

GIARDIA INTESTINALIS

THE ORGANISM/TOXIN

This organism is a protozoan parasite that produces gastrointestinal symptoms when ingested by humans. The organism is most likely to be present in the food as a cyst, the protozoan resting stage equivalent to a bacterial spore.

In the older literature this organism is referred to as *Giardia lamblia*.

GROWTH AND ITS CONTROL

Growth: The organism does not grow outside of the animal reservoir so controls designed to restrict the growth of bacteria will be ineffective. There is very little information on the survival of the organism on foods or on how cysts present on foods may be destroyed.

Survival: In general the cysts are stable and can last for long periods (months) in the environment. Cool moist conditions favour survival.

Cysts have been shown to survive on herbs for 8 days.

Temperature: Cyst survival in water is better at lower temperatures. Survival was 77 days in distilled water at 8°C, but only 4 days at 37°C. 0.1-25% survived in river water for up to 56 days.

Inactivation (CCPs and Hurdles):

Temperature: Heating cysts to 60-70°C for 10 min inactivates them. Alternatively heating to boiling for 3 min will achieve the same result.

Milk pasteurisation is sufficient to inactivate cysts.

Cysts may be inactivated when frozen in water for long periods.

Sanitisers/Disinfectants: Relatively resistant to ozone requiring 0.17 mg-min/l at 25°C or 0.53 mg-min/l at 5°C to reduce viability by 99%. Chlorination at levels required to inactivate *E. coli* is not sufficient to inactivate *Giardia* cysts. The protozoan requires <15 mg-min/l at 25°C and 90-170 mg-min/l at 5°C for inactivation.

C_t values: chlorine 93 to 121, chloramine 1,470, chlorine dioxide 17, ozone 1.3.

Physical removal, e.g. passing through an 8 µm pore size filter, will remove cysts from water.

Commercial phenol-based disinfectants are effective at inactivating the organism.

Radiation: Cysts are resistant to UV radiation. Doses of 42,000 to 63,000 µW-s/cm² resulted in only a 90% loss of viability. C_t for UV 80 mJ cm⁻².

THE ILLNESS

Incubation: One to 3 weeks after infection.

Symptoms: Immunocompetent people who are infected may be asymptomatic or experience

gastrointestinal disease. In the immunocompromised the results may be more serious (severe diarrhoea, dehydration and loss of weight), and occasionally life threatening. Malabsorption may be quite severe in diarrhoeal cases.

Symptoms may last from 4 to 6 weeks, and consist of diarrhoea followed by flatulence, foul-smelling stools and cramps.

The mean attack rate is 44%.

Condition: Giardiasis.

Toxins: Toxins are not formed in food by this organism.

At Risk Groups: Any one may become infected, but the disease is more serious in those who are immunocompromised. Infants and children are more susceptible to infection than adults.

Long Term Effects: Can be fatal in those unable to fight the disease. Lactose intolerance can be induced in 40% of cases for some time after symptoms have ceased.

Dose: As few as 10 cysts can cause an infection when ingested.

NZ Incidence: As at November 2000, the annual rate was 46.5 cases/100,000. Rates are above average in the West Coast, Central Auckland, Wellington, Tauranga and Hawkes Bay Health Districts. There is a peak in cases in the Autumn.

Treatment: Most cases are self-limiting, but chemotherapy can be used.

SOURCES

Human: Asymptomatic carriers may excrete the organism for years. The asymptomatic carriage rate has been estimated at 3-20% in the USA.

Animal: The organism is found in mammals, birds, reptiles and amphibians. However isolates from these sources are not necessarily pathogenic to humans.

Food: Agricultural products that have directly or indirectly been subjected to faecal contamination may be a source of cysts. *Giardia* has been isolated from root crops, lettuces, herbs and strawberries irrigated with wastewater.

Environment: Cysts are found in waters which have been faecally polluted.

Transmission Routes: Transmission to humans may be via water, food contaminated by water or a food handler, or person-to-person.

OUTBREAKS AND INCIDENTS

Outbreaks: Few well documented outbreaks have been reported, and this may be due to the long

incubation period. All these examples are from overseas.

Water or salad: 34 cases. Control point failure: illegal plumbing or contaminated food handler.

Raw sliced vegetables: 18 confirmed cases, 9 suspected. Control measure failure: Contamination by food handler.

Lettuce and/or tomatoes: 10 confirmed cases, 11 suspected. Control measure failures: washed in contaminated water.

Bottled salmon and/or cheese dip: 29 ill. Control measure failures: Contamination by food handler.

Noodle salad: 14 cases. Control measure failures: Contamination by food handler.

Sandwiches: 88 cases. Control measure failures: Contamination by food handler.

Fruit salad: 10 cases. Control measure failures: Contamination by food handler.

Ice(?): 27 cases. Control measure failures: Contamination by food handler.

ADEQUATE PROCESSING GUIDELINES

N.B. These guidelines have been derived from published information. Industry is advised to ensure that processing steps they are using are adequate to meet their particular food safety objectives.

| Cook meats to: | Internal temperature reached | Time |
|---|------------------------------|---------------|
| Minced meats, (beef, veal, lamb, pork) + pork cuts | 71°C | 15 sec |
| Minced poultry | 74°C | " |
| Meat cuts (beef, veal, lamb), fish, seafood | 63°C | " |
| Poultry, breast | 77°C | " |
| Poultry, whole | 82°C | " |
| Reheat cooked foods to | 74°C | Instantaneous |
| Avoid cross contamination from raw to ready-to-eat foods | | |
| Thoroughly wash all fruit and vegetables | | |
| Avoid direct handling of food by infected food handlers | | |
| Boil, filter or chemically treat non-potable drinking water | | |

REFERENCES

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