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SUSHI AND THE RISK OF HUMAN INFECTION WITH INFECTIOUS DISEASES

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Abstract: Sushi and sashimi served in Japanese restaurants and sushi bars are the traditional Japanese fish dishes which are now increasingly becoming popular as a delicacy worldwide. Eating sushi made with raw or undercooked fish carries a real risk of human infection from parasites, bacteria, and viruses containing infective larval stages of nematodes (*Anisakis*), cestodes (*Diphyllobothrium*) or encysted metacercaria of trematodes (*Heterophyes*). Bacterial hazards (*Vibrio parahaemolyticus*, *V. vulnificus*, *Salmonella* spp., *Listeria monocytogenes*) can cause severe gastroenteritis or systemic septicemia. Viral contamination, (*Norovirus* and *Hepatitis A* virus), frequently stems from contaminated water or poor personal hygiene during food handling. This review targets in providing practical information on fish-borne and parasitic zoonoses, evaluating the clinical risks of human infection, and highlights effective prevention and control strategies. A comprehensive literature review was conducted across major biomedical databases. Data regarding parasitic infections linked to raw seafood consumption were synthesized and analyzed. Mitigating these risks requires strict adherence to food safety standards, including rapid deep-freezing of fish before raw consumption, maintaining rigorous cold chains, and ensuring high hygienic standards among food handlers especially for people having weak immune system, young children, elderly people and pregnant women.

Keywords: Diagnosis, Fish-borne, Human infection, Prevention, Sushi, Treatment, Zoonoses.

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INTRODUCTION

Japanese-style foods are becoming increasingly popular with the most common dishes being sushi and sashimi. Sushi is traditionally made with vinegar, rice, seaweed wraps, vegetables, raw seafood, and occasionally cooked seafood. Sashimi is a dish of raw seafood served on its own. Eating sushi and sashimi is risky, especially if precautions are not taken, because raw foods are being consumed. Raw seafood may contain different parasites, viruses, and bacteria which make it very important to take steps to prevent food borne illness. This was reported by NSW Food Authority (2007), BC Centre for Disease Control (2010) and Alberta Health Services (2016). According to BBC news, Sushi lovers are being warned of the dangers of ingesting parasites from raw and undercooked fish.

In the past, most food-borne illness associated with sushi have been caused by *Vibrio parahaemolyticus, Staphylococcus aureus*, various types of *Salmonella*,

Listeria monocytogenes, and parasites, such as Anasakinae and *Diphyllobothrium* (Cleveland Clinic Health Essentials, 2020).

Parasites are among the most recognized risks of eating raw seafood, especially when wild-caught fish are not properly pre-frozen (Cleveland Clinic Health Essentials, 2020). Anisakiasis is not only an emerging global human health problem, but it is also an economic concern, due to the potential negative effects on consumer confidence and trade associated with infected fish products (González, 2023).

DISEASES CAUSED DUE TO SUSHI INTAKE

1. Anisakiasis

Clinically Anisakiasis (also known as herring worm disease) is a parasitic disease caused by nematodes (worms) that attach to the walls of the esophagus, stomach, or intestine. Caused by herring worms (*Anisakis simplex*), it is the most common sushi-related parasite. Ingesting live larvae can result in the worms attaching to or burrowing into the stomach or intestinal lining, triggering sudden, excruciating abdominal pain, nausea, and vomiting (CDC, USA, 2024).

The disease is most commonly found in areas where eating raw fish is popular, such as Japan. Because eating undercooked fish is becoming more common, there have been increasing cases in the US, Europe, South America, and other areas of the world (CDC, USA, 2024).

Signs and Symptoms: People with anisakiasis can experience signs and symptoms such as:

a) Abdominal pain, nausea, vomiting, abdominal distention, diarrhea, blood and mucus in stool and mild fever.

b) Allergic reactions such as itching, swelling, rashes and occasionally anaphylaxis (a severe, life-threatening allergic reaction).

c) A tingling sensation during or after eating raw or undercooked fish or squid. This sensation is actually the worm moving in the mouth or throat. People can often take the worm out of their mouth themselves or cough it up to prevent infection. Some people experience vomiting which can often expel the worm from the body (CDC, USA, 2024).

Diagnosis: *Anisakis* can be diagnosed by ultrasound. It might show small-bowel dilatation and thread-like, gastric filling defects. Often there is a spontaneous recovery, occasional removal of worms maybe required (Scholz *et al*., 2009).

Treatment: Definitive treatment for acute gastric anisakiasis is the immediate endoscopic removal of the live larvae from the stomach wall using biopsy forceps. Because humans are accidental hosts, the larvae cannot survive indefinitely, but medical intervention is required to manage acute symptoms, structural complications, or allergic reactions (Bucci *et al*., 2013).

2. Diphyllobothriasis

This is an infection caused by the broad fish tapeworm (*Diphyllobothrium* spp.), often linked to raw salmon. It can live quietly in the human small intestine for years, sometimes causing fatigue, diarrhea, or a distinct vitamin B12 deficiency (Nancy, 2012). Infection of *Diphyllobothrium* spp. is acquired by eating raw or undercooked freshwater or anadromous fish (i.e., sea fish that spawn in freshwater rivers, such as salmon). Marinated and smoked fish can also transmit the worm (Shimizu *et al*., 2008). Although cases in previously endemic areas have decreased, likely because of improved sewage treatment processes, however, there has been an increase in other parts of the developed world (Lee *et al*., 2001; Santos and de Faro, 2005; Llaguno *et al*., 2008; Shimizu *et al*., 2008; Arizono *et al*., 2009) presumably owing to increased consumption of raw fish. The widespread popularity of Japanese sushi (bite-sized pieces of cold cooked rice topped with fish, eggs, or vegetables and wrapped in seaweed) and sashimi (slices of raw fish) is a contributor, but other popular dishes might also be implicated, such as raw salted or marinated fillets (which originate from Baltic and Scandinavian countries), carpaccio (very thin slices of raw fish common in Italy), *tartare maison* (raw salmon), *poisson du lac façon nordique* (in French-speaking Europe) and ceviche (lightly marinated fish in Latin America) (Scholz *et al*., 2009). Clinically, it causes abdominal pain, diarrhea, eosinophilia, occasional B12 deficiency.

Signs and Symptoms: Majority of infected individuals remain almost entirely asymptomatic, however, manifestations can be:

a) **Visible Signs:** Passage of proglottids, anal pruritus.

b) **Gastrointestinal symptoms:** Weight loss, nausea, abdominal discomfort, altered bowel habits, gastric upset, intestinal inflammation.

c) Hematological and neurological symptoms (Vitamin B12 deficiency).

Due to absorption of the host's dietary vitamin B12 intake, long-term infection can deplete host stores and cause Megaloblastic anemia and Neurological deficits. Severe complications due to heavy infestations include mechanical bowel obstruction and organ inflammation.

Diagnosis: Diphyllobothriasis is diagnosed through microscopic identification of operculated eggs or proglottid segments in stool, alongside laboratory findings of low serum B12, elevated MCV, and eosinophilia (Scholz *et al.*, 2009). The adult tapeworm can also be visualized during routine endoscopy or colonoscopy procedures.

Treatment: Diphyllobothriasis treatment relies on a single oral dose of praziquantel (5-10 mg/kg) or niclosamide (2g) to eradicate the tapeworm (Scholz *et al.*, 2009). Patients with secondary macrocytic anemia also receive vitamin B12 supplementation, followed by a repeat stool screening 4 to 8 weeks later to confirm full clearance.

3. Flukes (Heterophyiasis)

Consuming raw freshwater or brackish-water fish can introduce liver flukes or intestinal flukes (*Heterophyes heterophyes*, *H. dispar*, *Metorchis conjunctus*, *Metagonimus yokogawi* and *Nanophyetus salmincola*), which can lead to long-term hepatobiliary complications (Yukifumi *et al.*, 2007).

Heterophyes dispar is a minute parasitic intestinal fluke that causes the disease heterophyiasis. It primarily infects humans and fish-eating mammals (cats, dogs, and sea lions) through the consumption of raw or undercooked brackish-water fish. It is highly endemic to regions like Egypt and the Middle East. Two human cases of *H. heterophyes* and *H. dispar* infections were confirmed by the recovery of their adult worms. The cases were 38-year and 40-year old Korean workers who had been in Saudi Arabia for 4-6 years with gastrointestinal troubles. In Saudi Arabia they had eaten raw brackish water fishes such as the mullet. After the treatment with 10 mg/kg praziquantel and purgation with magnesium salt, a total of 19 specimens of *H. heterophyes* and 140 of *H. dispar* were collected. It is of interest to note that the worms persisted in the patient although he had returned to Korea 14 months back. This was the first report on imported heterophyiasis in Korea (Chai *et al.*, 1986).

Signs and Symptoms: Typically, Heterophyiasis is asymptomatic, though it can cause intestinal inflammation leading to abdominal pain, diarrhea, fever and weight loss. In rare instances, eggs may migrate to the heart or brain, resulting in severe cardiovascular or neurological complications.

Diagnosis: Heterophyiasis is diagnosed by identifying small, operculated eggs in stool samples (Scholz *et al.*, 2009). Diagnostic procedures also include examination for elevated eosinophils via blood tests, and using CT or MRI scans to detect tissue granulomas caused by migrating eggs.

Treatment: Heterophyiasis treatment involves a single-day regimen of oral praziquantel (25 mg/kg, three times daily) to eliminate the flukes (Scholz *et al.*, 2009) or an alternative 2g single dose of niclosamide, with follow-up stool checks 2 to 4 weeks later. These methods effectively paralyze and clear the parasitic infection.

Bacterial infections

Bacterial infections are also possible from Sushi consumption such as *Bacillus cereus*, which can grow in rice dishes under ideal conditions. The rice needs to be kept refrigerated at 4°C (40°F) or acidified to be safe for consumption (Yukifumi *et al.*, 2007).

PREVENTION OF INFECTIONS THROUGH SUSHI

Anisakiasis can be prevented by avoiding eating raw or undercooked fish or squid. The food and drug administration (FDA) recommends the following for seafood preparation or storage to kill parasites:

a) Cooking (Seafood in general)
b) Cooking seafood adequately [to an internal temperature of at least 145° F (~63° C)].
c) Freezing (Fish):
    i. at -4°F (-20°C) or below for 7 days (total time), or
    ii. at -31°F (-35°C) or below until solid, and storing at -31°F (-35°C) or below for 15 hours, or
    iii. at -31°F (-35°C) or below until solid and storing at -4°F (-20°C) or below for 24 hours.

Cooked rice is to be kept hot at, or above, 60°C (140°F) as bacteria do not grow well in foods at this temperature. Rice stored at room temperature must be acidified to prevent bacteria from growing and consumed the day it is prepared. Leftover rice must be discarded if it's not used that day.

Having a consistent recipe will help to keep the pH (i.e. acidity level) of the rice the same for each batch prepared. The rice must have a pH of 4.6 or lower. A pH calibrator is an excellent way to ensure the rice is acidic enough to prevent bacteria from growing. If rice is not acidified or kept hot, it must be kept cold in the refrigerator (Yukifumi *et al.*, 2007).

Seafood used in making sushi should be labeled as sushi grade seafood. Fish that is consumed raw in sushi must be frozen to -20°C (-4°F) for 7 days or -35°C (-31°F) for 15 hours. This process will destroy any parasite in the fish making it safer to consume, however, risk still persists. It should never be assumed that seafood from the grocery store is safe to

use – it should always be ensured to purchase sushi grade labelled seafood (Yukifumi *et al.*, 2007).

When preparing sushi dishes, a large amount of food handling is involved from preparing the rice, vegetables, and seafood, to making the dish and preparing the rolls. It is important to be aware of cross-contamination because of the handling of raw and cooked foods.

PRECAUTIONS

a) Food must be handled after washing hands thoroughly and after touching raw food. Food must never be handled if feeling ill.

b) Raw foods must be kept separate and away from ready-to-eat foods.

c) Surfaces and equipment must be cleaned and sanitized after use.

d) Foods which are potentially hazardous must be kept refrigerated when not in use.

e) Frozen food should never be defrosted at room temperature. Foods should be thawed in the refrigerator or under cold, clean, running water.

f) If the bamboo mat used to roll the sushi is not non-absorbent (waterproof), the mat should be lined with food grade plastic wrap which is changed every 2 hours and after each contact with raw fish.

g) Prepared rolls should be refrigerated if not being served immediately. Rolls intended to sit at room temperature must not be kept outside for more than 2 hours.

h) If food is displayed at room temperature, there must be a system in place to monitor how long the food is out and when it should be disposed off. Foods at room temperature for longer than 2 hours must be discarded (Yukifumi *et al.*, 2007).

i) People who have weak immune system should limit or avoid eating sushi. Young children, elderly people, pregnant women and those who have an illness that weakens their immune system should avoid eating sushi because of the increased risk in consuming raw seafood (Bureau de Sanite de Windsor, 2016).

j) It is preferred that fresh fishes must be frozen for 48 hours before use in a raw state for preparing sushi. This can destroy the infective stages of the parasites before their use for sushi preparation. Also, it is of benefit for reducing viral or bacterial load of fishes if present.

CONCLUSION

Rising global sushi consumption offers high-quality nutrition but presents significant public health risks, primarily parasitic zoonoses like anisakiasis and diphyllobothriasis. To mitigate these dangers, strict enforcement of deep freezing protocols, cold chain maintenance, and food handling hygiene is essential.

REFERENCES

1. **Alberta Health Services** (2016). Guidelines for preparing sushi products. Retrieved from: https://www.albertahealthservices.ca/assets/wf/eph/wf-eh-guidelines-for-sushi-prep.pdf

2. **Arizono N., Yamada M., Nakamura-Uchiyama F. and Ohnishi K.** (2009). Diphyllobothriasis associated with eating raw Pacific salmon. *Emerging Infectious Diseases*. 15(6): 866-870. 10.3201/eid1506.090132

3. **BC Centre for Disease Control** (2010). Sushi safety. Retrieved from: http://www.bccdc.ca/resource-gallery/Documents/Educational%20Materials/EH/FPS/Fish/SushiSafety.pdf

4. **Bucci C., Gallotta S., Morra I., Fortunato A., Ciacci C. and Lovino P.** (2013). *Anisakis*, just think about it in an emergency!. *International Journal of Infectious Diseases*. 17 (11): e1071-e1072. 10.1016/j.ijid.2013.05.008

5. **Bureau de Sanite de Windsor** (2016). Sushi Safety at Home or in a Restaurant. https://www.wechu.org/food-safety/sushi-safety-home-or-restaurant

6. **CDC, USA** (2024). Centers for Disease Control and Prevention (CDC): About *Anisakis*. https://www.cdc.gov/anisakiasis/about/index.html

7. **Chai J.Y., Seo B.S., Lee S.H., Hong S.J. and Sohn W.M.** (1986). Human infections by Heterophyes heterophyes and H. dispar imported from Saudi Arabia. Kisaengchunghak Chapchi. 24(1): 82-86. 10.3347/kjp.1986.24.1.82

8. **Cleveland Clinic Health Essentials** (2020). Diet Food and Fitness / Nutrition. Modified and essential Health from Cleveland Clinics. Health.clevelandclinic.orgGonzález

9. **Raúl Rivas** (2023). How to be sushi smart: tips on avoiding anisakis disease. *The Conversation*. https://doi.org/10.64628/AAK.gdewhujdc

10. **Lee K.W., Suhk H.C., Pai K.S., Shin H.J., Jung S.Y., Han E.T. *et al.*** (2001). *Diphyllobothrium latum* infection after eating domestic salmon flesh. *Korean J. Parasitol.* 39(4): 319-321. 10.3347/kjp.2001.39.4.319

11. **Llaguno M.M., Cortez-Escalante J., Waikagul J., Faleiros A.C., Chagas F. and Castro C.** (2008). *Diphyllobothrium latum* in a non-endemic country: case report. *Rev. Soc. Bras. Med. Trop.* 41(3):301-303. 10.1590/s0037-86822008000300015

12. **Nancy Craig** (2012). Fish tapeworm and sushi. *Canadian Family Physician*. 58 (6) 654-658.

13. **NSW Food Authority** (2007). Food safety guidelines for the preparation and display of sushi. Retrieved from: http://www.food authority.nsw.gov.au

14. **Santos F.L. and de Faro L.B.** (2005). The first confirmed case of *Diphyllobothrium latum* in Brazil. *Mem. Inst. Oswaldo Cruz*. 100(6): 585-586. 10.1590/s0074-02762005000600013

15. **Scholz T., Garcia H.H., Kuchta R. and Wicht B.** (2009). Update on the human broad tapeworm (genus *Diphyllobothrium*), including clinical relevance. *Clin. Microbiol. Rev.* 22 (1):146-160. 10.1128/CMR.00033-08

16. **Shimizu H., Kawakatsu H., Shimizu T., Yamada M., Tegoshi T., Uchikawa R. *et al.*** (2008). *Diphyllobothrium nihonkaiense*: possibly acquired in Switzerland from imported Pacific salmon. *Intern. Med.* 47(14): 1359-1362. 10.2169/internalmedicine.47.1026

17. **Yukifumi N., Christoph H. and Johannes B.** (2005). Sushi Delights and Parasites: The Risk of Fishborne and Foodborne Parasitic Zoonoses in Asia. *Clinical Infectious Diseases*. 41(9): 1297-1303. https://doi.org/10.1086/496920