

STATENS
SERUM
INSTITUT



THE DANISH NATIONAL BIOBANK



DANMARKS
NATIONALE
BIOBANK

**Major involvements in establishment of
high capacity diagnostics in Denmark**



ANJE@ssi.dk

Statens Serum Institut (2011-)

- 2023 - : **IT section leader** (SDI section in Digital Infrastructure at SSI)
- 2020-2022: **IT solution architect** (Danish National Biobank & Testcenter Denmark)
- 2014-2017: **Database Administrator** (The Danish Health Data Authority)

Private Companies

- 1997-2014; 2017-2020: Employed in various private companies as system or database expert.

Copenhagen Business Academy, Denmark (1997)

- AP Graduate, Copenhagen Business Academy, Computer Science



Roadmap of my talk

- Danish National Biobank (DNB)
- COVID-19 effect on DNB – Testcenter Danmark
- Next steps / initiatives



Biobank establishment (2012)

The Danish National Biobank is situated at Statens Serum Institut, a national laboratory for more than 100 years

- Collections with many (millions) of biological samples
- Increasing demand from researchers
- Overview and structure was needed

Funds were raised to establish

- Danish Biobank Register (SSI samples and other joining biobanks)
- National Biobank that offers state-of-the art and well monitored freezing units and laboratory facilities



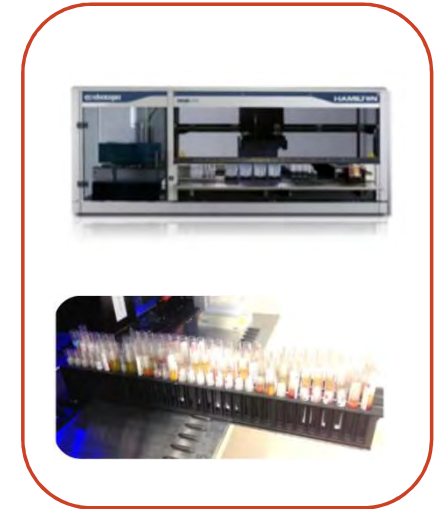
Danish National Biobank

DANMARKS
NATIONALE
BIOBANK

Automated storage



High throughput
automation



Manual storage



Total storage
capacity:
>15M

High throughput analyses





Danish National Biobank



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

Genetic analysis

- NGS-500 sequencing
- Array genotyping
- Targeted sequencing
- Mutation analysis
- Methylation
- mRNA microRNA profiling



Metabolomics and proteomics

- Explorative and focused using mass spec.
- LC-tandem mass spec. for small analytes
- MALDI-TOF mass spec.



Immunoassays

- Autoimmune disease diagnostics and development
- Biacore interaction analysis
- Antibody development
- Protein purification, characterization, conjugation
- MesoScale platform 10 analytes/run
- Luminex platform 30-50 analytes/run





Neonatal screening samples

Manual collection of 2 million Guthrie cards (PKU) placed in
automated -20°C robot systems





14 M biological samples

Sample type	Samples	Individuals
Throat swab samples	4.321.842	3.135.728
Serum	3.317.536	951.521
Dried blood spot samples	2.565.821	2.091.587
Plasma	1.488.350	442.752
Whole blood	830.524	320.872
DNA	678.237	451.455
Buffy coat	346.033	126.527
Urine	320.456	126.054
Saliva	90.407	42.554
Red blood cells	85.349	41.738
Amniotic fluid	66.407	56.505
Cord blood mononuclear cells	65.032	65.032
Proteins extracted from DBSS	39.168	38.979
Spinal fluid	28.596	16.498
Other (PBMS, feces, stem cells, biopsies, etc.)	83.430	49.040

Roadmap of my talk

- Danish National Biobank (DNB)
- COVID-19 effect on DNB – Testcenter Danmark
- Next steps / initiatives

STATENS
SERUM
INSTITUT



Testcenter Denmark (TCDK)

DANMARKS
NATIONALE
BIOBANK

TestCenter
Danmark



novo nordisk fonden



Establishment of TCDK

- Late March 2020:
 - Aim: establish national COVID19 testing infrastructure
 - up to 10,000 analyzed swab tests / day
 - Deadline: late April 2020

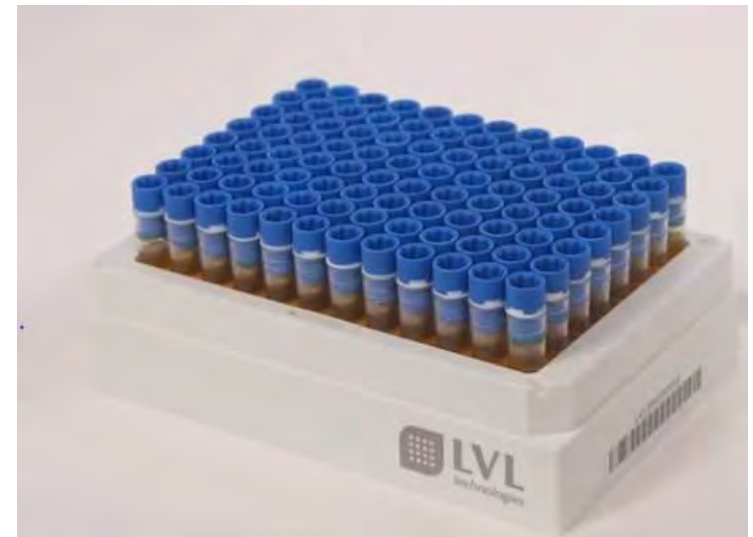
Requires manual handling

Not scalable



Decision

Use biobank common format

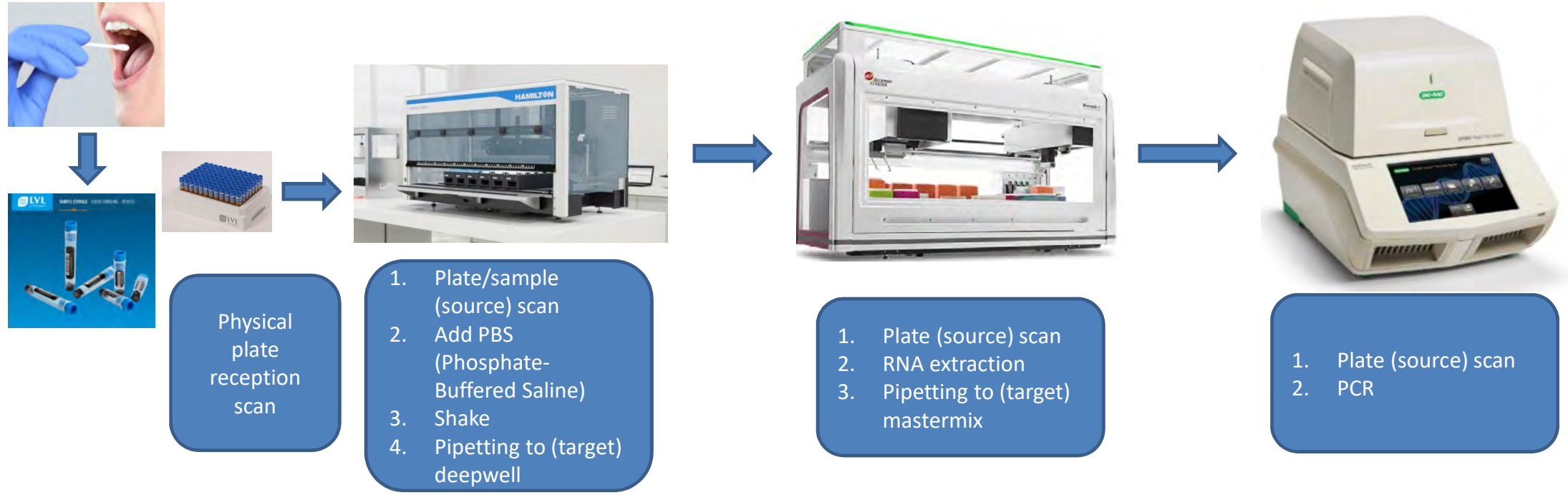


IT solution development

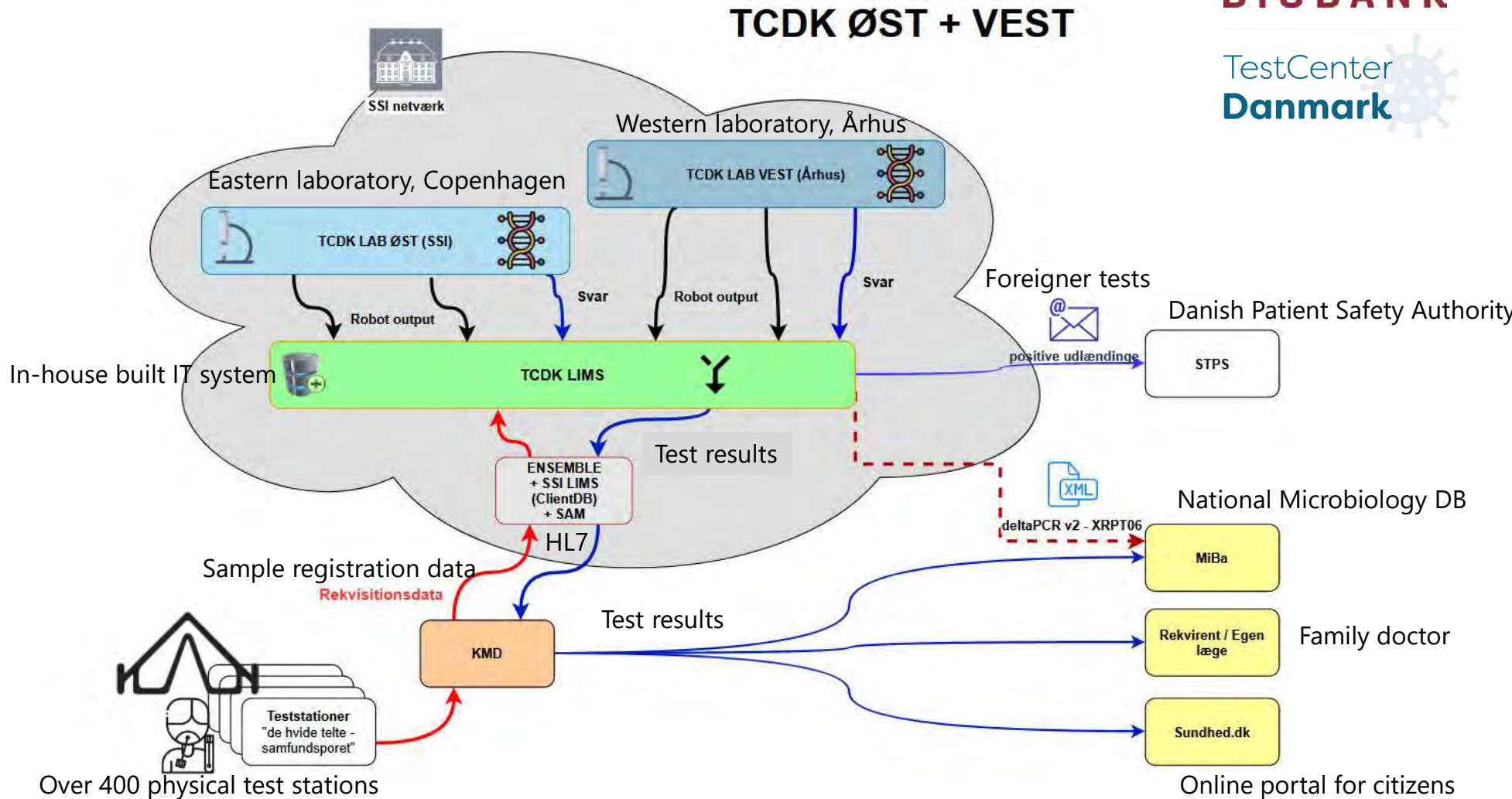
To do: build acutely an automated laboratory data flow

Solution:

based on experiences from the automated solutions
@ Danish National Biobank



TCDK data flow & architecture





TCDK data flows



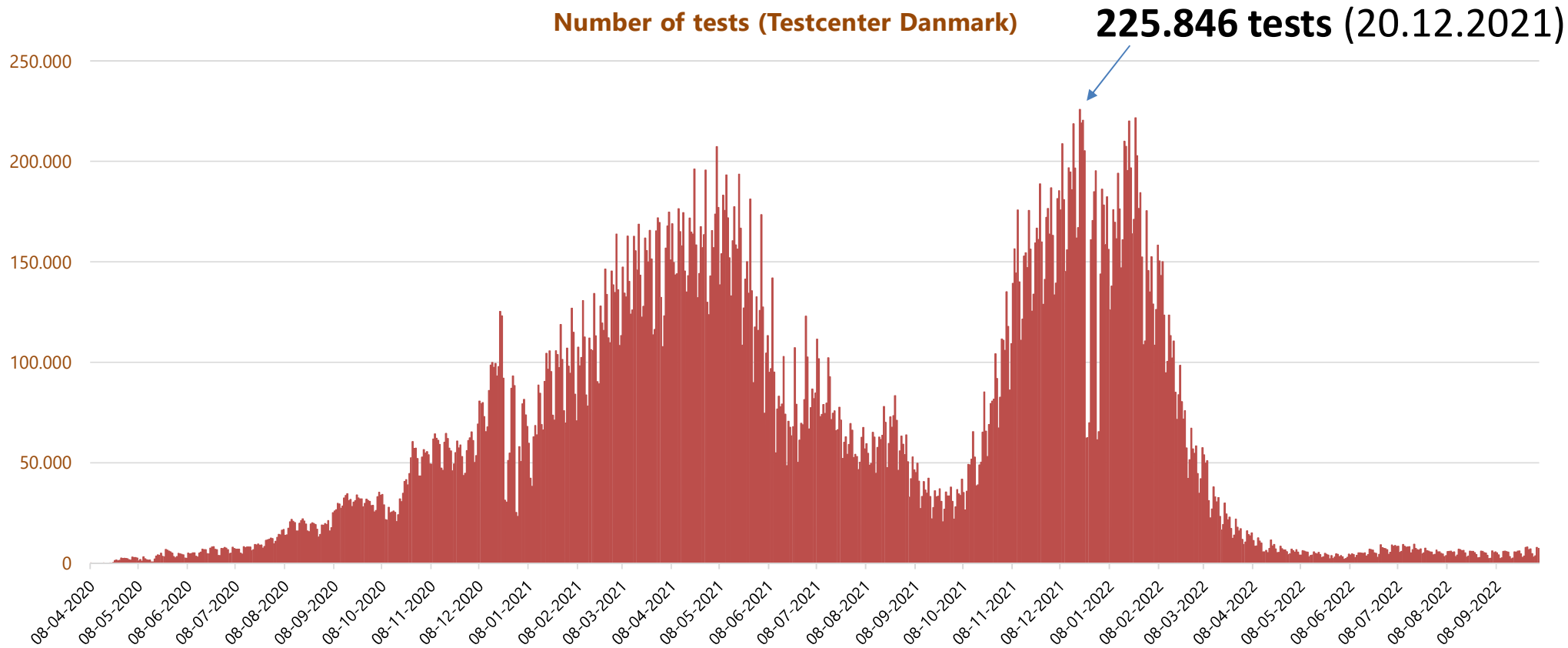
Danish Covid-19 Genome Consortium

WGS flow

& waste water analysis flow



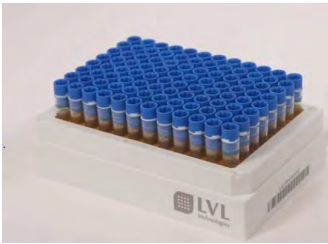
From 20k to 225k tests/day





Integration with the biobank

Processed & answered
swab tubes (RT-PCR)



Throat swab samples (all positive and 1M negative)



Processed & answered
serum tubes
(RT SARS-CoV-2 RBD serology)



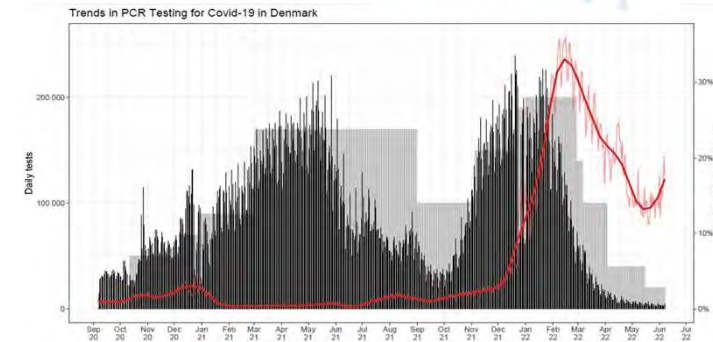
Blood: (all samples)





Testcenter Denmark infrastructure for biobank projects

- Capacity: 200.000 analyses/daily, RNA/DNA extraction
- Quality: ISO accredited flow,
 - Automated sample tracking
 - Semi-automated results release & validation
- Study design & project management
- Pipetting robots & PCR machines
 - 24 Hamilton Star & Vantage
 - 43 Biomek i7
 - 200 Bio-Rad thermal cyclers
- Automated storage system at +4 °C for picking of COVID19+ tubes
- Now (after COVID): **offers to take in diverse projects from biobanks**





Roadmap of my talk

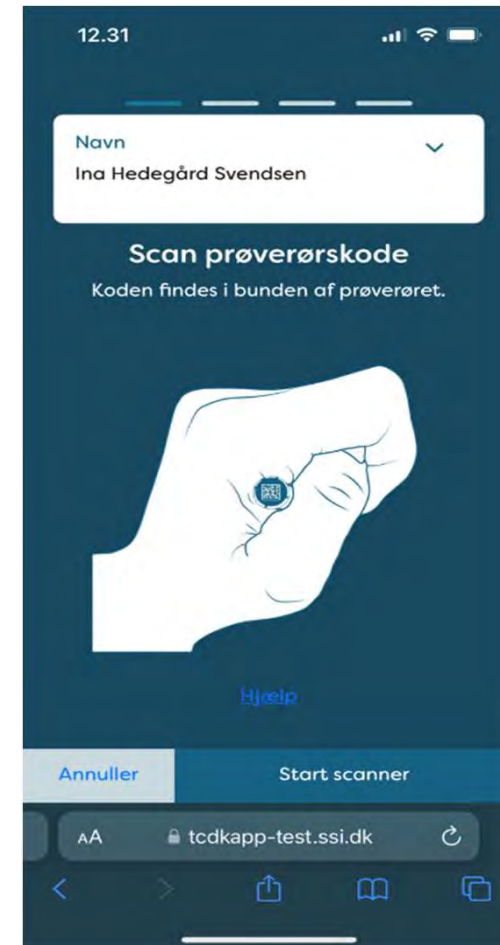
- Danish National Biobank (DNB)
- COVID-19 effect on DNB – Testcenter Danmark
- Next steps / initiatives



TCDK App - registration of supervised and unsupervised testing



- Responsive web application
- Supports digital registration of self tests
 - Incl. scanning module for barcodes, QR and **data matrix** codes
- Integration with national citizen identification system
 - digital login - MitID
- Integration with the National Service Platform (NSP)
 - Digital exchange of data and communication for healthcare
 - Parents can register on behalf of their kids (U15)
- Digital registration and consent to research/sentinel projects
- Supervisor management module (for project administrators)
- Access to laboratory results (registered via TCDK App)
- Flexible questionnaire module
- Direct integration with the servers at Statens Serum Insitut





TCDK App & Triple airway virus sentinel project

- Start: 1. april 2023
- Aim: To better monitor, prevent and fight infectious diseases
- Sentinel (SARS-COV-2, Influenza, RS virus)
- Participants: Voluntary employees + household
 - @ Statens Serum Institut
- Expansion plans (Q3-Q4 2023)
 - Include other Danish companies
 - Planned capacity: 2000 tests / week
- Samples saved in Danish National Biobank



Current DNB projects



ENFORCE

Danish National Cohort Study of
Effectiveness and Safety of
SARS-CoV-2 vaccines

2 years, 7.000 participants, 5 donations
Budget 101M DKK



Danish Covid Genetics Consortium

Genotyping 5.000 participants
Budget 5.4M DKK

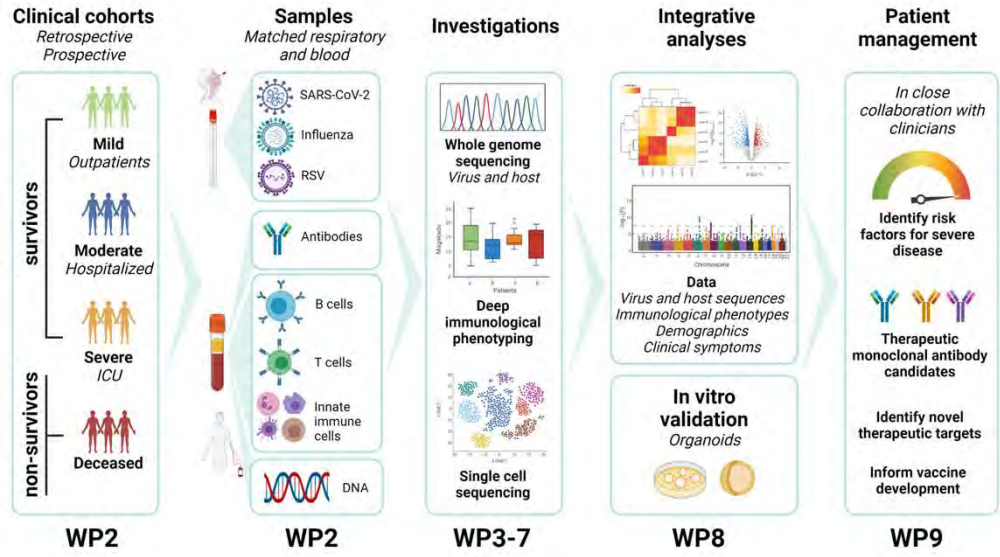


PREDICT

CENTER FOR MOLECULAR PREDICTION
OF INFLAMMATORY BOWEL DISEASE

6 years, budget: 68.4M DKK

REACT: Respiratory Host-Pathogen Interaction



4 years, start Q3 2022, Budget 52M DKK

www.danishnationalbiobank.com

Main sponsors



Uddannelses- og
Forskningsministeriet

novo nordisk fonden

