Summary brief

October 2022

High levels of antimicrobial resistant bacteria found in effluents from seafood processing facilities in Tema, Ghana: A call for a One Health approach to tackle AMR!

Agyarkwa MA, et al. Surveillance of WHO Priority Gram-Negative Pathogenic Bacteria in Effluents from Two Seafood Processing Facilities in Tema, Ghana, 2021 and 2022: A Descriptive Study. Int J Environ Res Public Health. 2022 Aug 30;19(17):10823. doi: 10.3390/ijerph191710823.

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Key Messages

- Effluents/wastewater from the two largest seafood processing facilities in Tema, Ghana, were found to contain antimicrobial resistant (AMR) bacteria, including those that are considered as 'priority pathogens' by the World Health Organisation (WHO).
- This poses an increased risk to the environment and public health, and therefore urgent actions are needed to prevent the spread of these harmful bacteria from these seafood processing facilities.
- The seafood processing facilities and other industrial sectors must be provided with guidelines on the best practices to reduce/eliminate the bacterial contamination in the treatment of effluents.
- The Environmental Protection Agency must develop guidelines for conducting routine surveillance/monitoring of AMR bacteria in industrial effluent discharges in Ghana.

What is the problem and why is it important?

Seafood processing facilities produce a large volume of effluents which may be significant in growing AMR bacteria, including the WHO priority pathogens identified as posing the greatest threat to human health, and therefore increasing antibiotic resistance. These effluents can reach the environment and can contaminate surface and groundwater that serve as potable or irrigation water. This is a great threat to public health.

It is increasingly being recognized that the environment plays a very important role in the development and transmission of AMR. Thus, a One Health approach is key to understanding and tackling AMR.

There is currently no published information on the burden of AMR bacteria in effluents from seafood processing facilities in Ghana. In addition, there are currently no surveillance measures in place to monitor the discharge of these AMR bacteria, including WHO priority pathogens, into the environment.

How did we measure it?

We collected 38 effluent samples from the two largest seafood processing facilities in Ghana, during 2021 and 2022, as part of a pilot surveillance project. We ascertained the bacterial load, bacteria species and their resistance to 15 antibiotics

Figure 1: Collection of effluent samples from the Seafood Processing Facilities

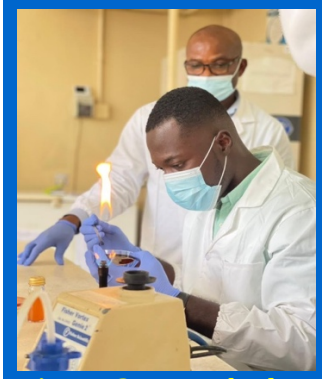

Figure 2: Microbial analysis of effluent samples using quality-controlled laboratory procedures.

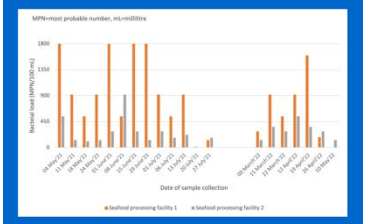

Figure 3: Bacterial load in the effluent samples collected from the two seafood processing facilities in Tema, Ghana during 2021 and 2022.

belonging to the WHO AWaRe (**A**ccess, **Wa**tch, **Re**serve) group of antibiotics - a categorization of antibiotics to promote their judicial use and prevent antimicrobial resistance.

What did we find?

- Nearly 95% (36 out of 38) of effluent samples from both seafood processing facilities contained bacteria, with several samples showing a high bacterial load. These effluents with high loads of bacteria were being discharged into the environment.
- About 5 (13%) of the effluent samples contained bacteria—*E. coli* (resistant to cefotaxime, ceftazidime and carbapenem) and *K. pneumoniae* (resistant to ceftriaxone)—which are included in the list of WHO priority pathogens for research and development of new antibiotics.
- About 57% of the bacteria showed mono or multi-drug resistance to fourteen commonly used antibiotics in Ghana. They include tetracycline, gentamicin, ampicillin, amikacin, sulfamethoxazole/trimethoprim, cefuroxime, cefotaxime, ciprofloxacin, levofloxacin, ceftazidime, cefepime, ceftriaxone, piperacillin/tazobactam and meropenem.

Implications and recommendation

- These findings are alarming and, if unaddressed urgently, there is an increased risk to the environment and public health due to infections caused by these bacteria. Also, there is an urgent need for further research into the sources of these resistant bacteria from the effluents discharged from the seafood processing facilities.
- There are currently no guidelines for routine surveillance/monitoring of AMR bacteria in industrial effluent discharges in Ghana and therefore high loads of bacteria are discharged into the environment without being monitored. The Environmental Protection Agency needs to develop guidelines and start monitoring the loads of bacteria in the industrial effluent discharges.
- The Environmental Protection Agency should engage with the seafood processing facilities to review their effluent treatment systems and adopt best practices to prevent the augmentation and spread of antimicrobial resistance.
- There is a need for the Environmental Protection Agency to review the Ghana Standard (GS 1212:2019) for Environmental Protection. This includes the requirements for the monitoring of effluent discharges so as to include AMR and adapting measures that can advise and guide industries to adopt modern pre-treatment practices. These in turn should reduce the loads of bacteria prior to discharge into the environment.