EUROPE BIOBANK WEEK

SEPTEMBER 13-16, 2016
VIENNA - AUSTRIA

Serenella Eppenberger-Castori: "Are existing biobanks of routinely collected FFPE and frozen specimens useful?"

BBMRI-ERIC® gateway for health

BBMRI.at Biobanking and BioMolecular resources Research Infrastructure Austria

European, Middle Eastern & African Society for Biopreservation & Biobanking

Are existing biobanks of routinely collected FFPE and frozen specimens useful?

Dr. Serenella Eppenberger-Castori
Biobank at Pathology – University Hospital Basel, Switzerland

Universitätsspital Basel

Basic clinical needs

1. Early «specific identification of disease» in order to avoid recurrences of disease by targeted neo- and adjuvant therapy modalities (mainly tissue specimens)

2. Control recurrences by monitoring of targets (mainly in liquids: e.g. cfDNA)

3. Non invasive diagnostic (liquids) for predisposition & at very early stages.

Biobanks → Purposes

- Diagnostic (clinics) repositories at pathology institutes or central laboratories
  - accompanied by storage of frozen specimens
  - subtractions (DNA-RNA ..)

  → Today's diagnostic & translational research

- University (clinics) research centers → Identification of new markers & pathways
- Pharmaceuticals industry's biobanks → New effective compounds with minimal side effects
- Prospective cohort's study
- Retrospective cohort's identification

→ Hypothesis driven studies

→ Validation studies

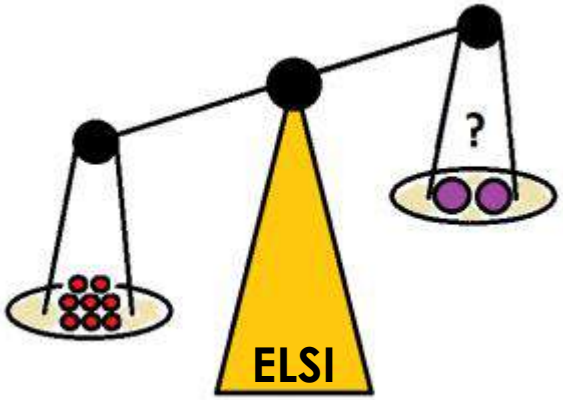
Link to clinical data and other specimens

- The availability of high-quality tissue samples and associated data is limited but essential

- Link to other specimens allows longitudinal studies

Minimal vs. Maximal Requirements

Challenge: Define what and how collecting



- More material versus more data?
- Anticipate data to collect for future cohort identification?

Expert-guided control mechanisms (1/3)

Entry

I. Excision time
II. Type of transport (container etc.)
III. Time and Temperature till lab
IV. Type (& time) of fixation and/or
V. Freezing procedure

VI. ELSI: consent

Modified from Schmitt S. Virchow Arch (2016) 468:93-99

Expert-guided control mechanisms (2/3)

Registration, conservation and biobanking proceedings

I. Quality and quantity of cell types % (tumour, stroma, inflammation, necrosis);
II. aliquots
III. Freezers / rooms / alarm systems
IV. Extraction of sub-fractions (RNA, DNA, etc.) by SOPs; quality and quantity

V. Preparation of TMAs

Expert-guided control mechanisms (3/3)

Exit -checked by scientific board for studies in interaction with university (basic researchers; bioinformatics; etc.) and/or pharmaceutical partners

I. Study specific requirements: feasibility evaluation including choose of “omics” analyses
II. Assignment of expert collaborators (from pathology and clinic)
III. Outcome of studies
IV. Storage / link of produced data
V. Publications (impact) tracking

Companion diagnostic

- ❖ **The biomarkers identified should be robust**

Optimize, standardize pre- and analytical conditions

- ➢ **but also check for practicability**
- ➢ **and never forget the ethical point of view**

BPUSB

The biobank at Pathology-USB, denominated BPUSB, collects together with several USB clinics as well as other hospitals rest diagnostic samples' material for undetermined.

BPUSB is active since 25 years.

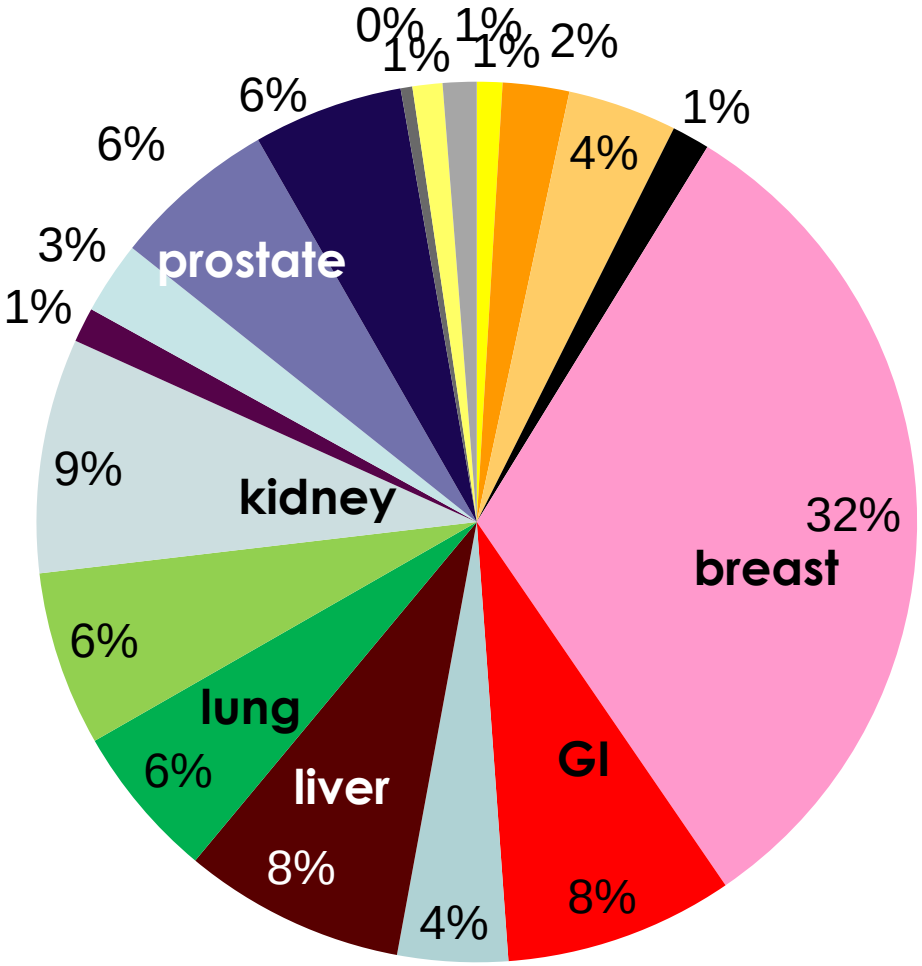
BPUSB collects samples and information produced during routine diagnostic for the following further uses: quality control, development of diagnostic tests and translational as well as experimental research.

The laboratories and activities of BPUSB are accredited according to ISO 17025/2005 and ISO 15189/2012 since autumn 2014 and up-dated on 15.03.2016.

Electronic records

- All diagnoses are registered **electronically** (in PW+) since **1990**
- **FFPE** material with known fixation (buffered) protocols of hundreds of thousands of biopsies and surgery specimens are stored in AC rooms at 20°C since **1990**
- **Frozen (FF)** Material stored at -75°C
  - Purpose of samples' use consistently recorded since 2012 in PW+ (Biobank module)
- All **NGS (since 2014)** and **Sanger** data are recorded electronically – DNA and RNA aliquots trackable electronically.
- Thousands of samples on **TMA**s with corresponding clinical follow-ups in electronic tables – and integrated in data base

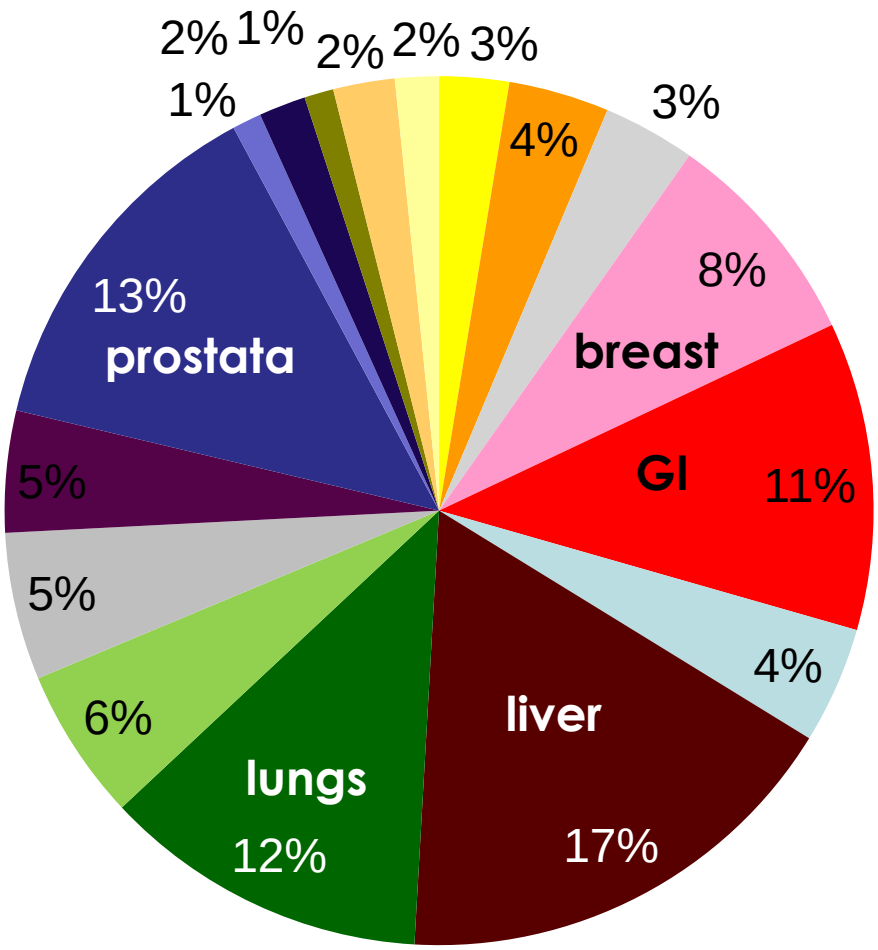
Overall available FF (-75°C) samples ~ 31'600



- HNO
- bladder
- bones
- brain
- breast
- GI
- kidney
- liver
- lung
- lymph nodes
- others
- ovary
- pancreas
- prostate
- skin and smouth tissues
- testis
- thyroid
- uterus

3'000 samples in n> 300 studies

Organ distribution of 1660 FF biopsies from 1073 patients newly acquired in **2015**



- bladder
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- liver
- lung bronchus
- lymphnodes
- others
- skin and smouth tissues
- prostate
- testis
- thyroid
- pancreas
- ovary
- uterus

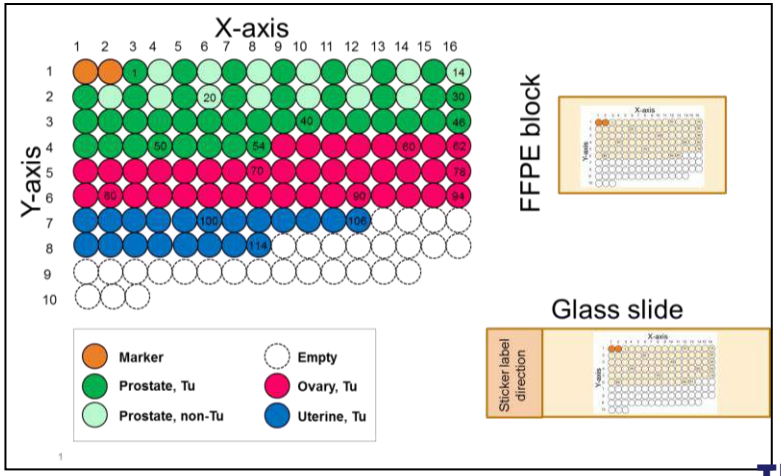
Preparation of TMAs

- List with all **codes** for array performance

NAT Non malignant Adjecent Tissue Blue TMA or NGS Green only NGS	**NVS coordinates**	NVS Array e.g. **SV4**	Block Nr	Römisch	H&ENVSnr	Pat Nr	MKG	NVS
ColonTu	**X3 Y1**	1		III	UB_HE_001826		4009	UB_SX_004009
ColonNAT	**X4 Y1**	2		I	UB_HE_001827		4009	UB_SX_004009
ColonTu	**X5 Y1**	3		V	UB_HE_001828		4010	UB_SX_004010
ColonNAT	**X6 Y1**	4		I	UB_HE_001829		4010	UB_SX_004010

Pre-coded container for NGS

- TMA Layout



Continuous numeric codes (barcodes) printed a priori covering H&E-slides B-Number

Samples for NGS also taken with TMA GM

This instrument allows the virtual over-positioning of scanned H&E slides and blocks' images producing very precise punches.

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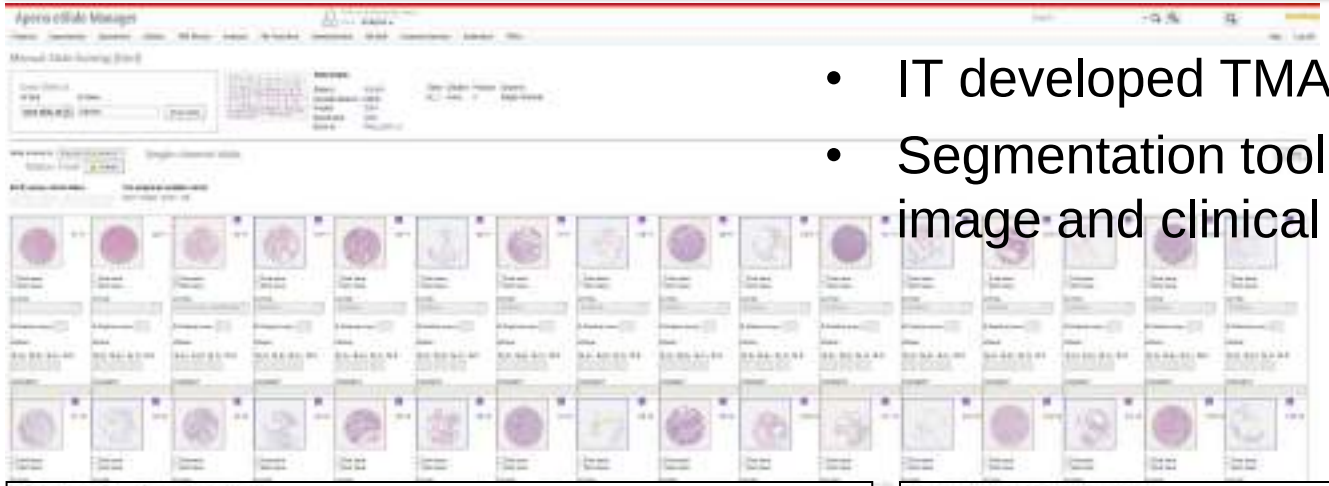
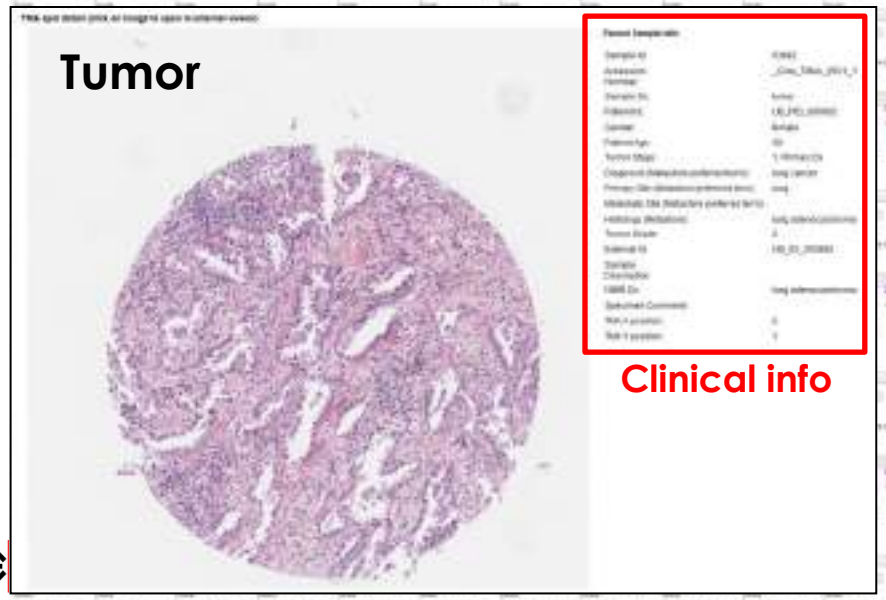
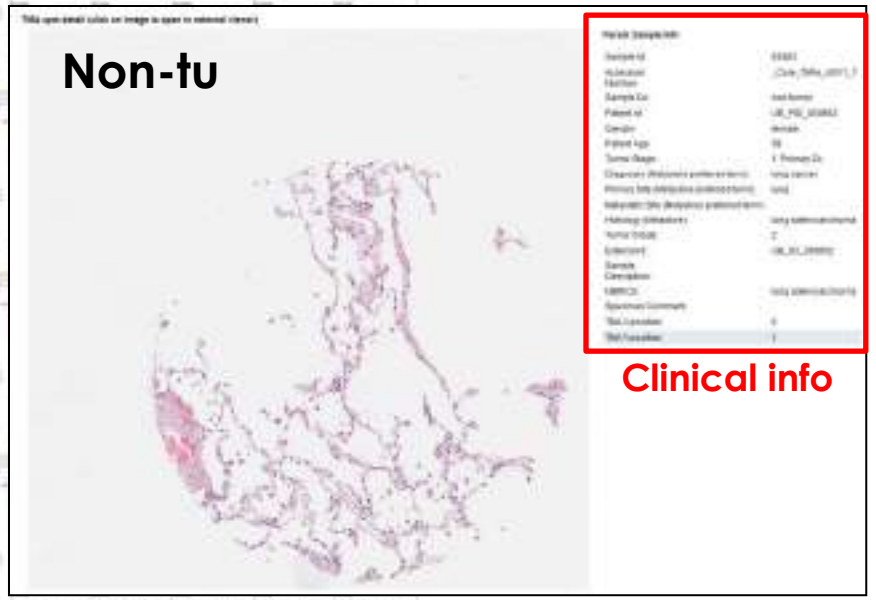
TMA QC *TMA segmentation tool captures clinical info*

TMA QC → TMA Tu/Non-Tu → QC marker 1 → QC marker 2 → Biomarker

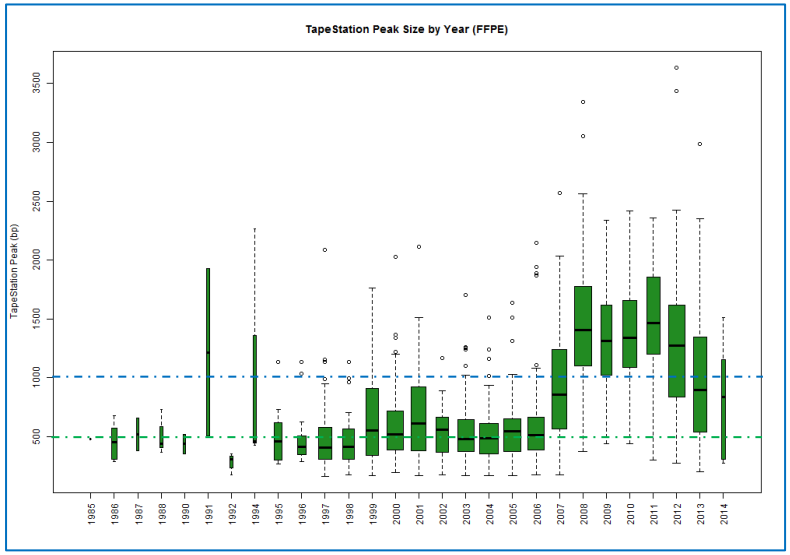


- IT developed TMA segmentation tool
- Segmentation tool provides zoon-in image and clinical annotation



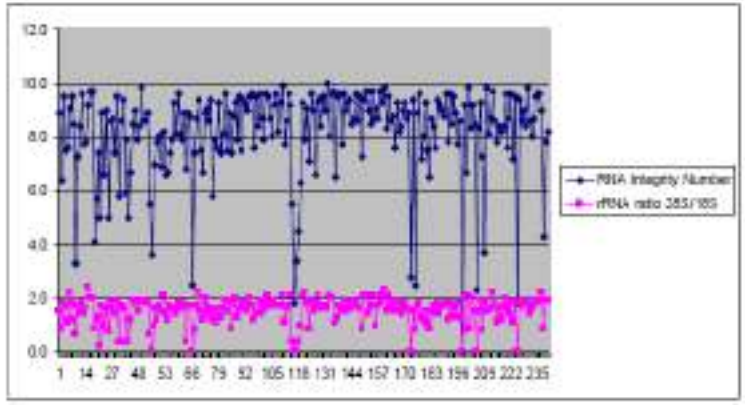


DNA integrity by year – FFPE samples



RNA integrity by year – FF samples

RIN>7.0
rRNA ratio>1.8 } **in ~ 70%**



16 y old specimen

5 y old specimen

Conclusion

Different levels of QC biobanks may be useful to answer clinical relevant questions,

if the data / characteristics are properly linked and continuously reviewed

with respect of ethical issues.

Thank you

The team

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Melanie Sticker
Simone Muenst
Serenella Eppenberger-Castori
Spasenija Savic
Tatjana Vlajnic
Vincenza Carafa

To Spenders

To you for your attention

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