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Food Animal Concerns Trust Comments on "Drinking Water Contaminants of Emerging Concern for the National Emerging Contaminant Research Initiative; Reopening of Comment Period"

Food Animal Concerns Trust appreciates the opportunity to provide feedback on drinking water contaminants of emerging concern. Among the contaminants causing adverse effects to human health, which lack a national primary drinking water regulation[1] antibiotic resistant organisms and their genes as well as veterinary drug residues pose an especially critical threat to public health. Research related to drinking water contaminants should be carried out under a One Health framework that considers human health, animal health, and environmental health together. In many rural parts of the country, the number of food producing animals far outnumbers the number of people, and animal wastes are not regulated like human waste. These combined factors create the potential for significant contamination of both surface and groundwater from food animal waste including any pharmaceuticals administered to the animals. When developing a National Emerging Contaminant Research Initiative (NECRI), HHS should consider the following research topics:

1. Research on antimicrobial resistant (AMR) contaminants. Specifically the impacts of food animal production on human exposure to water contaminants of concern.

The overuse of antibiotics in animal agriculture is contributing to the development and proliferation of antimicrobial resistance within the global food supply and is rapidly spreading into the environment.[2] This transfer of antimicrobial-resistant germs and their genetic elements from farms and animal production facilities into water sources such as streams, rivers, and lakes is well documented.[3] In a recent study by Ya He et al, researchers found that conventional livestock waste treatment processes do not completely remove antibiotic resistant genes. As a result, these genes are released into soil and water environments where humans inhale or ingest the resistant bacteria harboring these genes.[4] The dissemination of antibiotic resistance through

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[1] US EPA, OW. "National Primary Drinking Water Regulations." Overviews and Factsheets, November 30, 2015. https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations.

[2] Food and Agricultural Organization (FAO); World Health Organization (WHO). Joint FAO/WHO Expert Meeting in Collaboration with OIE on Foodborne Antimicrobial Resistance: Role of the Environment, Crops and Biocides; FAO and WHO: Rome, Italy, 2019.;
World Health Organization (WHO). Technical Brief on Water, Sanitation, Hygiene and Wastewater Management to Prevent Infections and Reduce the Spread of Antimicrobial Resistance; WHO: Geneva, Switzerland, 2020.

[3] Nappier SP, Liguori K, Ichida AM, Stewart JR, Jones KR. Antibiotic Resistance in Recreational Waters: State of the Science. *Int J Environ Res Public Health*. 2020;17(21):8034. Published 2020 Oct 31. doi:10.3390/ijerph17218034

[4] He, Y., Yuan, Q., Mathieu, J. et al. Antibiotic resistance genes from livestock waste: occurrence, dissemination, and treatment. npj Clean Water 3, 4 (2020). https://doi.org/10.1038/s41545-020-0051-0

contaminated water may have devastating effects on public health.[5] Research focused on source contribution and transport of antibiotic resistant bacteria and antibiotic resistant genes is needed to more fully understand the dynamics related to water contamination and food animal production facilities. The short term and long term biological effects and associated risks of antimicrobial resistant water contamination from animal sources must be further studied in order to develop mitigation tools and inform methods to reduce the threat of antimicrobial resistant human infections.

2. Risks related to veterinary drug residues as contaminants - including beta-agonists and carbadox.

In addition to contributing to the risk of antibiotic resistance, veterinary drugs contaminating water can also create risks to drinking water. Carbadox and its residues are recognized as known carcinogens [6] and the Joint FAO/WHO Expert Committee on Food Additives (JECFA) was unable to determine a safe level for human consumption of residues of this drug.[7] This carcinogen was the most frequently detected pharmaceutical in a study of Minnesota lakes (carbadox was detected in 14 of 50 sampled lakes) indicating the potential for widespread contamination of drinking water sources.[8] The beta-agonist ractopamine is a non-antibiotic growth promoter widely used in cattle and swine [9] that has significant potential to contaminate drinking water sources.[10] These are just two of many potential drinking water contaminants from concentrated animal feeding operations.[11]

3. The impact of microcystins and algal toxins on human health.

Microcystins (MCs) or cyanoginosins pose considerable ecological and public health risks. Their potential carcinogenicity and reported adverse health effects in both humans and animals, make

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[5] Manyi-Loh C, Mamphweli S, Meyer E, Okoh A. Antibiotic Use in Agriculture and Its Consequential Resistance in Environmental Sources: Potential Public Health Implications. *Molecules*. 2018;23(4):795. Published 2018 Mar 30. doi:10.3390/molecules23040795

[6] US FDA. "Questions and Answers regarding Carbadox." Accessed August 2, 2021. https://www.fda.gov/animal-veterinary/product-safety-information/questions-and-answers-regarding-carbadox

[7] JECFA. "Evaluations of the Joint FAO/WHO Expert Committee on Food Additives (JECFA):Carbadox." Accessed August 2, 2021. https://apps.who.int/food-additives-contaminants-jecfa-database/chemical.aspx?chemID=5124

[8] M. Ferry. Pharmaceuticals and Endocrine Active Chemicals in Minnesota Lakes. https://www.pca.state.mn.us/sites/default/files/tdr-g1-16.pdf

[9] T. J. Centner, J. C. Alvey, A. M. Stelzleni. Beta agonists in livestock feed: Status, health concerns, and international trade. Journal of Animal Science, Volume 92, Issue 9, September 2014, Pages 4234–4240, https://doi.org/10.2527/jas.2014-7932

[10] J. K. Challis et al. Ractopamine and Other Growth-Promoting Compounds in Beef Cattle Operations: Fate and Transport in Feedlot Pens and Adjacent Environments. Environmental Science & Technology 2021 55 (3), 1730-1739 DOI: 10.1021/acs.est.0c06450

[11] Kaur J. (2021) Pharmaceuticals as Emerging Contaminant in Agriculture: Source, Transport, Ecological Risks and Removal Strategies. In: Kumar Singh V., Singh R., Lichtfouse E. (eds) Sustainable Agriculture Reviews 50. Sustainable Agriculture Reviews, vol 50. Springer, Cham. https://doi.org/10.1007/978-3-030-63249-6_6.

them an excellent candidate for research within the NECRI. [12] More research must be conducted to understand exposure routes and mitigation strategies. More than 100 microcystin variants have been discovered, and require specific water treatment methods. Therefore, the development of new rapid, sensitive monitoring methods are becoming necessary.[13] The World Health Organization (WHO) has set a provisional guideline of 1 µg/L MCs in human's drinking water, however, the United States has not set a drinking water regulation.[14] Further research on this critical topic may inform policy and the implementation of regulated guidelines on MCs for the protection of public health within the United States.

4. Disparate impacts of water contamination on socio economically vulnerable populations.

Limited access to clean drinking water disproportionately impacts socioeconomically vulnerable populations and communities of color.[15] Therefore, HHS should always consider disparate impacts on vulnerable communities and people of color when identifying research projects related to drinking water. All four research areas - exposure, health effects, risk characterization, and risk communication- should take into consideration vulnerable populations. Many rural, agriculture communities throughout the United States, and especially in California's San Joaquin Valley, lack access to a clean water supply. [16] Aquifers are contaminated by intensive farming production facilities and in many communities the lack of infrastructure and implementation of water laws affects a higher proportion of minority and lower socioeconomic status residents. [17]

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[12] Lone Y, Koiri RK, Bhide M. An overview of the toxic effect of potential human carcinogen Microcystin-LR on testis. Toxicol Rep. 2015 Jan 27;2:289-296. doi: 10.1016/j.toxrep.2015.01.008. PMID: 28962362; PMCID: PMC5598424.

[13] Figueiredo, Daniela R. de, Ulisses M. Azeiteiro, Sónia M. Esteves, Fernando J. M. Gonçalves, and Mário J. Pereira. "Microcystin-Producing Blooms—a Serious Global Public Health Issue." *Ecotoxicology and Environmental Safety* 59, no. 2 (October 1, 2004): 151–63. https://doi.org/10.1016/j.ecoenv.2004.04.006.;
Massey, Isaac Yaw, Fei Yang, Zhen Ding, Shu Yang, Jian Guo, Clara Tezi, Muwaffak Al-Osman, Robert Boukem Kamegni, and Weiming Zeng. "Exposure Routes and Health Effects of Microcystins on Animals and Humans: A Mini-Review." *Toxicon* 151 (September 1, 2018): 156–62. https://doi.org/10.1016/j.toxicon.2018.07.010.

[14] Cyanobacterial toxins: microcystins. Background document for development of WHO Guidelines for drinking-water quality and Guidelines for safe recreational water environments. Geneva: World Health Organization; 2020 (WHO/HEP/ECH/WSH/2020.6). Licence: CC BY-NCSA 3.0 IGO.

[15] Balazs, Carolina L., and Isha Ray. "The Drinking Water Disparities Framework: On the Origins and Persistence of Inequities in Exposure." *American Journal of Public Health* 104, no. 4 (April 1, 2014): 603–11. https://doi.org/10.2105/AJPH.2013.301664.

[16] Real, Jose A. Del. "They Grow the Nation's Food, but They Can't Drink the Water." *The New York Times*, May 21, 2019, sec. U.S. https://www.nytimes.com/2019/05/21/us/california-central-valley-tainted-water.html.;
Balazs, Carolina, -Frosch Rachel Morello, Alan Hubbard, and Isha Ray. "Social Disparities in Nitrate-Contaminated Drinking Water in California's San Joaquin Valley." Environmental Health Perspectives 119, no. 9 (September 1, 2011): 1272–78. https://doi.org/10.1289/ehp.1002878.

[17] Burke G. 2009. AP IMPACT: School Drinking Water Contains Toxins. New York:Associated Press.;
Dubrovsky NM, Kratzer CR, Brown LR, Gronberg JM, Burow KR. 1998. Water Quality in the San Joaquin-Tulare Basins, California, 1992–95. U.S. Geological Survey Circular 1159. Available: http://pubs.usgs.gov/circ/circ1159/.;
Pillley AK, Jacquez S, Buckingham RW, Satya RP, Sapkota K, Kumar S, Graboski-Bauer A, Reddy T: Prevalence of arsenic contaminated drinking water in southern New Mexico border colonias [abstract]. 2009, Philadelphia:

The public health impacts of water contamination on these communities must be prioritized as well as risk characterization to inform risk mitigation and risk communication.

Sincerely,

Steve Roach, Food Animal Concerns Trust

American Public Health Association 137th Annual Meeting and Exposition on Water and Public Health, [http://apha.confex.com/apha/137am/webprogram/Paper204703.html].