COVID-19 - WHAT ARE DANISH IHCC COHORTS DOING, HOW WE TACKLED THIS CHALLENGE
THE DANISH NATIONAL BIOBANK

>12 million samples in store
- and growing by 1 million new samples per year

Liquid handlers (11)
daily samples

DNA extraction
1200 samples/day
One step conc./normalisation

Quantitative assays
- Immunological and biochemical assays
- Microbiological assays
- MesoScale platform 10 analytes/run
- Luminex platform 30-50 analytes/run

Genetic analysis

Metabolomics
Proteomics

-80 °C automated
storage (4 M)

-80 °C automated
storage (4 M)

-20 °C automated storage
(4 M tubes, 3 M PKU cards)

-196 °C storage
21 tanks

3 walk-in freezers, -20 °C
(basement, 4 M)

THE DANISH NATIONAL BIOBANK

-20 °C storage
20 tanks

-80 °C automated
storage (4 M)

-80 °C automated
storage (4 M)
Danish Biobank Register

25.3 million samples from 5.7 million people
COVID-19 SURVEILLANCE

- Follow trends
- Assess severity
- Identify risk groups
- Describe transmission chains
- Detect new virus variants
- Estimate vaccine effectiveness
- Side effects of vaccinations
- Assess effects of interventions

Microbiology Database
- PCR
- Antigen test

WGS
- Mutations
- Variants

National Patient Register
- Hospital admission
- ICU procedure codes
- Underlying illness

Civil Registration System
- Age, sex
- Place of living
- Date of death
- Ethnicity
- Family relations

Nursing homes
- Residents
- Staff

Occupation/workplace
- Healthcare workers
- Others

Vaccination register
- Date of vaccination
- Vaccine product

Patients with COVID-19
The biobank has >12 million biological samples in store

COVID-19 samples

Testcenter Denmark: Total samples COVID-19+
Throat swab 1,225,755 202,308
Blood samples 30,974 1,352

Other biobank samples: COVID-19+
DNA 10,070
Plasma 22,025
Serum 15,429

Exposure to fluoride compounds increases disease severity
Grandjean et. Al
PLOS ONE

Vit D and disease severity
Manus in prep

Mannan binding lectin and infectious rate
Ongoing

Angiotensin-II status and covid severity
Ongoing

Large scale hostpathogen genetic interaction

Population based seroprevalens in early 2020
Ongoing

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THE DANISH NATIONAL BIRTH COHORT OFFSPRING POPULATION AND GLOBAL DATA COLLECTIONS

DNBC Offspring Age

In 2030, DNBC offspring will be between 26 and 33 years old

Young adult follow-up (in preparation)

Corona I and II – Mental health and well-being spring 2020 and 2021

18-year: Mental health

Puberty: Repeated every 6 months from age 11½ - 17½, youngest 22,500 participants only

14-year: FFQ self-reported diet and exercise

11-year: Self-reported child health – from mother and child

7-year: Child health reported by mother

Gest. week 16 and 30, child age 6 and 18 months: Computer Assisted Telephone Interviews

www.dnbc.dk
COPENHAGEN HOSPITAL BIOBANK

- Biobank with >430K patients
- Initiated at Rigshospitalet in Copenhagen in 2009
- Collection of surplus of EDTA whole blood from the Clinical Immunology department
- Average age of patients at inclusion >45 years
- Linkable with Danish national registries and electronic health records
- Illumina GSA chip in collaboration with deCODE genetics
THE DANISH BLOOD DONOR STUDY

- Nationwide recruitment of donors via the Danish Blood Banks
- 206 donation points across Denmark
- High participation rate: 95%
- Builds on existing infrastructure
- **135K** blood donors recruited since 2010
- Donors donate up to four times per year (10 times if plasma donors)
- EDTA plasma stored in biobank at each donation
- Data (questionnaire, chip genotype, register, biomarkers) collected on a dedicated secure cloud
EPIDEMIOLOGY AND GENETICS OF COVID-19

• The project is based on a national collaboration, allowing combination of all large established genetic cohorts in Denmark, to conduct a large genetic-epidemiological study on COVID-19 disease.
  • Genetic cohorts: Copenhagen Hospital Biobank, the Danish COVID-19 Biobank and the Danish National Biobank

• The objective of the study is to acquire novel knowledge on COVID-19 disease pathogenesis and trajectories including influence of host genetics, environmental factors, co-morbidities, viral variants/strain and microbiome.

• The project applies a precision medicine approach to COVID-19 by revealing genetic variants and environmental factors determining both disease susceptibility, -severity and mortality.

• These data allows us to develop a frailty index score or other risk parameters, with further stratification of specific risk groups according e.g. gender-specific trends in disease trajectories and comorbidities that affects survival and disease progression.

• The project is funded by Sygeforsikringen Danmark (grant no. 2020-0178)
THE DANISH BIOBANKS SHOW DIVERSITY IN GENETIC ANCESTRY

- 96% are of European origin
- High-resolution HLA typing from high-quality imputed genotypes
- Linkable to symptom screening and COVID-19 outcome data via Danish registries
- Host and viral sequence data
THANKS FOR LISTENING