Biorepository of A-bomb Survivors and their Offspring

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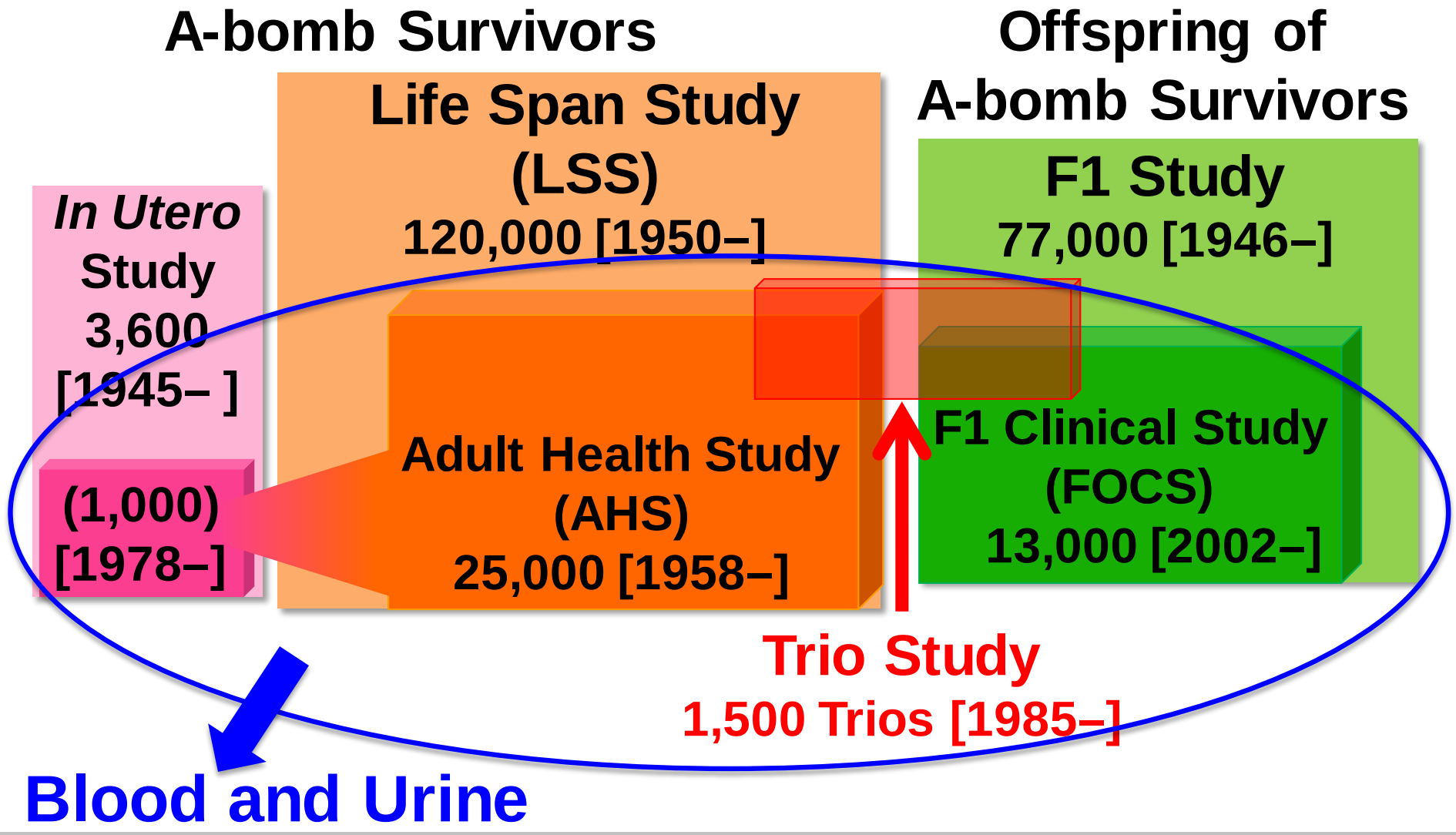
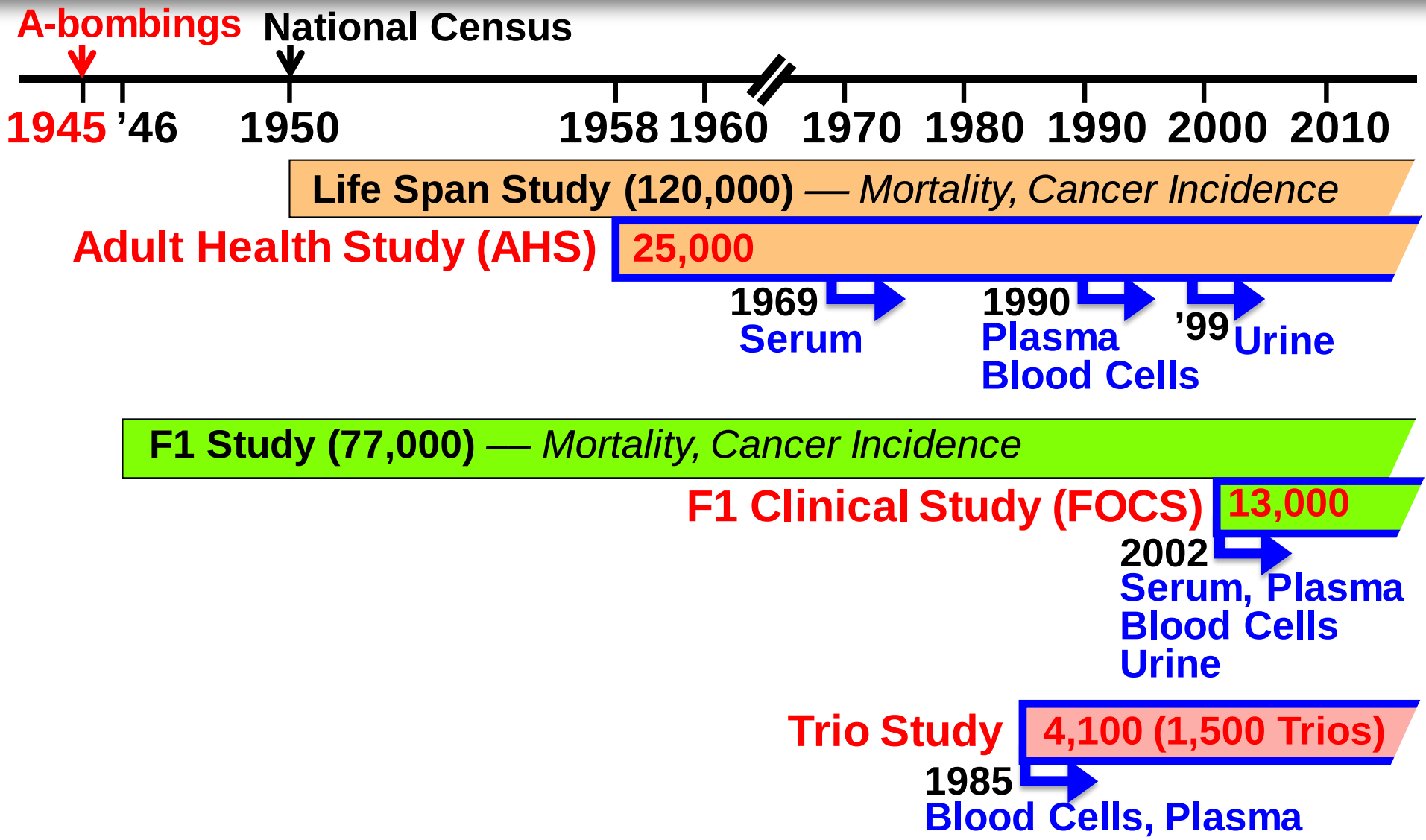
Outline

- RERF Cohorts
- Biosample Research Center (BRC)
- Blood and Urine Samples
- DNA Extraction and QA/QC
- LIMS
- Pathological Samples
- Future Perspectives

RERF Cohorts with Biosamples



RERF Cohorts with Biosamples



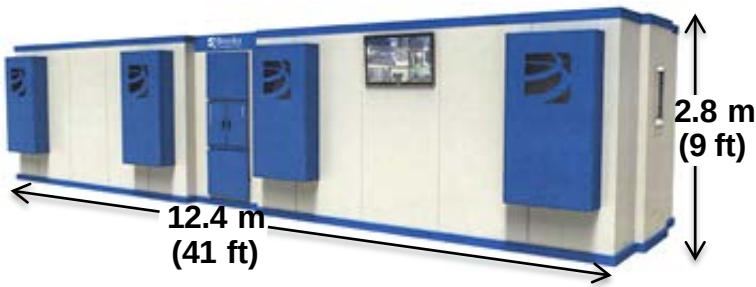
Storage Equipment at RERF

	Liquid N_2 Tank	Upright –80°C Freezer	Robotic –80°C Freezer	–20°C Freezer	4°C Fridge
Hiroshima	33	42	1	2	1
Nagasaki	7	32	0	0	1
TOTAL	40	74	1	2	2

Liquid N_2 Tanks

Upright Freezers

Robotic Freezer Brooks BioStore II



Biosample Research Center (BRC)

放影研 RERF

Established in 2013,

- **To centralize the management of archived biosamples, and the processing of newly collected biosamples**
- **To ensure secure preservation and quality control of biosamples**
- **To facilitate research use of biosamples for both internal and external collaborative research**

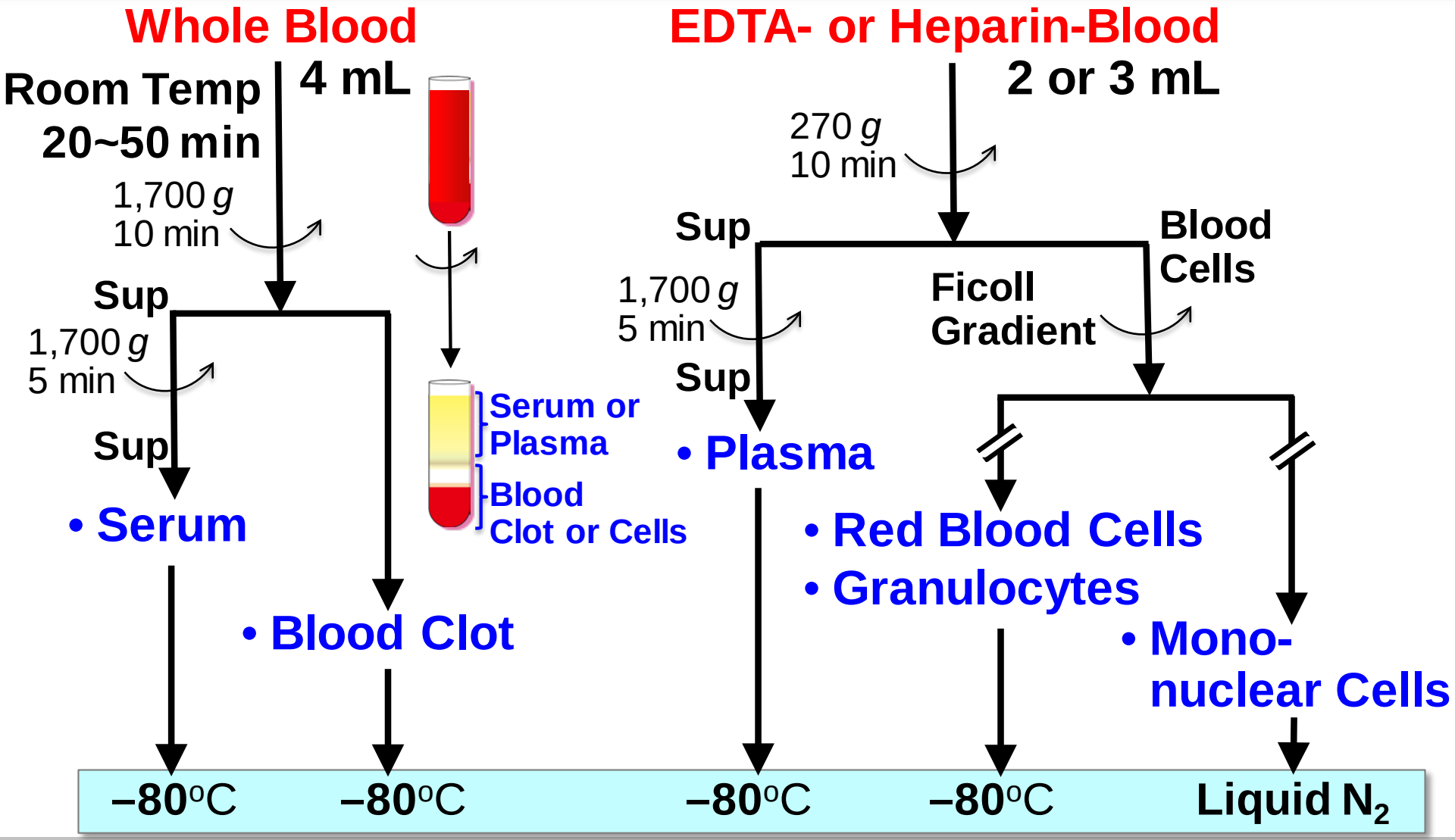
Biosample Research Center (BRC)

放影研 RERF

The BRC has been ...

- **Inventorying archived blood and urine samples since 2014**
- **Processing newly collected blood and urine samples with new SOPs since 2015**
- **Storing both newly collected and archived samples in Robotic Freezer installed in 2016**
- **Establishing SOPs for sample QA/QC**

Blood Processing Procedures



Samples from AHS and FOCS

Crude Sample	Volume	Processed Sample	Number of Tubes	
			AHS	FOCS
Urine	AHS/FOCS: 2 mL		4 (x 0.5 mL)	4 (x 0.5 mL)
Whole Blood	AHS/FOCS: 4 mL	Serum	~ 8 (x 0.2 mL)	~ 8 (x 0.2 mL)
		Blood Clot	1 (x 0.5 mL)	1 (x 0.5 mL)
EDTA-Blood	AHS: 3 mL FOCS: 2 mL	Plasma	~ 6 (x 0.2 mL)	~ 4 (x 0.2 mL)
		Red Blood Cells	1	1
		Granulocytes	1	1
		Mono-nuclear Cells	2	1
Heparin-Blood	AHS: 2 mL	Plasma	~ 4 (x 0.2 mL)	
		Red Blood Cells	1	
		Granulocytes	1	
		Mono-nuclear Cells	1	
		TOTAL	~ 30	~ 20

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		Red Blood Cells
		Granulocytes
		Mono-nuclear Cells
Heparin-Blood	AHS: 2 mL	Plasma
		Red Blood Cells
		Granulocytes
		Mono-nuclear Cells
		TOTAL

Thermo Matrix 2D Barcoded Tube (0.5 mL)

–80ºC

Hiroshima

Nagasaki

N_2 Tank

Cryogenic Vial (2 mL)

AHS and FOCS Samples Provided in 2019 – 2020

Health Examinations

- **AHS: A-bomb Survivors, Biennial**
- **FOCS: Survivors' Offspring, Every 4 Years**

Nov 2019 – Oct 2020

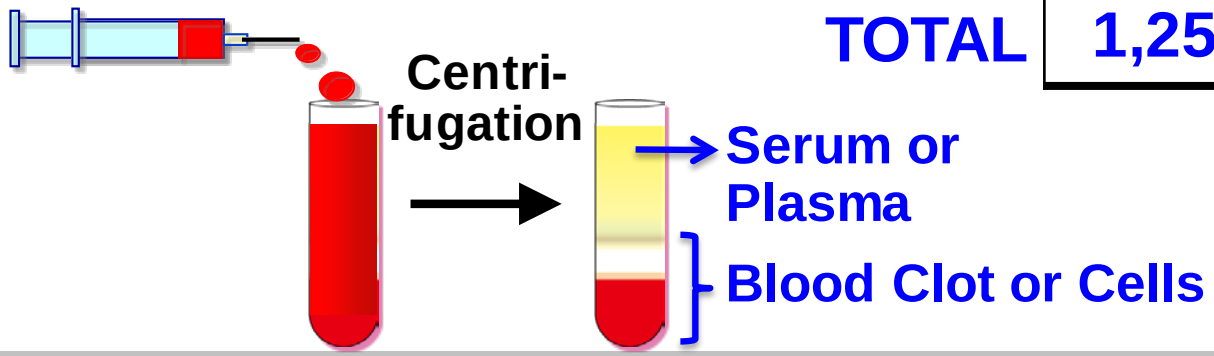
City	Subjects			Tubes		
	AHS	FOCS	TOTAL	Blood	Urine	TOTAL
Hiroshima	562	1,388	1,950	37,990	7,667	45,657
Nagasaki	304	663	967	17,186	3,771	20,957
TOTAL	866	2,051	2,917	55,176	11,438	66,614

AHS Samples Stored at BRC

AHS: Adult Health Study

As of Oct 2020

Type	Start Year	**Subjects**	**Tubes**	Storage Condition
Serum	1969	**16,800**	**536,000**	–80°C, 4°C
Plasma	1990	**8,900**	**298,000**	–80°C
Blood Clot/Cells	1990	**9,100**	**155,000**	–80°C
			142,000	Liquid N_2
Urine	1999	**7,100**	**125,000**	–80°C
		TOTAL	**1,256,000**	



FOCS Samples Stored at BRC

FOCS: F1 Clinical Study

As of Oct 2020

Type	Start Year	**Subjects**	**Tubes**	Storage Condition
Serum	2002	**12,600**	**257,000**	–80°C, 4°C
Plasma	2002	**12,600**	**103,000**	–80°C
Blood Clot/Cells	2002	**12,700**	**137,000**	–80°C
			58,000	Liquid N_2
Urine	2002	**12,500**	**112,000**	–80°C
		TOTAL	**668,000**	

AHS + FOCS

29,600 Subjects

1,923,000 Tubes

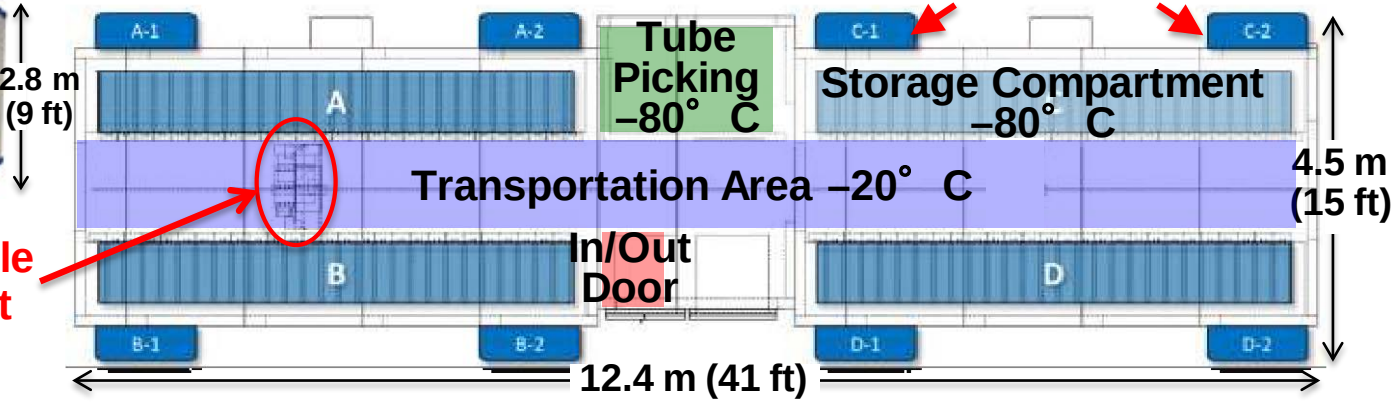
Trio Samples

Type		Subjects	Tubes	Storage
Blood Cells	Mono-nuclear Cells	4,100	11,400	Liquid N_2
	EBV-Transformed B Cells	4,100	43,200	
	Granulocytes	3,100	6,700	–80°C
	Red Blood Cells	1,400	1,400	
	TOTAL	4,100	62,700	
Plasma		4,100	4,300	–80°C

- Including 1,500 Trios of F1 Study subjects and both parents with known doses, accounting for 900 families
- Collected since 1985

Robotic –80°C Freezer

Brooks BioStore II QuadBank

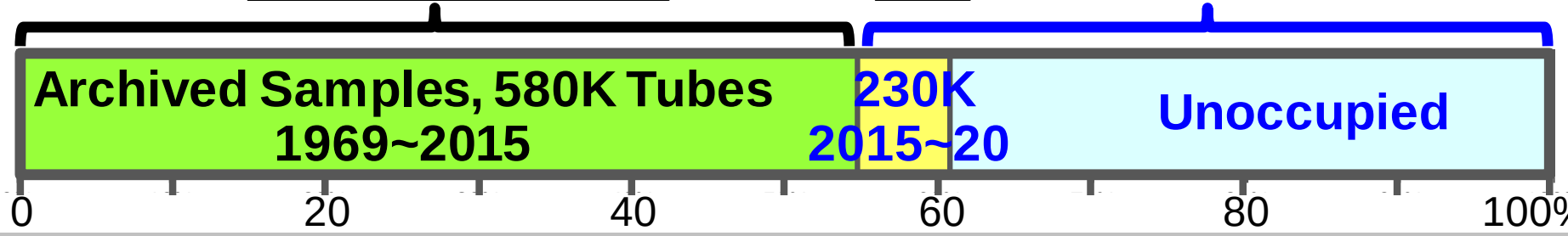


Various Tubes (1~2 mL)

Total Capacity

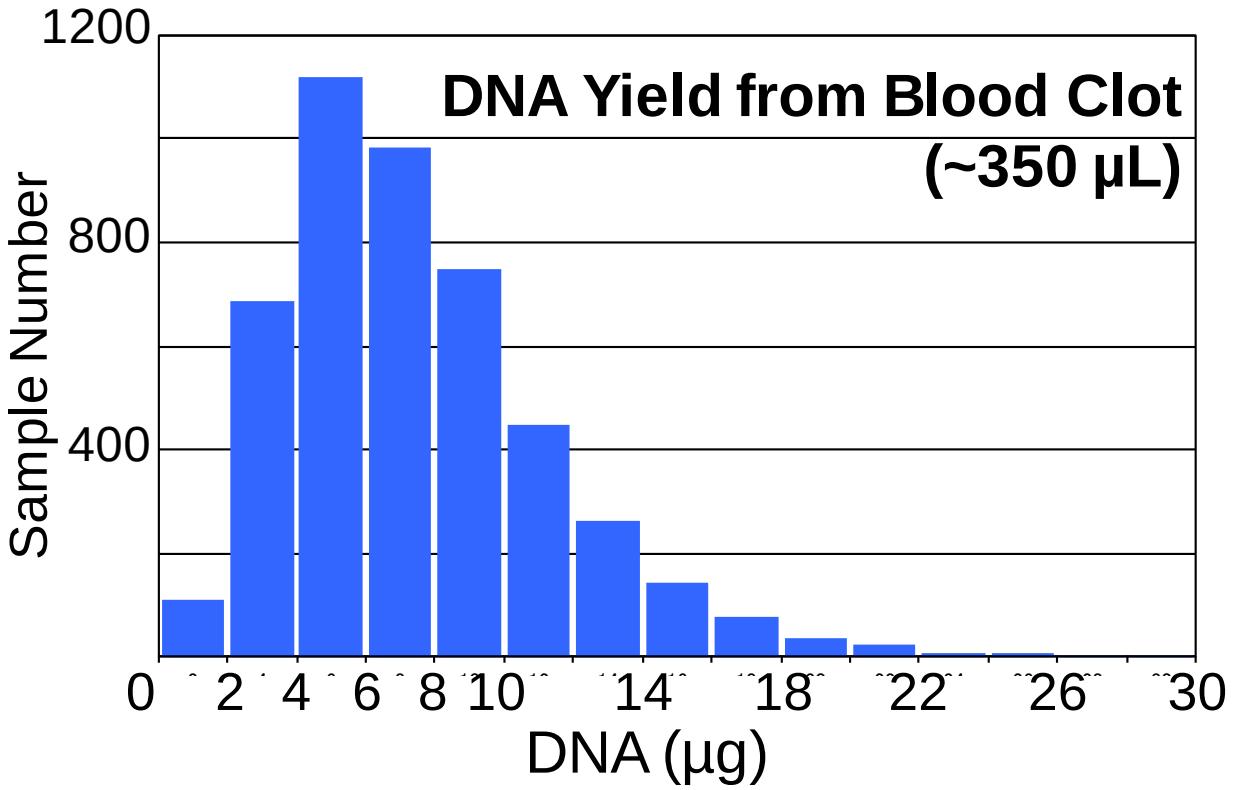
3.9M Thermo Matrix 2D Barcoded Tubes (0.5 mL)

Room for 1.8M Tubes



DNA Purification from Blood Clots

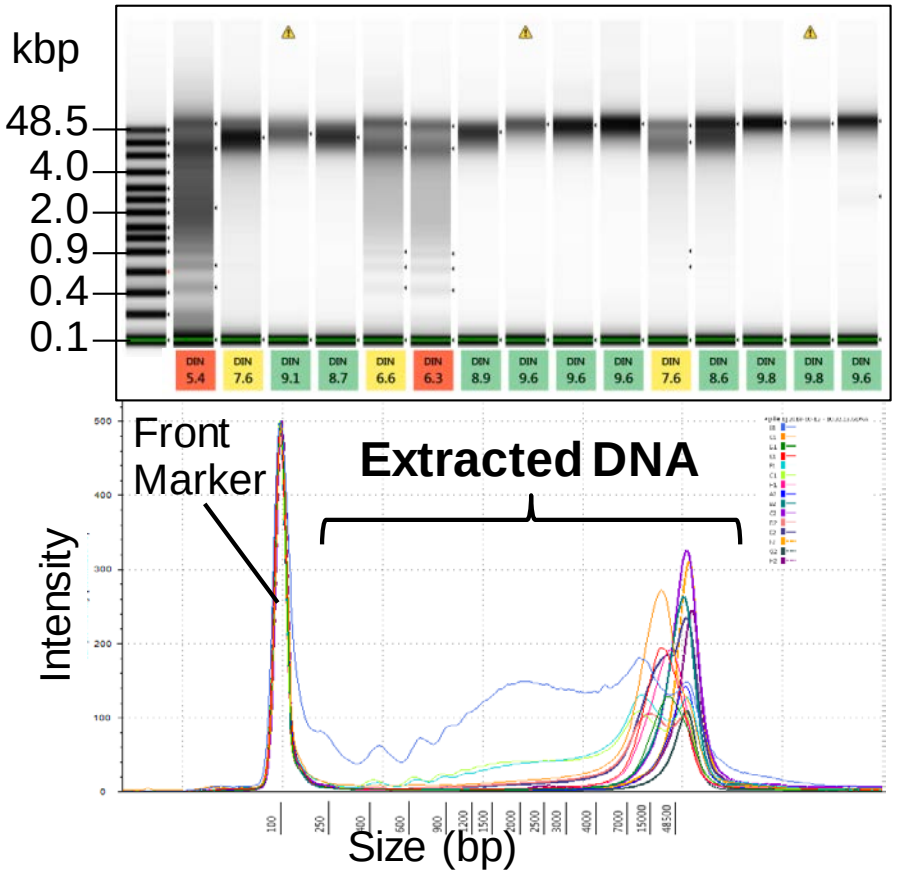
DNA was extracted from 4,664 blood clots provided by 2,642 AHS participants 10–15 years ago, using an automated DNA extractor, MagCore®.

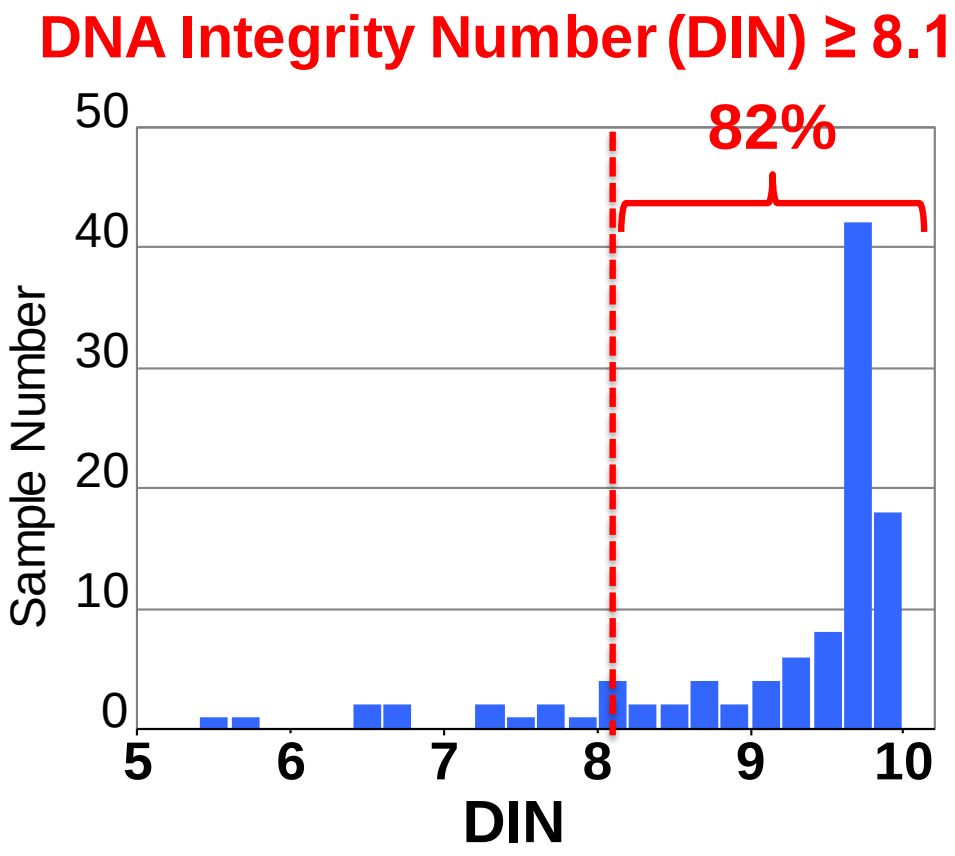


	DNA (µg)
Average	7.5
Maximum	39.0
Mode	5.2

Quality Assessment of DNA by Electrophoresis

Integrity of DNA, extracted from blood clots preserved at –80° C for 10–15 years, was assessed with TapeStation.



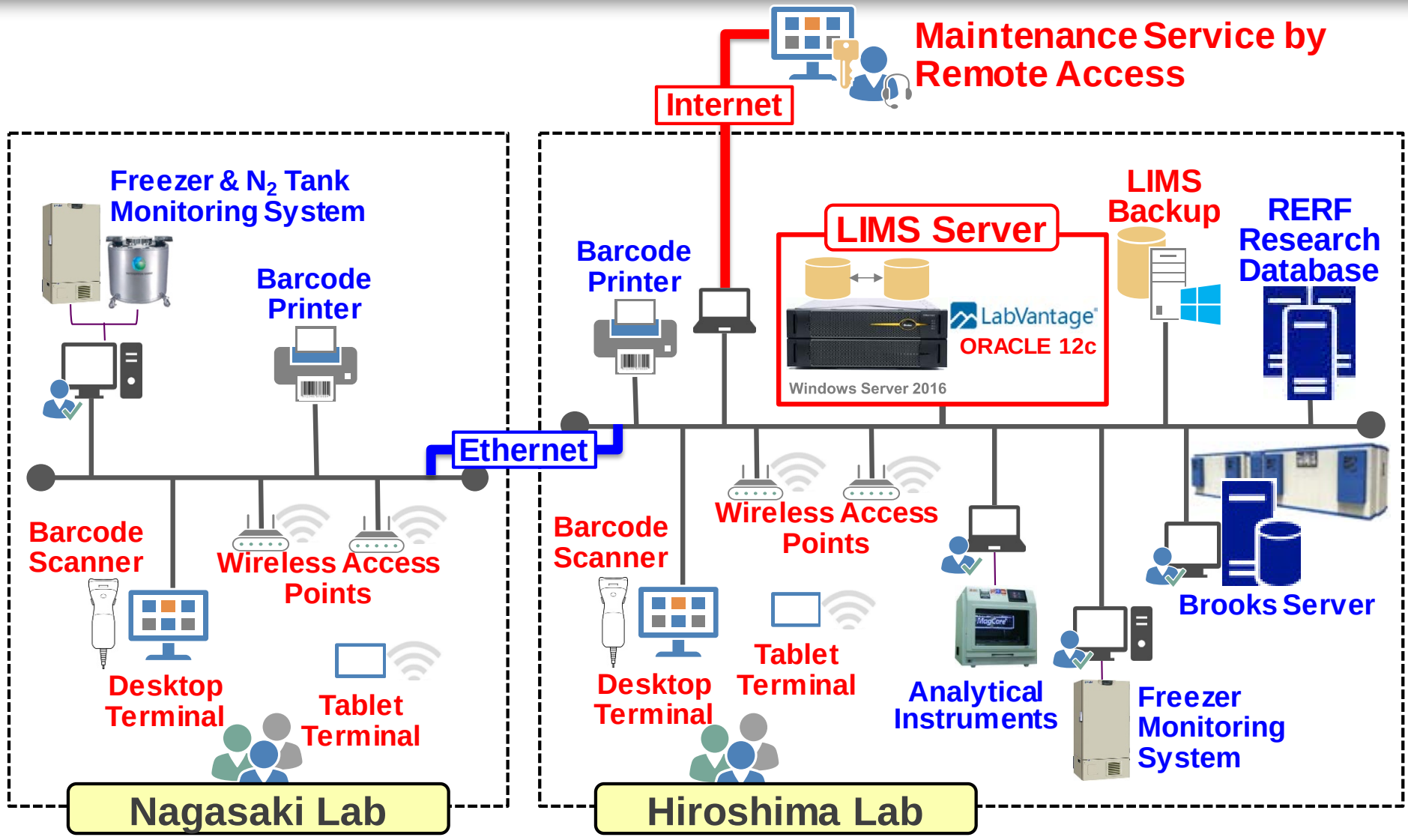


Laboratory Information Management System (LIMS)

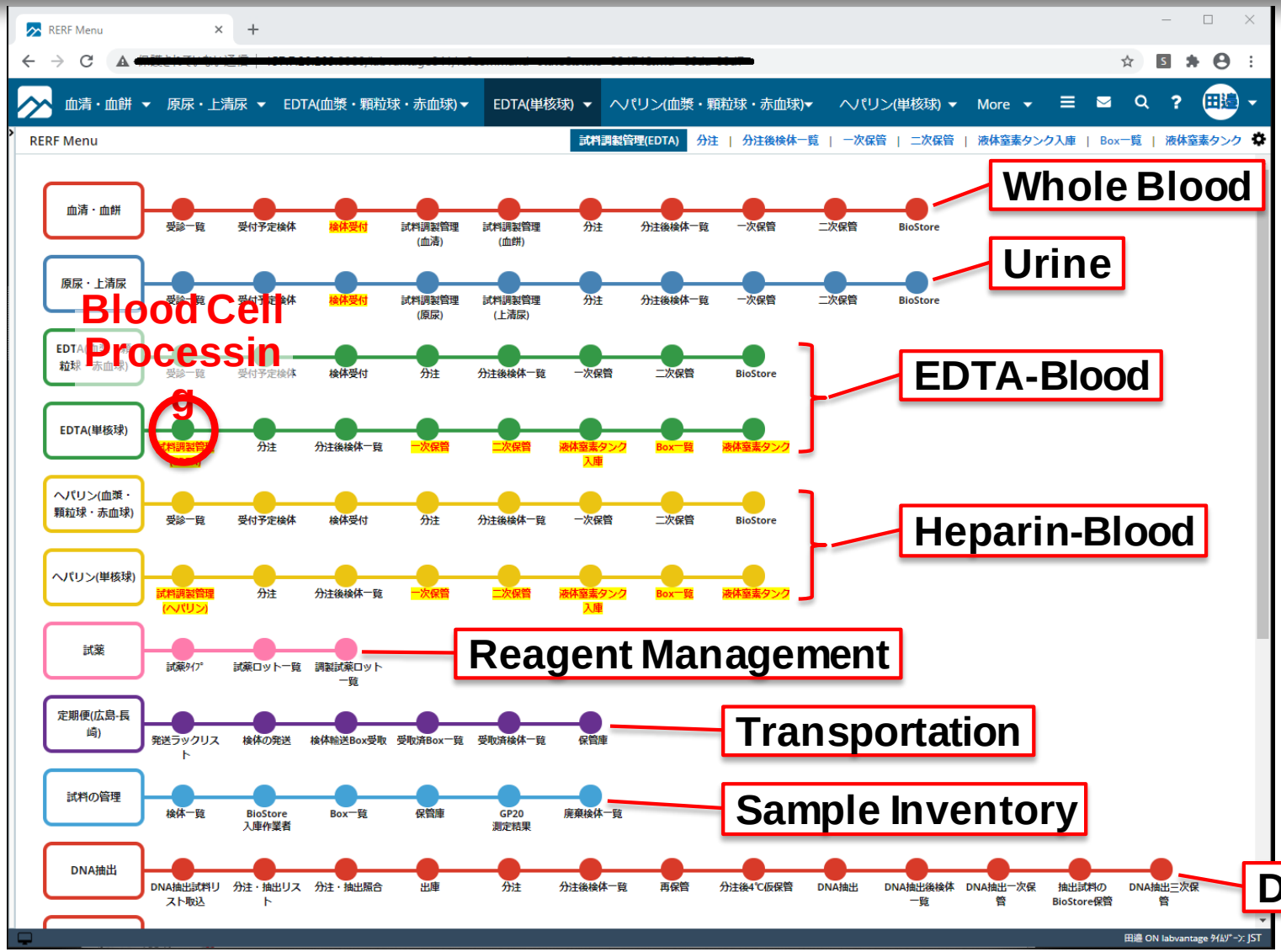
Commercial LIMS was implemented at RERF in 2020

- **To Manage**
  - **Biosample Workflows**
    - **Receipt**
    - **Processing**
    - **Storage**
    - **QA/QC**
    - **Distribution**
  - **Biosample Information**
    - **Inventory**
    - **Quality**
- **To Generate Comprehensive Biosample Database**

LIMS Composition



Workflow Management by LIMS



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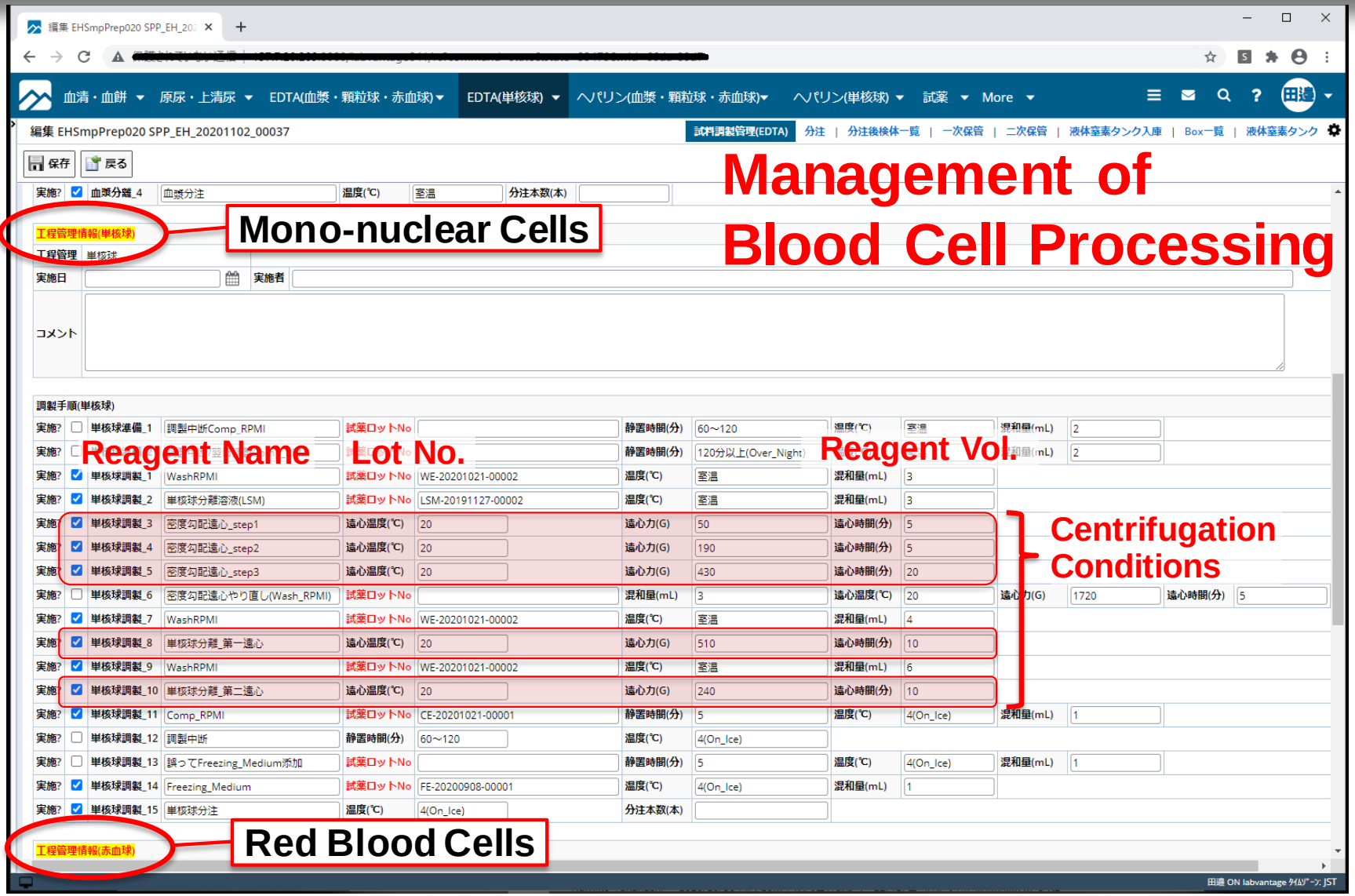

Pathological Tissue Samples – LSS and Others –

Type	Start Year	Case Number	
		LSS	Others
Autopsy	1948	8,400	4,400
Surgical	1948	12,000	–

Paraffin Blocks

Glass Slides

Future Perspectives

- **To establish policy, rules and procedures for biosample usage.**
- **To establish SOPs for QA/QC of blood and urine samples.**
- **To complete inventory of pathological samples, *i.e.* indexing, ordering, and recording the samples in a database.**

Stakeholder Committee on Usage of RERF's Stored Biosamples

- **Established by the RERF in 2018 to obtain objective opinions to draw up policies for fair use of biosamples.**
- **Consisting of local academic and legal experts, A-bomb survivors, and others.**
- **Formal advice was issued last month including the following issues ...**

Main Issues in Advice from Stakeholder Committee

- **Establishment of trustful relationship with A-bomb survivors and general public through effective information disclosure**
- **Adherence to RERF's objectives to study radiation effects for peaceful purposes, excluding military research**
- **Conscientious procedures in obtaining informed consent**
- **Careful explanation about genome research**

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