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Due Mar 29

Essential speech

Informative speech outline: Microplastics

**Format**: Problem / solution

**Topic**: Microplastics from the fashion industry

**General purpose**: To inform

**Specific purpose**: To inform the audience about the origination of microplastics in clothing, the effects of microplastics in animals, and one proposed solution.

**Thesis:** Microplastic contamination is an increasing issue. Studies show that it can cause gut damage, inflammation and stress in animals. Much of this contamination has recently been shown to originate in plastic-based clothing, specially occurring during washing. One proposed solution comes to us from the study of active matter, where micro- and nano-motor particles may be used to remove microplastics from water.

**Connections:** My milestone class is “Dress and Culture”. Thus, the connection is that microplastics often originate in clothes and the washing thereof. Additionally, I am doing my undergraduate research in the study of active colloidal particles, the class in which the proposed active matter solutions fall.

1. Introduction
   1. Attention grabber
      1. **In 2022, NBC news penned an article on leaded gasoline and its effects. [4]**
      2. 100 years ago, we began adding lead to gasoline. 30 years ago, we banned its use due to widespread poisoning, brain damage and death. Now, 100 years later, we may have found ourselves in the same trap: With microplastics.
   2. Relevance
      1. Nearly every human has microplastics in them
      2. They may pose significant health risks
   3. Credibility
      1. I’m doing research into Janus particles
      2. These may have a future in the cleanup of microplastics
   4. Thesis
      1. Microplastic contamination is an increasing issue
      2. Studies show gut damage, inflammation, stress
      3. A lot comes from washing clothes
         1. This is the tie to my milestone class
      4. Active matter may assist
         1. Micro and nano scale motors via Janus Particles
2. Body (keywords + verbal citations + cues)
   1. Recent studies show microplastics from washing clothes
      1. **A landmark 2011 study published in Environmental Science & Technology by Browne, Crump, Niven et. al. [1]**
         1. 6 continents
         2. Correlated with population centers
         3. Correlation between washing machine output and high microplastic concentration
            1. A single garment can create >1900 fibers in one wash
         4. “This suggests that a large proportion of microplastic fibers found in the marine environment may be derived from sewage as a consequence of washing of clothes. As the human population grows and people use more synthetic textiles, contamination of habitats and animals by microplastic is likely to increase.” [1]

**So what?**

* 1. Microplastics are bad for health
     1. **A 2019 study on Zebrafish microplastic exposure by Qiao et. al. [2]**
        1. Shows damage in gut biomes
        2. Significant inflammation, stress, gut damage
        3. With varied microplastic sizes and types
        4. “This study provides evidence that MPs exposure causes gut damage as well as alterations in gut metabolome and microbiome [in Zebrafish]” [2]

**Is anything being done?**

* 1. Cleanup is difficult, one approach is active matter
     1. Very few solutions have been proposed
     2. **A 2019 article in the journal of Applied Materials & Interfaces by Wang et. al. examining active nanoscale colloids as microplastic cleanup solutions [3]**
        1. Tiny particles behave predictably under certain applied conditions
        2. These can be “micromotors”, which can be used to do work
        3. Applications in medicine, cleanup, etc
        4. Can be used to push microplastics in certain directions
        5. “Environmental contamination is a major global challenge, and the effects of contamination are found in most habitats. In recent times, the pollution by microplastics has come to the global attention and their removal displays an extraordinary challenge with no reasonable solutions presented so far.” [3]

**Let’s recap.**

1. Conclusion
   1. Brief summary
      1. Microplastics are increasing
      2. Microplastics are bad for health
      3. Few solutions have been proposed, one is active matter
   2. Memorable last line
      1. 100 years ago, we began adding lead to gasoline. This caused brain damage, crime, and death on a massive scale, and evaded regulation despite known health issues. Due to worldwide action, the effects of leaded gasoline are finally beginning to fade; Hopefully we can one day say the same about microplastics.

**Bibliography**:

1. Browne, M. A., Crump, P., Niven, S. J., Teuten, E., Tonkin, A., Galloway, T., & Thompson, R. (2011). Accumulation of microplastic on shorelines woldwide [sic]: sources and sinks. Environmental science & technology, 45(21), 9175–9179. <https://doi.org/10.1021/es201811s>
2. Qiao, R., Sheng, C., Lu, Y., Zhang, Y., Ren, H., & Lemos, B. (2019). Microplastics induce intestinal inflammation, oxidative stress, and disorders of metabolome and microbiome in zebrafish. The Science of the total environment, 662, 246–253. <https://doi.org/10.1016/j.scitotenv.2019.01.245>
3. Wang, L., Kaeppler, A., Fischer, D., & Simmchen, J. (2019). Photocatalytic tio2 micromotors for removal of microplastics and suspended matter. ACS Applied Materials &amp; Interfaces, 11(36), 32937–32944. <https://doi.org/10.1021/acsami.9b06128>
4. NBCUniversal News Group. (2022, March 7). Lead in gasoline blunted IQ of half the U.S. population, study says. NBCNews.com. <https://www.nbcnews.com/health/health-news/lead-gasoline-blunted-iq-half-us-population-study-rcna19028>