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

Andersen, Signe Tanja; Erichsen, Anders Christian; Mark, Ole; Albrechtsen, Hans-Jørgen

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Introduction
During 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 mechanical 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 were 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 is 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

What caused the contamination
- The 3D water quality model (MIKE 3 FM by DHI) 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

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 indicates a potential risk of disease
  - No measurements were done on the day of the triathlon

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

Predicting disease
Acute situations; Measurements are time demanding and not always available, models gives 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