

Perspectives on urban wastewater as a source of microbial pollution

Akademisk avhandling

För avläggande av Medicine doktorsexamen vid Sahlgrenska akademien, Göteborgs universitet kommer att offentligens försvaras i Sal 3, Guldhedsgatan 10 A, den 7 februari 2020, klockan 13.00

av Stina-Mina Ehn Börjesson

Fakultetsopponent:

Åke Forsberg, professor emeritus

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Avhandlingen baseras på följande delarbeten

- I. Börjesson, Stina-Mina, Kühn Inger, Hernandez Jorge, Olsen Björn, Rehnstam-Holm Ann-Sofi, 2013. *Enterococcus* spp in Wastewater and in Mallards (*Anas platyrhynchos*) Exposed to Wastewater Wetland, IJEP, Vol. 3, 10: 1-12
- II. Ehn Börjesson Stina-Mina, Waldenström Jonas, Hernandez Jorge, Rehnstam-Holm Ann-Sofi, 2019. Characterization of *Campylobacter jejuni* isolated from Mallards (*Anas platyrhynchos*) prior, during and post exposure to treated wastewater, Manuscript.
- III. Collin Betty, Rehnstam-Holm Ann-Sofi, Ehn Börjesson Stina-Mina, Mussagy Aidate, Hemroth Bodil, 2013. Characteristics of potentially pathogenic vibrios from subtropical Mozambique compared to isolates from tropical India and boreal Sweden, FEMS Microbiol Ecol, Vol. 83, 2: 255–264.
- IV. Ehn Börjesson Stina-Mina, Collin Betty, Rehnstam-Holm Ann-Sofi, 2019. Different persistence among strains of *E. faecalis* and *E. faecium* in sterile treated wastewater microcosms – effects of temperature and ciprofloxacin, Manuscript.

**SAHLGRENKA AKADEMIN
INSTITUTIONEN FÖR BIOMEDICIN**



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Abstract

Wastewater treatment plants are important links for dissemination of intestinal bacteria into surface waters. In this study, twelve mallards were exposed to treated wastewater for a period of 55 days. Faecal samples were collected and analysed for *Enterococcus* spp. and *C. jejuni*. In general, the mallard and wastewater enterococci isolates belonged to different phenotypes, although some strains were identical. Phenotypical characteristics of *C. jejuni*, including antibiotic resistance, and genetical (PFGE and MLST) patterns were compared. All STs have previously been found in both humans and wild birds. The phenotypical expression of resistance against ampicillin and cefazolin, and ability to assimilate malate and succinate, changed during the mallards exposure to wastewater.

Edible clams were collected in Maputo Bay during both the dry and rainy seasons, and number of viable counts of *V. parahaemolyticus* peaked during the rainy season. A high percentage showed haemolytic capacity but did not carry the standard set of virulence genes.

The persistence of *E. faecium* and *E. faecalis* strains in sterilized treated wastewater at 10°C and 20°C was evaluated, including if ciprofloxacin had any effect. We could conclude that *E. faecalis* had a lower DC10 (92 and 43 days) than *E. faecium* (333 and 68 days) at 10°C and 20°C, respectively. Most of the strains were unaffected of ciprofloxacin was, but there were exceptions. All strains remained culturable the whole studied period (108 days).

Keywords: Wastewater, Mallard, *Anas platyrhynchos*, *Enterococcus* ssp, *E. faecium*, *E. faecalis*, *Campylobacter jejuni*, *Vibrio parahaemolyticus*