MEMORANDUM

To: Autumn Cleave, SFPUC and BAPPG

From: Stephanie Hughes (sehughes@scu.edu), Consulting Engineer

Date: December 31, 2020

Subject: Disposal of gel packs from prepared meal kits

At the December 2020 BAPPG meeting, a question arose about disposal of cold packs contained in widespread prepared meal kits. I was later asked to briefly look into this and determine whether the gel is safe for the sewers and POTWs. It appears that there are 2 types of gel packs, including a relatively new one that is marketed as drain-safe. Based on the findings below, it appears that typical gel packs need to be disposed in the trash due to their potential to clog drains (no other downstream impacts expected). According to manufacturer-provided materials, the drain-safe product does not appear to be of concern for POTWs or collection systems; meanwhile it may reduce impact of gel packs to landfills.

Typical Gel Packs

It appears that typical gel packs contain sodium polyacrylate (also known as 2-propenoic acid[1]). The sodium polyacrylate creates the highly viscous hydrogel quality of the cold packs. Due to its quality as a superabsorbent polymer (SAP), sodium polyacrylate is used in many consumer products, including diapers, potting soil, and toys (such as Orbeez beads); it is also used in laundry detergent to chelate metals. Therefore it is likely that sewage treatment processes have been exposed to this chemical from numerous products for decades. It also appears that it is easily removed by activated sludge processes.[2, 3] It also does not appear to be a major concern with respect to aquatic toxicity.[4] Meanwhile, the primary issue with respect to the cold packs appears to be that of possible clogging of drains due to the viscous nature of the SAP.

The City of San Jose instructs users not to dispose down the drain:

> *"Gel from ice packs will cause bad clogs in your drains, so make sure this gel doesn't get washed down a sink or flushed down a toilet. If your ice pack is just filled with water, cut a corner of the pack and place it in a sink to thaw. After the water has melted and drained, dry the empty pack and* ***drop it off with other plastic bags****."* [5]

Similarly, the meal kit company Home Chef recommends reuse or disposal to the trash:

> *"Ice Packs - Our ice packs are non-toxic and made of 99% water and 1% sodium salt (polyacrylate). They can be easily rinsed off and reused. To dispose of the ice packs, simply cut open the film, throw the contents in the trash, and recycle the film where you recycle your plastic bags."* [6]

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[1] https://pubchem.ncbi.nlm.nih.gov/compound/4068533

[2] Martin, et al. Carbon-14 tracer study of polyacrylate polymer in a wastewater plant, International Journal of Radiation Applications and Instrumentation. Part A. Applied Radiation and Isotopes, 1990.

[3] Xia Zhao et al. Removal of polyacrylate in aqueous solution by activated sludge: Characteristics and mechanisms, Journal of Cleaner Production, 2018.

[4] https://www.ecotoxcentre.ch/media/194999/2019_dellambrogio_polyacryl.pdf (see Table 8)

[5] https://sanjoserecycles.org/what-to-do-with-all-that-meal-kit-packaging/ and https://sanjoserecycles.org/guide/ice-packs/

[6] https://support.homechef.com/hc/en-us/articles/210097943-How-do-I-dispose-of-the-box-packaging-materials-

Drain-Safe Gel Packs

One cold pack company, Nordic Cold Chain Solutions (Nordic), manufactures two types of cold packs, one is billed as a Regular Gel Pack, while the other is listed as a Drain-Safe Gel Pack ("*Ideal for routine deliveries where reuse and disposal are inconvenient or not an option.")* [7] Nordic is marketing the drain-safe product as a way of reducing the impact of gel packs to landfills (see link to 2019 press release).[8] These products are being used by at least one meal kit company. Blue Apron uses Nordic products and instructs users to recycle the plastic film, telling them cut open the bag and drain the contents down the sink. [9]

On the Nordic website, the content of the drain-safe product is stated as containing "non-toxic, proprietary ingredients." I reached out to a Nordic representative on behalf of BAPPG, asking them to substantiate their claim that the content was non-toxic, including for aquatic organisms, and that it would not impact sewage treatment operations. Their Vice President of Sales, Keith Baechle,[10] responded and sent several attachments, including a 3rd party review and documentation for use in the European Union.

The Nordic drain-safe product includes 2 proprietary ingredients. Ingredient 1 is a thickening agent (not an SAP). According to documentation, "*Ingredient #1 is commonly used in water-based products throughout the consumer product industry*." Ingredient 2 is a chemical that promotes the dispersion / solubilization of ingredient 1. This suggests that the inclusion of ingredient 2 makes it so that once cut open, the thickening agent breaks down, eliminating the clog concern. According to the documentation, "*This class of chemical is safely used globally in consumer products that are disposed down the drain*." Below is a table directly from one of the documents provided by Nordic regarding the fate and effects of the pure raw materials (prior to dilution into the manufactured gel). [11] According to the documentation provided with the table, the cause of mortality in acute toxicity tests appears be from exhaustion due to the water's increased viscosity. Further, the documentation states *"The molecular structure of the Nordic Drain Safe™ gel significantly inhibits the material from crossing biological membranes and consequently minimizes aquatic toxicity and any potential for bioconcentration or accumulation."* and *"Dilution and natural breakdown of the gel product in sewage and sorption during treatment will ensure that no gelling will occur in the sewage infrastructure or aquatic environment."*[12]

Ingredient	Function in Product	Biodegradation	Bioaccumulation Potential	Aquatic Tox Acute Fish and Invertebrates LC_{50}	Aquatic Tox Acute Algae LC_{50}	Aquatic Tox Chronic Fish and Invertebrates NOEC	Aquatic Tox Chronic Algae NOEC
Active ingredient #1	Active	Not biodegradable (OECD method)	low	210 to 1120 mg/L	No available data	No available data	No available data
Active ingredient #2	Active	Readily biodegradable (OECD method)	low	1.6 to 4.1 mg/L	2 to 6 mg/L	>0.8 mg/L	1.0 mg/L

Conclusion

It appears that typical gel packs should be disposed of in the trash, to prevent drain clogging, while the drain-safe product is unlikely to have an impact to either collection systems or wastewater treatment.

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[7] https://nordiccoldchain.com/products/refrigerants/gel-packs/

[8] Press release, December 2019, Nordic Drain Safe™ Gel Packs Eliminate 35,000 tons of Refrigerant from Landfills in 2019. https://markets.businessinsider.com/news/stocks/nordic-drain-safe-gel-packs-eliminate-35-000-tons-of-refrigerant-from-landfills-in-2019-1028773497

[9] https://www.blueapron.com/recycle

[10] (913) 213-0687, keith.baechle@nordicice.com

[11] Ramboll Global Product Safety, Memo to Nordic Ice, October 9, 2020.

[12] Ibid.