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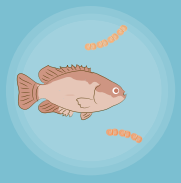
INVASIVE DISEASE LINKED TO RAW FRESHWATER FISH



RISK PROFILE

Group B *Streptococcus* (GBS) *Streptococcus agalactiae* sequence type (ST) 283 in freshwater fish

June 2021

The "new" food safety problem

In 2015, a bacterium called *Streptococcus agalactiae*, also referred to as Group B *Streptococcus* (GBS), caused a foodborne disease outbreak involving at least 146 people in Singapore. The specific strain responsible for the outbreak was later identified as sequence type 283 (ST283). This outbreak was **remarkable** because:

- it was the first reported foodborne outbreak of invasive disease caused by GBS;
- it affected healthy adults (GBS is normally very uncommon in healthy adults); and
- it caused severe consequences, including septicaemia or bacteraemia, commonly known as blood poisoning.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Link to the consumption of raw freshwater fish

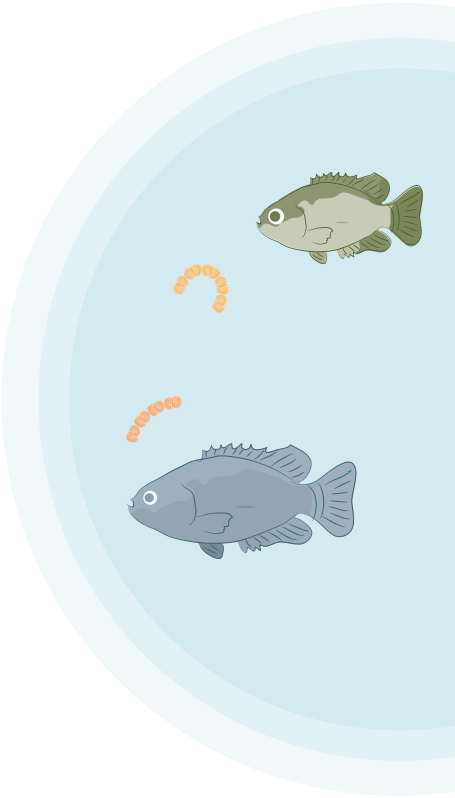
The Singapore authorities found a strong link with **consumption of raw freshwater fish**, an ingredient of a local dish. The public was warned not to eat raw freshwater fish, and the outbreak quickly abated. A resurgence of cases led to new legislation in December 2015, banning the sale of all raw freshwater fish as a ready-to-eat food. However, cases of ST283 infection continued to be identified in Singapore, with at least 18 cases in July 2020. It was not clear if these more recent infections were also linked to the consumption of raw freshwater fish.

Relevance in Asia

Invasive GBS ST283 disease is also found in other countries in and around Southeast Asia including China, Hongkong SAR, Lao People's Democratic Republic, Malaysia, Thailand and Viet Nam (other countries in the region have not yet been studied). In contrast, very few cases have been reported beyond the region, despite numerous sequence typing studies undertaken in Africa, mainland China, Europe and North and South America. The Regional Office for Asia and the Pacific of the Food and Agriculture Organization of the United Nations (FAO) developed a **risk profile** to document the current state of knowledge and identify relevant data gaps about the presence, transmission and impact of GBS ST283 along the freshwater fish supply chain, covering aquaculture and wild capture, transport, processing, retail, preparation and consumption primarily in Southeast Asia.

What do we know about GBS ST283?

GBS ST283 is common among invasive GBS cases in humans and tilapia in limited research studies in Southeast Asia. However, in many low- and middle-income countries (LMICs), identifying GBS ST283 is a challenge as it requires advanced methodology for sequence typing. Therefore, it is likely that GBS ST283 cases have been under-reported and infection and disease are more widespread.



It appears that ST283 is more aggressive in humans than other GBS as it is the only strain of GBS to have caused a foodborne outbreak of invasive disease. In addition, it affects healthy humans, which is unusual for other GBS. Fortunately, ST283 is easily treated if detected early, as it is susceptible to common antibiotics like penicillin. However, if the symptoms are not recognized early, then disease can be severe and result in long-term sequelae, and even death.

Relatively little is known about how environmental conditions affect growth and survival of GBS in general (not specifically ST283), especially in food products. It is known that GBS are heat sensitive, can grow at a wide range of pH (3 to 11), and that freezing for up to 180 days does not completely inactivate GBS.

How does it get into our food?

GBS ST283 is known to cause morbidity and mortality in aquaculture systems. However, not all infected fish show disease signs and it is believed that apparently healthy-looking fish are a likely source of ST283 contamination of food. GBS ST283 can result in human disease if contaminated food is consumed without a risk reduction step such as heating/cooking.

Can we estimate the risk now?

Given that GBS ST283 is an emerging hazard, the list of identified data gaps is extensive. As a result, no good estimation of risk can currently be made. However, from what is known about the organism, it can be said that heat-treated products pose less risk to consumers than products that have not received heat treatment. It is uncertain whether consumption of freshwater fish products that have been fermented or prepared using traditional practices would reduce the risk. Given that available data are insufficient to conduct a proper risk assessment, the first step is to have a full picture of what is known about GBS ST283 in relation to freshwater fish production, processing and consumption, and where significant data gaps in understanding the hazard exist. For this purpose, FAO published the **risk profile** which is a prerequisite of risk assessment.

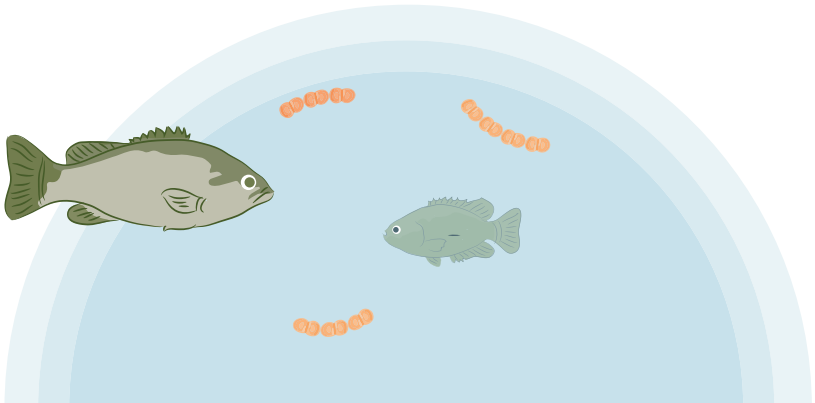
What should we consider in controlling the hazard meanwhile?

Visual inspection	Heat-treatment	Non-heat treatments
Discarding visibly abnormal/diseased fish is expected to reduce risk. However, we should not rely on visual inspections alone, as healthy-looking fish are no guarantee of safety.	Proper heating/ cooking is the only known effective risk mitigation measure.	There is no evidence that traditional fish preparation methods without heat treatment are effective. Freezing is not an effective control measure.

What are the main gaps in knowledge / data?

A wide range of knowledge and data gaps exist; these are documented in the FAO **risk profile**. Among them, the most critical data gaps that prevent us from estimating the risk are:

1. prevalence and concentration of GBS ST283 on different raw freshwater fish species at retail, or at the point of consumption;
2. the effects of different preparation methods on GBS ST283 concentration;
3. consumption practices, including serving size, frequency and preparation;
4. demographic information of consumers; and
5. the dose-response model, or ID_{50}, of ingested GBS ST283 in the general population.



Practical recommendations for food safety competent authorities

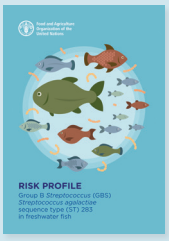
While it is very important to continue to strengthen the various aspects of national food control systems, including foodborne disease surveillance systems and inspection mechanisms, below are some practical recommendations for short- and medium-term actions.

- **Read** the FAO **risk profile**. As the issue is relatively new, it is important for the national food safety competent authorities to have an overview of what is currently known of this foodborne disease.
- **Discuss** among food safety, public health and fisheries/aquaculture colleagues to exchange information and share views. As this may impact the aquaculture industry in particular, there may be push-back or a defensive reaction from some of these stakeholders. From a long-term perspective, it will be beneficial for all stakeholders to address the problem at an early stage. Both public health and socio-economic aspects will need to be considered, especially as GBS also affects fish health and survival. Initiating an open dialogue is a good first step.
- **Team up** with the in-country experts. Contact university professors, researchers and scientists and inform them of the issue and discuss the issue at national level. It is a pressing need to fill the data gaps identified in the FAO **risk profile**, especially the critical gaps identified above. Obtaining the scientific insights and relevant data from the national experts is not only useful to minimize the risks but also valuable to contribute to the global effort in risk assessment.
- **Share** relevant research findings from your country with the scientific community as well as with FAO. At a global level, risk assessment largely depends on reliable research results and data published in peer-reviewed journals. National data are extremely valuable to identify different variables, thus letting FAO know what is being done and which data gaps are being addressed would significantly contribute to international risk assessment efforts. The scientific community can also avoid duplicating research this way.
- **Assess** the technical capacities to detect GBS ST283 within the country. If GBS ST283 is deemed relevant to your country, it is a good idea to consult public health/microbiology laboratories and technical staff to set up an enabling environment to identify GBS ST283 in human infections as well as food products and aquaculture systems. If assistance in assessing the technical capacities is needed, contact FAO at the email address below.
- **Plan and implement** a general and targeted food safety campaign aimed at potential consumers, local populations or villagers to inform them of the potential risks of consumption of raw freshwater fish. This could include participatory approaches to focus on rural communities where consumption of raw freshwater fish may be common.

CONTACT

Masami Takeuchi
Food Safety Officer – Regional Office for Asia and the pacific
FAO-RAP@fao.org
fao.org/asiapacific

Food and Agriculture Organization of the United Nations
Bangkok, Thailand



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