



Karolinska  
Institutet

# BIOBANKING

## The Karolinska Institutet Experience

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*Department of Medical Epidemiology and Biostatistics*

*Karolinska Institutet*

*Department of Oncology, Södersjukhuset*

*Stockholm, Sweden*

## Overview of my talk

- Karolinska Biobank - today
- The Karma Intervention Study
- Karolinska Biobank - tomorrow

# Karolinska Biobank - today

# A short history of KI Biobank...



## 2004 kick-off!

- Lab, data systems, processes
- Ethics and legal compliance addressed
- 1st study – the Swedish Twin Register

## 2006

- First withdrawals
- Quality System and ISO accreditation
- IT support to external collections

## 2010

- Technical re-development
- Big cohorts start

## 2023

Taking the next step

## Some statistics

- Number of doners:  $\approx 750,000$  (7.5% of the Swedish population)
- Number of samples:  $\approx 8,000,000$
- Number of papers: 227 (since 2011 from our group only)
  
- Number of sample *types*                      56 (e.g. DNA, plasma, hair, breast milk, umbilicord blood, bone marrow)
- Number of tube types:                      44
  
- Sample withdrawals:  
    → 2020-2022                               $\approx 70\,000$  samples/year

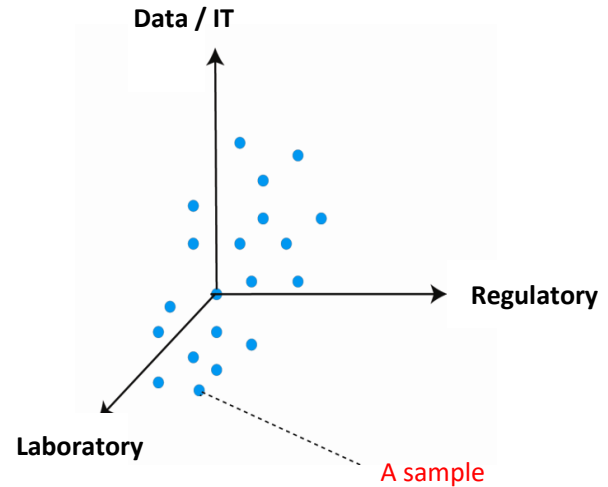
# Storage

- Static storage
  - Room temperature filter paper
  - +4°C saliva
  - -20°C DNA
  - -80°C plasma, serum
  - -196°C liquid nitrogen viable cells
- Automated storage: Auto freezer (-80°C)



# What is biobanking?

- Three important dimensions;
  - **Regulatory**
  - **Data / IT**
  - **Laboratory**
- In order to, in a legally and ethically correct way;
  - Handle and prepare human samples
  - Secure storage of samples
  - Guarantee traceability of samples
  - Send samples for analysis



# What is biobanking?

- **Regulatory aspects**

- Adherence to biobank laws and regulations
- Applications to authorities such as the Medical Products Agency and the Ethical Board
- Biobank agreements
- Sample agreements
  - Material transfer agreement (MTA)
  - Data transfer agreement (DTA)
  - Data processing agreement (DPA)

- **Data / IT**

- Laboratory information management system (LIMS)
  - Traceability
  - Data filtering and visualisation
  - Automation
- Referral
- Databases
- Integrations

- **Lab**

- Sample type/tube type
- Preanalytical handling
- Sample withdrawal

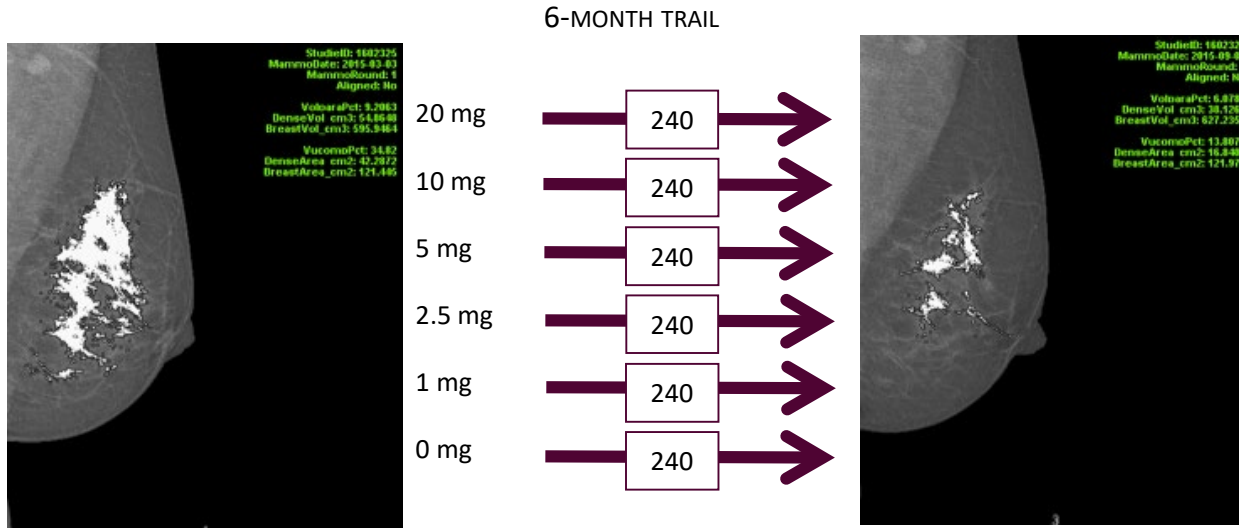
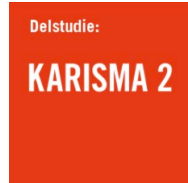


# The Karma Intervention study – KARISMA-2

An example of how a biobank could be used

# The Karma Intervention Study – KARISMA-2

- A dose determination trail – five doses of tamoxifen and placebo
- Double blinded randomised controlled trial including 1,440 women



Eriksson, J Clinical Oncology, 2021

# The Karma Intervention Study – **KARISMA-2**



We wanted to study germline DNA (e.g. CYP2D6 polymorphism), tamoxifen (and metabolites) concentrations, safety measures (liver tests, etc), protein and hormone levels, receptor expression, etc, in tissue

- Polymorphisms - DNA
- Safety - Plasma
- Metabolites of tamoxifen - Plasma
- Proteins - Plasma
- Hormones - Plasma
- Receptors - Tissue

# KI Biobank, services

Delstudie:

**KARISMA 2**

- Sample services
  - Planning studies
  - Ethics & regulatory advice
  - Referrals & registration
  - Blood sampling
  - Sample preparations
  - DNA extraction
  - Sample withdrawal
- Data services
  - Informed consent
  - Lab info management (LIMS)
  - Data withdrawal
  - Participant data (CRM/CRF)
  - Data visualisation & access
  - Survey data

Research areas | Researchers | Research funding | Infrastructure

## KI Biobank

KI Biobank at Karolinska Institutet in Solna is a modern and high-tech infrastructure for pre-analytical handling, storage and distribution of human biological samples. We provide services for collection, handling, storage and traceability of biobank samples and

This page in Swedish

- Services & Prices
- Agreements
- Laws & ethics
- Sample collections
- About us
- Contact

# KI Biobank

## Tjänstekatalog

Version: 2, 2015

KI Biobank är en core facilitet som erbjuder service för provinsamling, provförvaring och provdistribution.

I samarbete med:

**BBMRI.se**  
Biobanking and  
Molecular Resource  
Infrastructure of  
Sweden

**Karolinska Institutet**

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**Karolinska  
Institutet**

Stora nationella  
bröstcancerstudien

**Karma**

**Karisma 2**

**Jag har läst och samtycker till deltagande i Karisma 2**

<

Undertecknad har tagit del av den skriftliga informationen om Karisma 2, vars syfte är att undersöka vilken dos av tamoxifen som bäst lämpar sig för förebyggande behandling mot bröstcancer.

Jag har haft möjlighet att ställa frågor och fått dem besvarade. Mitt deltagande är helt frivilligt och kan avbrytas när jag vill utan närmare förklaring.

Jag samtycker till att Karolinska Institutet (KI) behandlar mina personuppgifter och sparar biologiska prov enligt den information jag har tagit del av. Jag samtycker till att KI får ta del av uppgifter om mig i medicinska journaler och från offentliga register och använda dessa samt uppgifter från undersökningen för forskning som har godkännande från etikprövningsnämnd - även för forskning utanför Sverige och EU/EEA.

Jag samtycker också till att mina journal- och personuppgifter kan komma att granskas av regulatorisk myndighet (Läkemedelsverket) och av representanter utsedda av Karma i syfte att säkerställa att studien följer uppsatta regelverk och myndighetskrav.

>

<p>För Deltagare: _____</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">Deltagarens namnteckning</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">Namnförtydligande</div> <div style="border: 1px solid black; padding: 2px;">Datum</div>	<p>För Karma: _____</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">Namnteckning</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">Namnförtydligande</div> <div style="border: 1px solid black; padding: 2px;">Datum</div>
--	--

Jag har fått information om och ger även mitt samtycke till att lämna vävnadsprov från bröstet (biopsi) i samband med studiestart samt vid avslutande av studieläkemedel.

+

Fylls i av personalen. Avläses maskinellt. Skriv tydligt.

<p style="font-size: 0.8em; text-align: center;">A A A A W W D D N N N N</p> <div style="border: 1px solid black; padding: 2px; text-align: center;">Deltagarens personnummer</div>	<p style="font-size: 0.8em; text-align: center;">A A A A M M D D</p> <div style="border: 1px solid black; padding: 2px; text-align: center;">Datum</div>
---	--

KI Biobank, Institutionen för Medicinsk Epidemiologi och Biostatistik, Karolinska Institutet, Box 281, 171 77 Stockholm  
 Tel: 08-524 823 77 [ki.se@biobank](mailto:ki.se@biobank), [info@biobank.se](mailto:info@biobank.se)

Ver: 2017-01-30, Karisma 2

## Informed consent

- ID
- Signature
  - ➔ Participant
  - ➔ Investigator
- Date and time

Delstudie:

**KARISMA 2**

Stora nationella bröstcancerstudien: **Karisma 2**

**Karma**

KI Biobank  
Provta

**Vävnadsremiss Karisma 2**

Instruktion till provtagaren:

- Kontrollera identiteten.
- Fyll i remissen med deltagarens personnummer samt datum för provtagningsmärk upp rör och kassett med medföljande streckkodsetiketter. (Använd rör märk med personnummer ifall de andra etiketterna går sönder.)
- Kassett OCT: Förutom etikett skriv Tissue 3-nummret med penna på kassett.

Provtagning:  
Enligt SOP Karisma 2 Biopsi.

Godkänt av Region Öst 2018/151-312  
Måttgivande biobank  
Karolinska Institutet

Fylls i av personalen. Avläses maskinellt. Skriv tydligt.

A A A A M M D D N N N N N  
Deltagarens personnummer

A A A A M  
Provtagningsdatum

RemissID  
99999999

T T T M M M  
Provtagningstid

**Ref**

**Tag rätt etikett till rätt rör/prov**

Tissue 1	99999998	FFPL_1	FFPL_2	OCT	KARISMA	KR10
Tissue 2	99999997					
Tissue 3	99999996					
Tissue 4	99999995					
RID	99999999					

KI Biobank, Institutionen för Medicin, Epidemiologi och Biostatistik, Karolinska Institutet, Box 281, 171 77 Stockholm  
Tel: 08-524 823 77 ki.se@ki.se, info@ki.se

Stora nationella bröstcancerstudien: **Karisma 2**

**Karma**

KI Biobank  
Provtagningsremiss

**Blodprovremiss Karisma 2**

Instruktion till provtagaren:

- Kontrollera identiteten.
- Fyll i remissen med deltagarens personnummer samt datum och tid för provtagningen.
- Märk upp rören med medföljande streckkodsetiketter.
- Provtagning som vid vanlig venpunktion. Vand rören försiktigt fem gånger.

Provtagning: **EDTA (1st 4 ml plaströr, lila propp).**  
**EDTA (2 at 10 ml plaströr, lila propp).**  
Vänd rören försiktigt fem gånger efter provtagnin.

Godkänt av Regional Etikprövningsnämnd Öst 2015-6/953 31/2  
Måttgivande biobank: KI Biobank (reg.nr 222),  
Karolinska Institutet.

Fylls i av personalen. Avläses maskinellt. Skriv tydligt.

A A A A M M D D N N N N N  
Deltagarens personnummer

A A A A M M D D  
Provtagningsdatum

RemissID  
99999999

T T T M M M  
Provtagningsid

Provtagarens signatur

**Ref**

**Tag rätt etikett till rätt rör.**

blodf1	99999998	4 mL EDTA	10 mL EDTA	10 mL EDTA
plasma1	99999997			
plasma2	99999996			
RemissID	99999999			

KI Biobank, Institutionen för Medicin, Epidemiologi och Biostatistik, Karolinska Institutet, Box 281, 171 77 Stockholm  
Tel: 08-524 823 77 ki.se@ki.se, info@ki.se

Ver: 2017-01-31, Karisma 2

## Referral

- ID
- Time point
- Sample type
- Tube type
- Bar code for tubes

Delstudie:

**KARISMA 2**

# Summary



Ethical application  
Ethical approval  
Medical Products Agency  
Biobank agreement



Consent



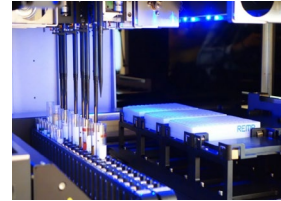
Inclusion



Phlebotomy



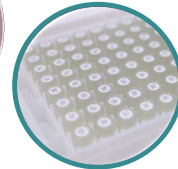
Transport



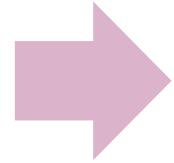
Handling



Storage



Withdrawal



Analysis

KIBO Manager

Area	Barcode	Quantity	Unit	Material Name	Storage Location	Status	Lot	Expiration Date	Batch	Comments	Volume	Unit Price	Unit Value	Inventory	Location	Lot	Temp	Material	Inventory	Material	Unit Price	Unit Value		
LABData	DKM	2023-09-27	10	MS_39020103-02	MS_39020103-02	Received	MS_39020103-02	2023-09-27	MS_39020103-02	Received	REMAP000	77.0	123											
LABData	DKM	2023-09-27	10	MS_39020103-03	MS_39020103-03	Received	MS_39020103-03	2023-09-27	MS_39020103-03	Received	REMAP000	77.0	124											
LABData	DKM	2023-09-27	10	MS_39020103-12	MS_39020103-12	Received	MS_39020103-12	2023-09-27	MS_39020103-12	Received	REMAP000	80.7	130											
LABData	DKM	2023-09-27	10	MS_39020103-13	MS_39020103-13	Received	MS_39020103-13	2023-09-27	MS_39020103-13	Received	REMAP000	80.7	130											
LABData	DKM	2023-09-27	10	MS_39020103-14	MS_39020103-14	Received	MS_39020103-14	2023-09-27	MS_39020103-14	Received	REMAP000	80.2	129											
LABData	DKM	2023-09-27	10	MS_39020103-15	MS_39020103-15	Received	MS_39020103-15	2023-09-27	MS_39020103-15	Received	REMAP000	118.4	74											

MTA  
DTA/DPA  
Collaboration agreement





Karolinska Biobank - tomorrow

## How could Principal Investigators and external researchers get access to information?

- How could information be transferred to researchers without the involvement of the biobank?
- How could transparency be increased?
- How could samples be better used?

# Sample withdrawals

Karolinska Institutet

KIBB Manager

Kivis2 Invoicing Logout

Studies and services lists Invoicing

Search without input file 

**Search criteria**

Study Name \*

Barcode

Sample type

Received date  

Status

Tube type

Concentration: min value  and/or max value

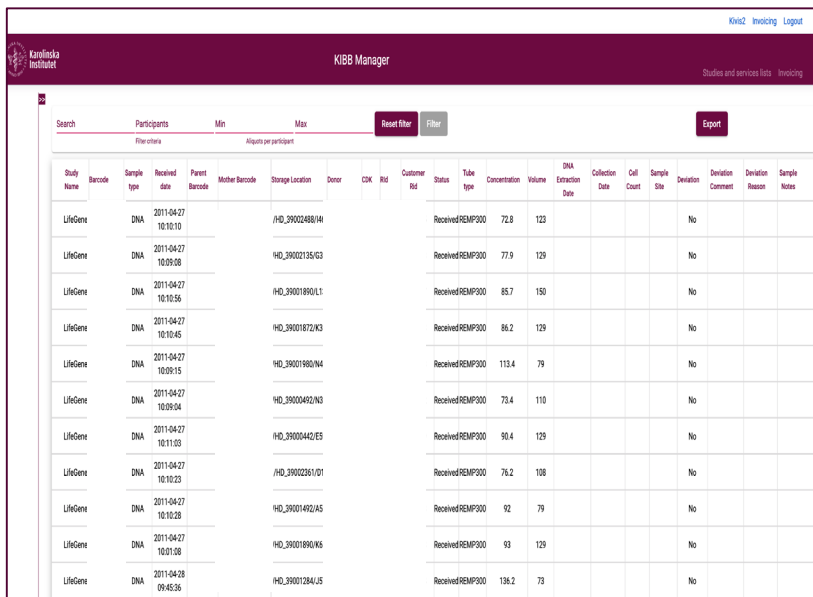
Volume: min value  and/or max value

Deviation



KIVIS-2.0  
Tool for Data Withdrawal

# Sample withdrawals




The screenshot shows the KIBB Manager interface with a table of sample withdrawals. The table has columns for Study Name, Barcode, Sample type, Received date, Parent Barcode, Mixture Barcode, Storage Location, Donor, CSK, RID, Customer ID, Status, Tube type, Concentration, Volume, DNA Extraction Date, Collection Date, Cell Count, Sample Site, Deviation, Deviation Comment, Deviation Reason, and Sample Notes. The data rows show various samples from the LifeGene study, including DNA samples received between 2011-04-27 and 2011-04-28, with concentrations ranging from 72.8 to 136.2 and volumes from 73 to 129.


Study Name	Barcode	Sample type	Received date	Parent Barcode	Mixture Barcode	Storage Location	Donor	CSK	RID	Customer ID	Status	Tube type	Concentration	Volume	DNA Extraction Date	Collection Date	Cell Count	Sample Site	Deviation	Deviation Comment	Deviation Reason	Sample Notes
LifeGene		DNA	2011-04-27 10:10:10			/HD_39002488/4H					Received	REMP300	72.8	123						No		
LifeGene		DNA	2011-04-27 10:09:08			HD_39002135/G3					Received	REMP300	77.9	129						No		
LifeGene		DNA	2011-04-27 10:10:56			HD_39001890/L1					Received	REMP300	85.7	150						No		
LifeGene		DNA	2011-04-27 10:10:45			HD_39001872/K3					Received	REMP300	86.2	129						No		
LifeGene		DNA	2011-04-27 10:09:15			HD_39001880/W4					Received	REMP300	113.4	79						No		
LifeGene		DNA	2011-04-27 10:09:04			HD_39000492/N3					Received	REMP300	73.4	110						No		
LifeGene		DNA	2011-04-27 10:11:03			HD_39000442/E5					Received	REMP300	90.4	129						No		
LifeGene		DNA	2011-04-27 10:10:23			/HD_39002295/V01					Received	REMP300	76.2	108						No		
LifeGene		DNA	2011-04-27 10:10:28			HD_39001492/A5					Received	REMP300	92	79						No		
LifeGene		DNA	2011-04-27 10:01:08			HD_39001890/K6					Received	REMP300	93	129						No		
LifeGene		DNA	2011-04-28 09:45:36			HD_39001284/J5					Received	REMP300	136.2	73						No		

**KIVIS** gives study specific information for researchers regarding their own samples:

- No. of participants, ID numbers
- No. and type of samples, date of sampling
- DNA concentrations, position in freezer, etc
- Status in LIMS (e.g. received, delivered)
- *Possibility to add information such as diagnosis, medications, hospitalisation, etc, from registers*
-

# Karolinska Biobank Sample Collection Catalogue, beta version

**Karolinska Institutet**

 Filters

Study Name


Sample Type


Tube Type


RESET SUBMIT

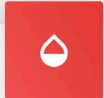
## Karolinska Institutet Biobank Sample Collection Catalogue

All samples belonging to research studies at Karolinska Institutet biobank are visible in the catalogue, displayed with study name, sample type, and tube type. The catalogue is automatically generated and updated on a regular basis, resulting in real time data display, giving the viewer a very easy to use way to see what's in the collection. If you are interested in knowing more and how to collaborate with any of the listed studies in the catalogue, please contact [biobank@ki.se](mailto:biobank@ki.se).

 Studies  
220

 SampleTypes  
56

 TubeTypes  
44

 Samples#  
6501487

## Sample collection statistics at KI Biobank

Based on samplotype and sample tubetype

study_name	study_pi
(s)-RAMPP	
5-COOP	Stefan Fors

# Karolinska Biobank Sample Collection Catalogue, beta version

**Karolinska Institutet**

Filters

Study Name

Sample Type  
**Bone marrow**

Tube Type

RESET SUBMIT

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Studies: 1

SampleTypes: 5

TubeTypes: 7

Samples#: 16703

### Sample collection statistics at KI Biobank

Based on sampletype and sample tubetype

study_name	study_pi
NMDSG14B	

# Karolinska Biobank Sample Collection Catalogue, , beta version

**Karolinska Institutet**

**Filters**

Study Name

Sample Type  
**DNA**

Tube Type

RESET SUBMIT

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Studies	157	SampleTypes	46	TubeTypes	36	Samples#	6144624
---------	-----	-------------	----	-----------	----	----------	---------

### Sample collection statistics at KI Biobank

Based on samplotype and sample tubetype

study_name	study_pi
ALE	

# Karolinska Biobank Sample Collection Catalogue – The Karma Cohort

KARMA

sampletype	penametubetype	donorcount	samplecount
Plasma	Cryo tube	479	1431
Blood	10 ml EDTA	481	491
Plasma	10 ml EDTA	40	67
DNA	REMP300	69707	80027
Plasma	REMP300	69588	1340998
Blood	4 mL EDTA	13238	13249
Blood	REMP900	69484	146228

≈ 1.6 million aliquots

- 70,877 women
- Aliquots for each participant;
  - 1 DNA
  - 16 plasma
  - 2 whole blood back up
- Continuously matched to the Cause of Death-, Cancer-, In/Out patient-, Prescription-, MultiGeneration-, Emigration Registers
- ≈ 2,400 women diagnosed with breast cancer
- **Collected 2010-2013**
- (≈ 1.4 million mammograms)



## Karolinska Biobank Sample Collection Catalogue

- A biobank is much more than a freezer
  - **Karolinska Biobank** is a core facility supporting scientists in questions regarding regulatory, legal, ethical, IT, data and laboratory issues
- **KIVIS** is a PI support system for getting detailed information about samples
- **Karolinska Biobank Sample Collection Catalogue**
  - is a meta data base for anyone to use
  - does not give any details of participants but a possibility to brows the content of the **Karolinska Biobank**
  - access has to be permitted by the study PIs

## Karolinska Biobank – my own view

- Without **Karolinska Biobank** we would not have 1.6 million aliquots of plasma and DNA for  $\approx$  75,000 women
- We would not be able to collaborate with a large number of groups globally
- From a biobank / laboratory / sample preparation perspective, our trials are comparatively easy to conduct
- Cost is the draw back
  - Possible solution is to expand consent and open up more than today



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**THANK YOU!**