



Aeromonas spp.

22.04.2021

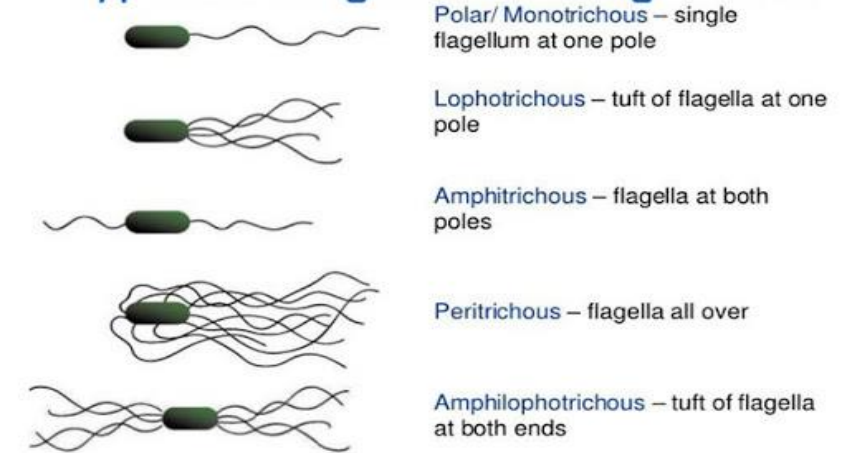
CONTENTS

- ❑ Characteristics
- ❑ Growth
- ❑ Sources
- ❑ Diseases
- ❑ Virulence factors
- ❑ Outbreaks

Aeromonas spp.

- ❑ The genus was formerly classified within *Vibrionaceae* Family (1980s)
- ❑ Now:
 - classified within the family *Aeromonadaceae*
 - Species associated with gastroenteritis: *A. hydrophila*, *A. caviae*, *A. veronii*, *A. dhakensis*
 - Distinct DNA hybridization groups (HGs) within species (3 main HGs in *A. hydrophila*)
- ❑ Characteristics
 - Gram-negative
 - Rod-shaped bacteria
 - Facultative anaerobes
 - Motile by a single polar flagellum
 - Ubiquitous in freshwater and brackish water (water having more salinity than freshwater, but not as much as seawater – estuaries)

Types of Flagellar Arrangement



SOURCES

- ❑ Natural habitat: Aquatic environment
- ❑ Found in freshwater fish, saltwater fish, and shellfish (mussels, oyster, shrimps, cockles).
- ❑ Frozen product of fish, sashimi, oysters, shrimps.
- ❑ Other sources: drinking water including treated, and bottled water.
- ❑ Also cause fish diseases (parasites)
 - *A. hydrophila* (mesophiles)
 - *A. salmonicida* (psychrophiles) infect cold water-fish including the salmonids
 - ✓ salmon live in saltwater but reproduce in freshwater
 - ✓ trout live in freshwater
- ❑ Fruits & vegetables – contaminated water



GROWTH

- ❑ Wide temperature range: -2 to 45 °C
 - Mesophilic group (opt growth at 35-37°C)
 - ✓ Cause infection in human (e.g. *A. hydrophila*, *A. dhakensis*)
 - Psychrotrophic group (opt growth 22-28 °C)
 - ✓ Cause infections in fishes (e.g *A. salmonicida*)
- ❑ NaCl tolerance ranges from 0 to 4%
- ❑ Tolerance to pH ranges from 5.2 to 9.8.
- ❑ The limiting pH and NaCl levels are temperature dependent.

Table 5 Influence of Temperature on pH and NaCl Limits for *A. hydrophila* K144 Grown Aerobically in Brain-Heart Infusion Broth

Temperature (C)	Limits of	
	pH	NaCl (%)
28	G at 5.5 NG at 4.5	G at 4.5 ^a
4	NG at 5.5	G at 3.5 NG at 4.5

G, Growth; NG, no growth.

Foodborne Disease Handbook, Vol. 1: Bacterial Pathogens: Y.H. Hui (2001)

DISEASE

- ❑ Opportunistic emerging pathogens - take advantage of a host with a weak immune system.
- ❑ Diseases
 - Gastroenteritis – inflammation of the GI tract due to invasion of bacteria into the intestinal mucosa
 - Septicemia – growth of bacteria in bloodstream (immunocompromised people).
 - Wound infection -- linked to water-related injuries or aquatic recreational activities. Wound infection can progress severely to necrotizing fasciitis (flesh eating disease)
- ❑ The link between the pathogen and disease in humans is based on mostly on epidemiologic data
 - Lacking in animal model study



necrotizing fasciitis

Aeromonas species associated with human disease

Species name	Occurrence in clinical specimens	Disease association
<i>A. hydrophila</i>	Common	Wounds, septicemia, gastroenteritis, leech therapy, peritonitis
<i>A. dhakensis</i>	Common	Wounds, septicemia, gastroenteritis, leech therapy, peritonitis
<i>A. veronii</i> biovar <i>sobria</i>	Common	Wounds, septicemia (including "primary septicemia"), gastroenteritis, leech therapy, peritonitis
<i>A. caviae</i>	Common	Gastroenteritis (esp. pediatric), septicemia
<i>A. veronii</i> biovar <i>veronii</i>	Rare	Gastroenteritis, septicemia
<i>A. jandaei</i>	Rare	Wounds, septicemia, gastroenteritis
<i>A. schubertii</i>	Rare	Traumatic aquatic wounds, septicemia
<i>A. trota</i>	Rare	Gastroenteritis



VIRULENCE FACTORS

- Virulence factor
 - Flagella - motility
 - Adhesins – help in bacterial adherence, initiate colonization
 - Hemolysins – forming pores in host cell membrane – cell lysis
 - Endotoxin (lipopolysaccharides-LPS)
 - Enterotoxin (Heat-labile and heat stable toxins) – inhibit phagocytic activity of host cell
 - Fimbriae - attachment
 - TT3SS – directly inject bacterial effector proteins into the host cell
- These factors are believed to be attributed in the pathogenesis of *A. hydrophila*.
- However, the exact mechanism of the cause disease is not fully understood.

OUTBREAK

- Malaysia 2017: A case of natural co-infection of Tilapia Lake Virus and *Aeromonas veronii* in a Malaysian red hybrid tilapia farm experiencing high mortality 45 days after introduction into earthen ponds.
- 2012: outbreak in China, contaminated cold salad from polluted water.
- 1993: China, 82 persons were affected, and the source of infection was drinking water, which was contaminated with sewage.

OUTBREAK

A foodborne outbreak of *Aeromonas hydrophila* in a college, Xingyi City, Guizhou, China, 2012

Qian Zhang,^a Guo-Qing Shi,^b Guang-Peng Tang,^c Zhi-Tin Zou,^c Guang-Hai Yao^c and Guang Zeng^b

Correspondence to Qian Zhang (e-mail: zhangqian527@126.com).

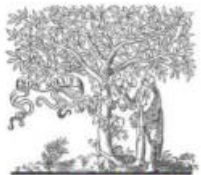
Background: On 12 May 2012, over 200 college students with acute diarrhoea were reported to the Guizhou Center for Disease Control and Prevention. We conducted an investigation to identify the agent and mode of transmission and to recommend control measures.

Methods: A suspected case was a person at the college with onset of \geq two of the following symptoms: diarrhoea (more than three loose stools in 24 hours), abdominal pain, vomiting or fever ($> 37.5^{\circ}\text{C}$) between 6 and 15 May 2012. A confirmed case also had a positive *Aeromonas hydrophila* culture from a stool sample. A retrospective-cohort study of 902 students compared attack rates (AR) by dining place, meals and food history. We reviewed the implicated premise, its processes and preparation of implicated food.

Results: We identified 349 suspected cases (AR = 14%) and isolated *Aeromonas hydrophila* from three stools of 15 cases. Students who ate in cafeteria A were more likely to be ill compared to those eating in other places (relative risk [RR]: 3.1, 95% confidence interval [CI]: 2.0–4.8). The cohort study implicated cold cucumber (RR: 2.6, 95% CI: 2.0–3.3) and houttuynia dishes (RR: 1.8, 95% CI: 1.4–2.3). Environmental investigation showed that vegetables were washed in polluted water from a tank close to the sewage ditch, then left at 30°C for two hours before serving. The *Escherichia coli* count of the tank was well above the standard for drinking water.

Conclusion: This outbreak of *Aeromonas hydrophila* was most probably caused by salad ingredients washed in contaminated tank water. We recommended enhancing training of foodhandlers, ensuring tanks and sewerage systems comply with appropriate standards and adequate monitoring of drinking water sources.

- *Aeromonas hydrophila* in salad
- Symptoms: acute diarrhea, abdominal pain, vomiting or fever.
- *A. hydrophila* was isolated from stools samples
- Findings: The outbreak was caused by salad ingredients washed in contaminated tank water.



ELSEVIER

Contents lists available at ScienceDirect

Aquaculture

journal homepage: www.elsevier.com/locate/aquaculture



Short communication

A case of natural co-infection of Tilapia Lake Virus and *Aeromonas veronii* in a Malaysian red hybrid tilapia (*Oreochromis niloticus* × *O. mossambicus*) farm experiencing high mortality

M.N.A. Amal^{a,f,*}, C.B. Koh^b, M. Nurliyana^a, M. Suhaiba^a, Z. Nor-Amalina^c, S. Santha^c, K.P. Diyana-Nadhirah^c, M.T. Yusof^d, M.Y. Ina-Salwany^{c,f}, M. Zamri-Saad^{e,f}

^a Department of Biology, Faculty of Science, Universiti Putra Malaysia, Selangor, Malaysia

^b Cargill Feed Sdn. Bhd., West Port, Klang, Selangor, Malaysia

^c Department of Aquaculture, Faculty of Agriculture, Universiti Putra Malaysia, Selangor, Malaysia

^d Department of Microbiology, Faculty of Biotechnology and Biomolecular Sciences, Universiti Putra Malaysia, Selangor, Malaysia

^e Department of Veterinary Laboratory Diagnosis, Faculty of Veterinary Medicine, Universiti Putra Malaysia, Selangor, Malaysia

^f Laboratory of Marine Biotechnology, Institute of Bioscience, Universiti Putra Malaysia, Selangor, Malaysia



Red hybrid tilapia juvenile that positive to TiLV and *Aeromonas veronii* showing skin redness and haemorrhages around the operculum area, body and base of dorsal, caudal and anal fins.





"Doctor fish" nibble dead skin from feet as part of a pedicure at Yvonne's Day Spa in Arlington, Va. - Medill

NATIONAL

Pedicure fish may harbor harmful bacteria



By Meghann Myers - Medill News Service

May 16, 2012 12:00 AM



Back in 2008, a new pedicure trend swept the nation: tiny fish eating the dead skin off customers' feet. Now the Centers for Disease Control and Prevention warns that the so-called "doctor fish" may carry bacteria that could cause serious infections.

- The Centers for Disease Control and Prevention (CDC) warns that the so-called "doctor fish" may carry bacteria that could cause serious infections.
- These bacteria included: *Aeromonas*, which causes wound infections and gastrointestinal problems in humans



THANK YOU