

ITU TRIATHLON WATER QUALITY STATEMENT

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Triathletes are very intense exposed to the contaminated water during training and triathlon competitions. They can become infected due to water ingestion and or due to skin or mucous membrane contact with the water.(Schep G. 1992) It is very plausible that, during a competition, some athletes are more prone to develop infections than under normal circumstances. There are several physiological mechanisms during exercise that may lower the resistance to infections during and shortly after an endurance effort like a triathlon. It is mainly based upon three mechanisms ie. :

- the hormonal stress reaction
- the drop in some specific immune parameters like the concentration and activity of natural killer cells
- the possible failure of local protective mechanisms of the gastrointestinal tract and of the skin.

Water quality problems

The most important health problem due to contaminated swimming water is associated with microbiological contamination.

For triathlon the most relevant pathogens are in order of importance associated with the following risk factors :

1) Human and animal faecal contamination

There is an association with the following pathogens : enterococci/faecal streptococci, E.Coli, faecal coliformi, total coliform, salmonella, shigella, campylobacter, vibrio cholera, gastro enteritis viruses, enteroviruses, parasitic protozoa, some other exotic parasites, Aeromonas and Plesiomonas.

2) The occurrence of rodents

Most relevant are brown rats and muskdeer, who can pass leptospirae in their urine into the water when they are infected. A determination of leptospirae in surface water is very complicated and not feasible. The most important reason is the very low dose that is necessary for an infection (below the limit of laboratory detection) and the fact that the concentration of leptospirae in the water is almost always extremely low.

3) *Eutrofication of the water*

Some pathogenic bacteria like *Aeromonas*, *Plesiomonas*, *Cyanobacteria*, can actually multiply themselves in surface water. This multiplication is stimulated if the water contains more nutritious matter (eutrofication). People may be exposed to Blue-Green algae or Red Tide algae toxins by drinking or bathing in contaminated water.

4) *Bird colonies*

Since birds can be infected with *Plesiomonas*, *Campylobacter* and *Salmonellae* they may contaminated the water with those organisms.

5) *Industrial cooling water installations*

It is proven that naturally occurring and potential severely pathogenic amoeba's can grow in a hot environment like the plume of an industrial cooling installation.

Risk factors

The most important risk factor is faecal contamination due to human faeces. Animal faeces is less important in harbouring human pathogens. Human faeces can come into the water directly (bad sanitation, in many countries discharge of non purified sewage and by discharge from house boats). However also purification of sewage is not able to control all the disease causing organisms. Dependant on the flow and the extent of the discharge there can be large fluctuations in the quality of the water.

Faecal contamination can harbour many potentially pathogens. It is not feasible to test all those micro organisms. Further on there is also a lack of data considering the quantitative relationship of the concentration of many of those pathogens and the risks of disease. Especially the viruses are the most hazardous.

The commonly used indicator.

Bacterial indicators of faecal contamination considered are enterococci/faecal streptococci, *E.Coli*, faecal coliformi and total coliform. Thermotolerant coliform bacteria are present in human and animal faeces. However they also occur in other environments that bear no relationship to faecal contamination (discharge from paper industry, brewery's etc). *Escherichia coli* (*E.Coli*) is a species of faecal coliform that is specific for faecal material from humans and other warm-blooded animals. Enterococci are a subgroup within the faecal streptococcus group and are distinguished by their ability to survive in salt water. Faecal coliforms as a group were determined to be a poor indicator of the risk of GI illness (US EPA 2002).

Water quality control consists of :

- a) ***Quite obviously measurable entities that are not so specific indicators of the water quality***, like :
 - the colour of the water that may not change in an abnormal way
 - the absence of oils that float on the water or that cause smelling

- the absence of a smelling of phenol
 - a transparency of the water of more than one meter. When the diminishing transparency is caused by algae this can be considered as a sign of eutrofication and of an indicator of inferior water quality.
- b) ***Bacterial and or viral tests***. Those test are a measure for faecal contamination and they are very important regarding swimming associated health risks. Traditionally the microbiological quality of waters has been measured by the analysis of indicator microorganisms. Human enteric virus are the most likely pathogens responsible for waterborne diseases from recreational water, but detection methods are complex and costly for routine monitoring and so the main parameters analysed for compliance with the Directive are indicator organisms.

EEA Standards

The **Directive 2006/7/EC** reduced the number of parameters from 19 to 2 key microbiological parameters and the faecal contamination is assessed by determination of two mandatory indicator bacteria :

- Escherichia Coli
- Enterococci

The choice of microbiological parameters is based on available scientific evidence provided by epidemiological studies conducted by the WHO and health Institutes in Germany, France and Netherlands.

For some characteristics E. Coli may be considered a more useful indicator than faecal coliforms and it has been included in all recent laws regarding fresh, marine and drinking waters.(Baudisova D.1997, Briancesco R. 2005) E.Coli and enterococci are adequate indicators of GI illness in marine water. In fresh water, E. Coli is a more reliable as consistent predictor of GI illness than is enterococci. E.Coli was superior to enterococci at predicting illness and the E.Coli guideline level was supported because exposure below presented no significant risk, whereas exposure above were associated with an elevated and statistically significant increased risk of GI illness(Foulon et al 1983, Kay et al.1994, McBride et al.1998). The body of literature does support the use of enterococci and E.Coli as useful predictors of GI illness in marine environment (Wade TJ et al. 2003) Also salmonellae and enteroviruses there are standars, however one will not determine those micro organisms on a routine base.

EEC has a guideline limit that indicates the value that one should try to realize to obtain excellent swimming water.

For Coastal waters and Transitional waters

A	B	C	D
	Excellent quality	Good quality	Sufficient quality
1) Enterococci ufc/100 ml	100(*)	200(*)	185(**)
2) E. Coli ufc/100ml	250(*)	500(*)	500(**)

(*) according to percentile 95°

(**) according to percentile 90°

For Inland waters

A	B	C	D
	Excellent quality	Good quality	Sufficient quality
1) Enterococci ufc/100 ml	200(*)	400(*)	330(**)
2) E. Coli ufc/100ml	500(*)	1000(*)	900(**)

(*) according to percentile 95°

(**) according to percentile 90°

c) A validation whether the swimming place is suitable for sanitary and safety reasons :

- A sanitary inspection needs to be performed since a location with many garbage can be an ideal environment for brown rats and needs to be regarded as unacceptable.
- A judgement of other occasionally and structurally occurring problems like a discharge of cooling water from a factory, sewage discharge or the occurrence of house and boats, bird colonies and algal bloom needs to be taken into account and if such a structural problem exist it may be a good reason to disapprove the location as a swimming place.
- The transparency of the water of more than one meter. This may be only be less when this is caused by natural circumstances.
- The absence of oils and of a smelling of phenol.

Standards under discussion

It is very difficult to prove that an infection is due to an exposure with swimming in a surface water since :

- a) The symptoms are often quite vague and aspecific. So the disease is often not properly diagnosed.
- b) Viral examinations are very difficult, because there can be so many possible viruses responsible for the disease.
- c) Numerous epidemiological studies of waterborne illness in developed countries indicate that the common aetiological agents are more likely to be viruses and parasitic protozoa than bacteria (Levy et al. 1998)
- d) It is very difficult to establish the relationship with the exposure to the swim water because there is no routine testing for those viruses and because the symptoms in general only start several weeks after the exposure.
- e) No treatment is available for those viral illnesses so a practical working doctor is not so eager to find out which virus was the cause of the disease. In the contrary when a doctor considers a possible leptospirosis infection that may look quite similar it has much more practical implications for the treatment to determine whether or not the patient is infected.

We learn from this that it may very well be possible that the health problems associated with faecal contaminated swimming water do not restrict themselves to the rather innocent gastroenteritis.

ITU Water Quality Rules

Since 2010 ITU adopted the EEC standards 2006/7/EC of bathing water quality. It should therefore be recommended to organize only triathlons in swimming water that falls in the category "Excellent".

Especially for international competitions it is absolutely necessary to get a clear view on the water quality of such competitions. Since in some countries there is risk for some very serious disease causing health problems (Migliorini S, 2009).

Water quality tests submit to ITU

- At the time when the LOC announces the venue (if this takes place at least 15 months before the first competition date)
- One year prior in the month of the event
- Two months before the competition

- 7 days before the competition

A sample of a mixture of water collected from three different locations on the swim course will be analysed and the result will determine if the swim can take place. The swim will be allowed if the following values are below the level of tolerance in the different types of water.

a) Sea and Transition waters:

- PH between 6 and 9
- Enterococci not more than 100 per 100 ml (ufc/100ml)
- E. Coli not more than 250 per 100 ml (ufc/100ml)
- The swim leg is cancelled in presence of Red Tide Algal bloom.

b) Inland waters

- PH between 6 and 9
- Enterococci : not more than 200 per 100 ml(ufc/100ml)
- E. Coli not more than 500 per 100 ml(ufc/100ml)
- The presence of Blue-Green Algal blooms/scum (cyanobacteria) with more than 100.000 cells/ml

If the water quality test shows values out of the tolerance limits as indicated above, the swim will be cancelled, unless the ITU Medical Committee permits.

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On behalf of the ITU Med Com



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