

AEROMONAS

THE ORGANISM/TOXIN

Aeromonas are Gram negative bacteria common in water and soil. The role of some *Aeromonas* species in rare but serious conditions including wound infections, necrosis, septicaemia and meningitis is well accepted. The role of *Aeromonas* in food and waterborne gastroenteritis remains hotly debated (Janda and Abbott, 2010).

Members of four *Aeromonas* groups may cause gastroenteritis: *A. hydrophila*, *A. veronii* biovar *sobria*, *A. caviae* and *A. trota*. *A. schubertii* and *A. jandaei* have also rarely been isolated from faeces (von Graevenitz, 2007). Some reported cases/outbreaks have implicated consumption of food contaminated with *Aeromonas*.

Problems arise with collecting data to demonstrate the link between gastroenteritis and consumption of food or water contaminated with *Aeromonas*, because there are no animal models for gastrointestinal infection and because the taxonomy of this genus is very complex. Commercial laboratory test kits are limited in their ability to type these bacteria, and many laboratories do not routinely culture/type them.

Many potential virulence factors have been identified, and these may one day assist in the identification of virulent strains.

Aeromonas can grow at refrigeration temperatures and under both aerobic and anaerobic conditions, however they are easily destroyed when food is cooked. They do not form spores.

GROWTH AND CONTROL

Significant inter-strain variability is reported in conditions for growth and survival.

Growth

Temperature

- Optimum 28 to 35°C
- Range -2 up to 42-45°C, although often < 40°C depending on the strain

pH

- Optimum 7.2
- Minimum 4.5
- Maximum \geq 8.7
- Unlikely to grow in food below pH 6.0 and stored at low temperatures

Atmosphere

Facultative anaerobe.

Water activity

Optimum approximately 1-2% NaCl

Survival

pH

At pH 4.5, no growth observed at 4 or 28°C

Water Activity

4.5% (~0.975 a_w) NaCl inhibited growth for >14 days at 4°C. At 28°C 5% NaCl (~0.97 a_w) inhibited most strains and 6% NaCl inhibited them all (ICMSF, 1996)

Inactivation

Temperature

$D_{45^\circ\text{C}}$ = 12-29 minutes

In saline (0.85% NaCl), $D_{48^\circ\text{C}}$ = 2.2-6.6 minutes and $D_{51^\circ\text{C}}$ = 1.2-2.3 minutes (Palumbo *et al.*, 1987)

pH

Inactivated at values <4.5

Water activity

< 0.96 a_w (~ 6 to 7% NaCl) controls all strains tested (ICMSF, 1996)

Disinfectants / Sanitisers

Susceptible to disinfectants, including sodium hypochlorite, quaternary ammonium compounds, iodoform, 2-chlorophenol and glutaraldehyde (ICMSF, 1996)

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CLINICAL PICTURE

It is likely that some strains of *Aeromonas* cause gastroenteritis, but the role of members of this genus in foodborne illness remains controversial.

Incubation: 1-2 days (Janda and Abbott, 2010). In an outbreak of *A. caviae* infections in France, the mean incubation time was 10.6 hours (Hansman *et al.*, 2000).

Symptoms: Broad spectrum of symptoms ranging from mild, self-limiting watery diarrhoea to dysentery. Abdominal pain, nausea, chills, headache and colitis may also occur. Symptoms last 1 to 7 days. Chronic diarrhoea has also been reported, usually 7-10 days. *A. veronii* biovar *sobria* has been associated with severe gastroenteritis with dysenteric symptoms. Some strains produce 'aerolysin', which is toxic to vero cells, and a number of haemolytic uremic syndrome cases have been attributed to such strains.

Condition: Gastroenteritis.

Dose: In one human trial where up to 10^{10} cells were given, only two of 57 (healthy) volunteers developed diarrhoeal symptoms.

At Risk Groups: Immuno-compromised individuals including adults with disrupted gastrointestinal flora. Symptoms are more severe for children.

Long Term Effects: Older patients more likely to present with chronic enterocolitis.

SOURCES

Human: Prevalence comparisons between symptomatic and asymptomatic individuals show higher values for those with symptoms, but the ranges are broad and overlapping. The organism is, however, not considered to be a normal inhabitant of the gut (Janda and Abbott, 2010).

Animal: May colonise aquatic plants and animals e.g. fish, leeches and frogs. Causes disease in animals associated with water, e.g. reptiles, fish, shellfish and snails. Minor flora component of domestic animal faeces (pigs, cows, sheep, poultry). Has been isolated from houseflies, mosquitoes and ticks (Galindo and Chopra, 2007). Recently isolated from faeces of *Macaca fascicularis*, a primate (Harf-Monteil *et al.*, 2004).

Food: Organism has been isolated from fresh produce (McMahon and Wilson, 2001) and foods of animal origin, such as meat, raw milk, poultry, fish, and shellfish.

Environment: Found in salt, fresh, stagnant, estuarine and brackish water worldwide. Tends more towards freshwater because as salinity increases, recovery of organism decreases (ICMSF, 1996). Also isolated from soil, sewage, and even tree bark. Its isolation from water and sediments decreases during cooler months (ICMSF, 1996). Typing data have been reported supporting water to human transmission (Khajanchi *et al.*, 2010).

Transmission Routes: Via water and possibly by ingestion of foods including seafood, particularly oysters that receive little or no cooking during their preparation.

OUTBREAKS AND INCIDENTS

NZ Incidence: Not notifiable in New Zealand.

Seasonal variation observed, with *Aeromonas*-associated gastroenteritis peaking in warmer months (Kirov, 2003).

Collated information (Kirov, 2003) on 16 outbreaks/incidences of *Aeromonas*-associated gastroenteritis implicated a range of suspect foods including fish, land snails, oysters, prawns, shrimp cocktail, dried fish sauce and egg salad. Adults are the largest age group reported among cases. Larger, suspected, outbreaks include:

Oysters: Louisiana, USA, 472 adult cases (*A. hydrophila*) (Abeyta *et al.*, 1986).

Dried fish sauce: France, 10 adult cases (*A. caviae*) (Hansman, 2000).

Mixed meal including seafood, meat and offals: Sweden, 27 people (*A. hydrophila*) (Hudson, 2004)

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