

On gastrointestinal viral infections

Akademisk avhandling

som för avläggande av medicine doktorsexamen vid Sahlgrenska Akademin, Göteborgs Universitet kommer att offentligen försvaras i Infektionskliniken i Infektionskliniken, Sahlgrenska Universitetssjukhuset/Östra, Diagnosvägen 21, Göteborg.

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av Thomas Beck-Friis

Fakultetsopponent:

Blenda Böttiger

Institutionen för Laboratorievetenskap, Avdelningen för Medicinsk Mikrobiologi
Lunds Universitet

Avhandlingen baseras på följande delarbeten

- I. Andreasson T*, Gustavsson L, Lindh M, Bergbrant IM, Raner C, Ahren C, Westin J, Andersson LM. **Evaluation of anamnestic criteria for the identification of patients with acute community onset viral gastroenteritis in the emergency department--A prospective observational study.** *Scandinavian Journal of Infectious Diseases*. 2014;46(8):561-5.
- II. Beck-Friis T, Andersson M, Gustavsson L, Lindh M, Westin J, Andersson LM. **Burden of rotavirus infection in hospitalized elderly individuals prior to the introduction of rotavirus vaccination in Sweden.** *Journal of Clinical Virology*. 2019;119:1-5.
- III. Beck-Friis T, Sundell N, Gustavsson L, Lindh M, Westin J, Andersson LM. **Outdoor absolute humidity predicts seasonal variation of norovirus GII infection.** *Submitted manuscript*.
- IV. Beck-Friis T[∞], Kärlander A[∞], Nystrom K, Wang H, Gisslen M, Andersson LM, Norder H. **Comparison of SARS-CoV-2 spike RNA sequences in feces and nasopharynx indicates intestinal replication.** *Gut Pathogens*. 2022;14(1):35.

*Changed last name from Andreasson to Beck-Friis in 2018. [∞]Equal contribution.

SAHLGRENSKA AKADEMIN
INSTITUTIONEN FÖR BIOMEDICIN



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ABSTRACT

Gastrointestinal viral infections cause considerable morbidity and mortality worldwide. Many factors influencing clinical presentation, disease severity, epidemiology, and transmission are not fully understood.

The aims of this thesis were (I) to develop a predictive model based on clinical criteria to assess patients with gastroenteritis symptoms in the Emergency Department; (II) to determine the morbidity and mortality in elderly hospitalized individuals with rotavirus infection; (III) to examine how outdoor climate factors impact seasonal variation of gastroenteritis virus detection; and (IV) to study differences in SARS-CoV-2 sequences from feces and nasopharynx.

In **paper I**, we prospectively observed 66 patients presenting with vomiting or diarrhea in the Emergency Department. Thirty-one (47%) tested positive for gastroenteritis. In a model, scoring one point for each of diarrhea, vomiting, and short symptom duration, a score of less than two identified patients without viral gastroenteritis. In **paper II**, we retrospectively studied 159 elderly patients hospitalized with rotavirus gastroenteritis. Most patients presented with community-onset disease and had few comorbidities. Short-term mortality was low (2.5%). In **paper III**, weekly detection rates of gastroenteritis viruses were studied in relation to weekly data of outdoor climate factors. Low absolute humidity correlated strongly with detection rates of all viruses. A drop in absolute humidity preceded the beginning of norovirus epidemics. In **paper IV**, we prospectively observed 112 patients hospitalized with COVID-19. SARS-CoV-2 was found in 88 (79%) fecal samples and did not correlate with severe disease. More strain variability was found in SARS-CoV-2 sequences from feces compared to nasopharynx.

In conclusion, diarrhea and short symptom duration were independently associated with detection of gastroenteritis by PCR. Rotavirus infections in the hospitalized elderly mainly affected relatively healthy individuals. Low absolute humidity correlated with norovirus seasonality and predicted onset of seasonal epidemics. SARS-CoV-2 strain variability was greater in feces compared to the nasopharynx, indicating intestinal SARS-CoV-2 replication.

Keywords: norovirus, rotavirus, SARS-CoV-2, gastroenteritis, diagnosis, elderly, epidemiology, humidity, COVID-19, genomic structural variation.