Gastroenteritis: A waterborne outbreak affected 430 triathletes in an ironman competition - Could this be avoided?

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Gastroenteritis: A waterborne outbreak affected 430 people in Copenhagen harbour during ironman competition – Could this be avoided?

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Introduction

During the night of the 14th of August 2010 an extreme rain event overloaded the sewer system in Copenhagen, Denmark. Consequently, untreated rain- and wastewater was discharged at the coast through a combined sewer overflow.

Also, the waste water treatment plant Lynetten was overloaded, which caused bypass of mechanically treated rain- and wastewater from the combined sewer system. The following day a triathlon competition with ironman distance was held in the Laguna of Amager Strandpark where 1582 triathletes competed. Many of the competitors got gastroenteritis.

Aim

To investigate if the risk of disease can be predicted by the use of models of indicator bacteria. To show that models are a strong tool for early warnings.

Results

The overflow event

- 45.6 mm of rain within 24 hours
- 26,000 m³ overflow from the combined sewer system to Oresund
- 190,000 m³ mechanical treated bypass water from Lynetten to Oresund

Increased concentrations of indicators

![Graph showing increased concentrations of indicators](image)

The model forecasted, in real-time, high levels of the two indicator bacteria E. coli and Enterococci at Amager Strandpark.

The combined sewer overflow caused the bacterial pollution of the Laguna.

Minor contribution from the bypass water from WWTP Lynetten.

High indicators levels indicate a potential risk of disease.

No measurements were done on the day of the triathlon.

What caused the contamination

- The 3D water quality model (MIKE 3 FM by DHI) forecasted a likely risk of disease if swimming in the Laguna.
- The prediction was true, the triathletes became diseased.

What were the consequences

- Several pathogenic agents caused disease:
  - Campylobacter spp.
  - E. coli (ETEC)
  - Intimin producing E. coli (A/EEC)
  - Giardia lamblia
- Virus and toxins were not examined

- 778 (59%) answered the survey; 428 (55%) had gastroenteritis

How serious was the contamination

- The model forecasted high levels of indicators in the Laguna at 7 am.
  - 25,554 CFU/100 ml E. coli
  - 25,217 CFU/100 ml Enterococci
- The high indicators levels indicate a potential risk of disease.
- No measurements were done on the day of the triathlon.

Predicting disease

- Acute situations: Measurements are time demanding and not always available, models give real-time information at all times.
- The model predicted a likely risk of disease if swimming in the Laguna.
- The prediction was true, the triathletes became diseased.

The model is shown to be a strong tool for warnings but requires that warnings are taken seriously.

Conclusions

- A combined sewer overflow caused the contamination.
- Disease when ingesting contaminated seawater when swimming.
- Models are fast and strong tools for analysis of water quality.