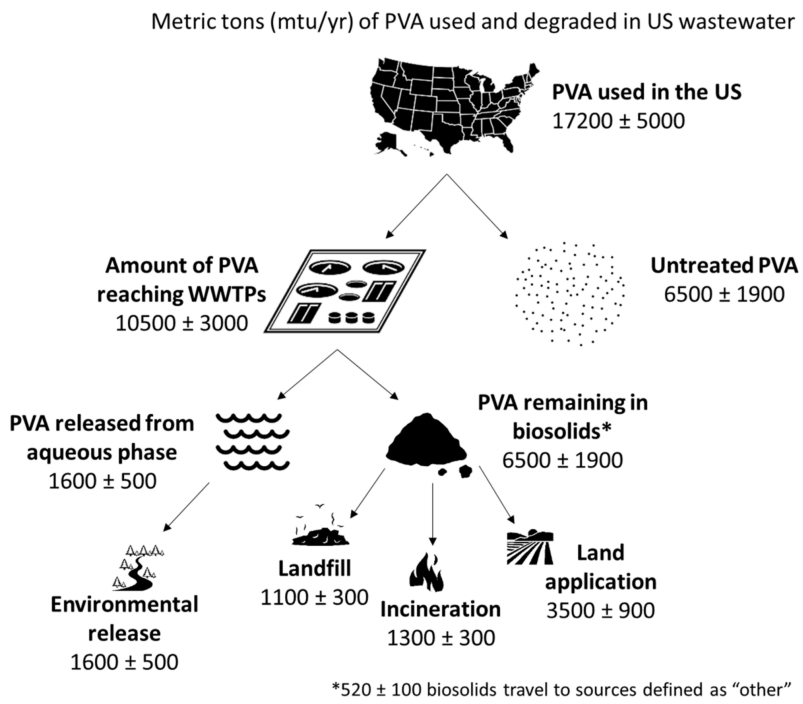

Figure 4 from Degradation of Polyvinyl Alcohol in US Wastewater Treatment Plants and Subsequent Nationwide Emission Estimate showing the path of PVA

The ~75% of PVA that remains intact after it leaves the WWTP weighs roughly eight thousand metric tons and is released back into the environment each year, just from plastic laundry and dishwasher pods alone.[33] With PVA's numerous and increasing applications across the cleaning and personal care space, PVA is referred to as one of the most ubiquitous pollutants in waterways and soil.

PVA has various potential impacts on the soil and waterways it pollutes. Further research is still needed to determine the potential harms of PVA in the environment; however, PVA could have the following impacts:

PVA in soil: PVA that is released from WWTPs as sludge often ends up on land and in soil. This has the potential to affect agricultural yields.[34]

PVA in aquatic environments: A study shows that PVA can alter gas exchanges within aquatic environments. In addition, PVA has exhibited bioaccumulation properties; it has

[33] Oceans, Plastic. "Detergent Pods Contributing to Plastic Pollution." *Plastic Oceans International* (blog), July 23, 2021. https://plasticoceans.org/detergent-pods-contributing-to-plastic-pollution/.

[34] *Ibid. 12*

> "even been documented to mobilize heavy metals from sediments to water resources. Hydrophilic compounds, such as biocides, insecticides, herbicides, flame retardants, corrosion inhibitors, personal care products, and pharmaceuticals are present in wastewater and stormwater. Some of these are proven carcinogens with great aqueous phase stability. As the sorption of organic and inorganic pollutants is not limited to hydrophobic compounds but can also occur with hydrophilic compounds, PVA could act as a vector for transport up the food chain, similarly to more conventional plastics."[35]

Section 5: Requested Actions:

Request for Health and Environmental Safety Tests under the Toxic Substances Control Act

Given the potential for PVA to persist in the environment as a harmful plastic pollutant, this petition requests that the EPA require health and environmental safety tests under the Toxic Substances Control Act on PVA and ultimately regulate PVA as a toxic substance, pending the results from testing. The Toxic Substances Control Act seeks to protect human health and the environment by empowering the EPA to issue testing requirements for specific chemicals and establish regulations that restrict manufacturing, processing and distribution of chemicals that are determined a health or environmental risk.[36]

The Toxic Substances Control Act from 15 US Code Chapter 53 Subchapter I section 2603 states:

> "If the Administrator finds that—
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> **(A)(i) (I)**the manufacture, distribution in commerce, processing, use, or disposal of a chemical substance or mixture, or that any combination of such activities, may present an unreasonable risk of injury to health or the environment,
>
> **(II)**there is insufficient information and experience upon which the effects of such manufacture, distribution in commerce, processing, use, or disposal of such substance or mixture or of any combination of such activities on health or the environment can reasonably be determined or predicted, and
>
> **(III)**testing of such substance or mixture with respect to such effects is necessary to develop such information; or
>
> **(ii)(I)**a chemical substance or mixture is or will be produced in substantial quantities, and (aa) it enters or may reasonably be anticipated to enter the environment in

[35] *Ibid. 12*
[36]US EPA, "Toxic Substances Control Act (TSCA) and Federal Facilities."

substantial quantities or (bb) there is or may be significant or substantial human exposure to such substance or mixture,

(II)there is insufficient information and experience upon which the effects of the manufacture, distribution in commerce, processing, use, or disposal of such substance or mixture or of any combination of such activities on health or the environment can reasonably be determined or predicted, and

(III)testing of such substance or mixture with respect to such effects is necessary to develop such information; and

(B) in the case of a mixture, the effects which the mixture's manufacture, distribution in commerce, processing, use, or disposal or any combination of such activities may have on health or the environment may not be reasonably and more efficiently determined or predicted by testing the chemical substances which comprise the mixture;

the Administrator shall by rule, or, in the case of a chemical substance or mixture described in subparagraph (A)(i), by rule, order, or consent agreement, require that testing be conducted on such substance or mixture to develop information with respect to the health and environmental effects for which there is an insufficiency of information and experience and which is relevant to a determination that the manufacture, distribution in commerce, processing, use, or disposal of such substance or mixture, or that any combination of such activities, does or does not present an unreasonable risk of injury to health or the environment.[37]"

Due to the unknown dangers that PVA poses to the environment, the EPA has an obligation, under the TSCA, to test PVA and its end of life in marine and aquatic ecosystems, as well as soil environments, to determine the implications for human and environmental health. This petition requests that the EPA complete full environmental and human health tests on both untreated and treated PVA that is released into aquatic, marine and land environments.

Request to Remove PVA from EPA Safer Choice Program and Safer Chemical List

In addition to requesting that PVA be tested and ultimately regulated under the TSCA, this petition requests that PVA be removed from the EPA Safer Choice List and Safer Chemical Lists until the requested testing is complete.

The EPA Safer Choice Program has the following guidance on polymers:

"To be acceptable for labeled products, polymers must have low-concern characteristics.1 Also, the requirements of this section apply to the low molecular weight components of

[37]15 U.S.C. 53 §2603. Testing of chemical substances and mixtures

polymers (typically less than 1,000 daltons). Safer Choice encourages the use of degradable polymers whenever possible; only those that do not degrade into CMRs or PBTs (Persistence, Bioaccumulation, Toxins) will be allowed."[38]

If a polymer does break down into PBTs, it should be excluded from the EPA Safer Choice list. Using the definitions that the Safer Choice programs outline for persistence and bioaccumulation, PVA should be excluded from the EPA Safer Choice list.

1. Persistence: "The length of time the chemical can exist in the environment before being destroyed (i.e., transformed) by natural processes".[39]

Rolsky and Kelkar's paper demonstrates that there is significant potential for PVA to persist within waterways, oceans and soils after it leaves WWTPs, with ~75% remaining intact post water treatment.[40]

2. Bioaccumulation: "is a process in which a chemical substance is absorbed in an organism by all routes of exposure as occurs in the natural environment, e.g., dietary and ambient environment sources. Bioaccumulation is the net result of competing processes of chemical uptake into the organism at the respiratory surface and from the diet and chemical elimination from the organism including respiratory exchange, fecal egestion, metabolic biotransformation of the parent compound and growth dilution".[41]

Rolsky and Kelkar cite Chiellini et. al to suggest that PVA has the potential to exhibit bioaccumulation properties, citing its ability to "mobilize heavy metals from sediments to water resources. Hydrophilic compounds, such as biocides, insecticides, herbicides, flame retardants, corrosion inhibitors, personal care products, and pharmaceuticals are present in wastewater and stormwater".[42]

PVA clearly demonstrates the EPA definitions of Persistence and has the potential for Bioaccumulation. Partially degraded PVA might have the potential to interact with or carry PBT chemicals and bioaccumulate them up the food chain. Because of these characteristics, PVA should not be eligible for the polymer exclusion and should be removed from the EPA Safer Choice List unless it can be proven to be safe.

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[38] "EPA's Safer Choice Criteria for Colorants, Polymers, Preservatives, and Related Chemicals," n.d., 3.
[39] EPA PBT Final Rule [9]
[40] Rolsky and Kelkar, "Degradation of Polyvinyl Alcohol in US Wastewater Treatment Plants and Subsequent Nationwide Emission Estimate." 12
[41] EPA's Safer Choice Program Master Criteria for Safer Ingredients
[42] Chiellini, Emo, Andrea Corti, Salvatore D'Antone, and Roberto Solaro. "Biodegradation of Poly (Vinyl Alcohol) Based Materials." *Progress in Polymer Science* 28, no. 6 (June 1, 2003): 963–1014. https://doi.org/10.1016/S0079-6700(02)00149-1.

Lastly, PVA is used in all laundry and dishwasher pods and sheets. Many brands who use PVA market their pods and sheets as "100% biodegradable" and or "100% plastic-free". Both claims are misleading, given that they use PVA, which is a petroleum-based plastic, and is only biodegradable under extremely specific conditions, as the research by Rolsky and Kelkar explains. These can mislead consumers to think these products are better for the environment than they are, when there is still further research needed. Even with further research, claims such as "100% biodegradable" and "100% plastic-free" would not be substantiated. We request that the EPA Safer Choice Program review claims about PVA through the lens of truth in advertising to ensure that consumers have accurate information about PVA and its potential environmental impacts.

Section 6: Conclusion

PVA plastic film is widely used in conventional household and personal care products. It is designed to become a solution when exposed to water before it is flushed down the drain. PVA can be biodegradable in WWTPs when it encounters a set of extremely specific conditions, as cited above. Unfortunately, as Rolsky and Kelkar found, these conditions are rarely met in the U.S. Instead, ~75% of PVA from laundry and dishwasher pods likely persists in waterways, soil and oceans.[43] Further research is needed to determine the potential hazards that polluted PVA can pose to ecosystems and human health. Given the gravity of the plastic pollution problem and the known impacts of other plastic polymers on the environment, this petition requests the EPA require extensive health and environmental safety testing of PVA once it is released into ecosystems by way of WWTPs, to determine potential environmental impacts. In addition, given the persistence of PVA in the environment and its potential for bioaccumulation, this petition requests immediate removal of PVA from the EPA Safer Choice List and EPA Safer Chemical Lists until required testing is conducted. Using the polymer exemption definition, the EPA puts forth, a polymer cannot be exempt if it degrades into PBTs (Persistence, Bioaccumulation, Toxins).[44] Rolsky and Kelkar model that PVA likely persists in our environment and Chiellini et al. have shown the potential for PVA to have bioaccumulation properties.[45] For these reasons, it is requested that PVA undergo the requisite testing to determine its impact on the environment and be removed from the Safer Choice Program until the tests are complete.

[43] Rolsky and Kelkar, "Degradation of Polyvinyl Alcohol in US Wastewater Treatment Plants and Subsequent Nationwide Emission Estimate." 1.
[44] EPA PBT Final Rule [9]
[45] Chiellini et al., "Biodegradation of Poly (Vinyl Alcohol) Based Materials."

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"15 USC Ch. 53: TOXIC SUBSTANCES CONTROL." Accessed July 21, 2022. http://uscode.house.gov/view.xhtml?path=/prelim@title15/chapter53&edition=prelim.

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Ragusa, Antonio, Alessandro Svelato, Criselda Santacroce, Piera Catalano, Valentina Notarstefano, Oliana Carnevali, Fabrizio Papa, et al. "Plasticenta: First Evidence of Microplastics in Human Placenta." *Environment International* 146 (January 2021): 106274. https://doi.org/10.1016/j.envint.2020.106274.

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