

Fungal contaminants - a paradoxal void in safety regulation of drinking water and recreational areas.

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Objectives

The United Nations sustainable development goal #3, aims to “By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination” (New York, September 2015). This study’s objective is to assess the European drinking and bathing water regulations and detect missing fungal parameters that may affect human health.

Methods

Analytical review of European regulatory documents (Directives and member-states’ legislation), scientific reports (DOI: 10.1128/JCM.41.9.4101-4106.2003; DOI: 10.1097/EDE.0b013e31823b504c).

Results and discussion

Exposure to fungi and their metabolites by inhalation, contact and ingestion has often been addressed, but rarely made way into safety regulation. Air quality in Portugal is an exception, with fungi added to the national legislation upon transposing the European directive 2008/50/CE. The EU drinking water directive 98/83/EC and the national legislation in the European countries - with very few exceptions - fails to address fungi explicitly.

Microbiological safety of drinking and recreational waters is monitored by bacterial parameters indicating faecal contamination. These parameters correlate with gastro-intestinal

illness but leave behind microbes that cause illness other than gastro-intestinal, and also several emerging pathogens (Novak-Babič *et al.*, submitted). Bathing/recreational waters also use faecal indicator bacteria as parameters to regulate their safe use, but also leave behind fungi, both for coastal and inland/fresh waters. In Europe, the regulatory Directive 2006/7/EC is currently undergoing its second revision, since it was first created in 1976. There is no plan to introduce fungi during the ongoing revision. Yet, fungi in water often originate in sand and are washed-in by tidal retraction and rain (DOI: 10.1017/S0025315415000843).

Should the regulation on fungal exposure via drinking water not take place in times of emerging agents and resistance to anti-microbials? Of new composite materials for building and wearing? When saving energy and water on home and industrial appliances is the rule, reducing the water flow rate of distribution and temperatures of operating cycles?

When we go to the beach where do we spend most of the time? Is it in the water or on sand? Rodents roam freely at night, along with other kinds of wild and semi-domestic life, interacting with the sand that we possibly lie on and play with during the day. The abrasive nature of sand increases shedding into sand; so why is the regulation addressing only the water and not the sand itself? The World Health Organization recommended sand monitoring already in 2003 (Guidelines for safe recreational water environments - Volume 1: Coastal and fresh waters).

Sandboxes fall in this same category - not regulated for any microbial contaminants. The lack of salt from nearing seawater and of extreme sun exposure, allow fungal proliferation and resilience where children are intended to play. One quarter of the human population worldwide, and up to 50% of the elderly, is estimated to suffer from superficial fungal infections (DOI: 10.1111/j.1365-2710.2009.01107.x).

Conclusion

There is clear evidence that beach sand matters and that fungal contaminants in drinking water distribution systems cause direct harm to human health. Regulation needs updating to include fungal parameters.