Patient Registries and Biobanks for Lyme IACI

LYME DISEASE BIOBANK
A BAY AREA LYME FOUNDATION PROGRAM

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Patient Registry

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- Collection of standardized information about people who share a disease or experience
  - *"an organized system that uses observational study methods to collect uniform data (clinical and other) to evaluate specified outcomes for a population defined by a particular disease, condition, or exposure, and that serves a predetermined scientific, clinical, or policy purpose(s)".[Gliklich 2010]*
- No consistent definition of "patient registry" used in research
- Traditionally researcher generated, but now patient-powered
- May include biospecimens

Gliklich, AHRQ 2010. https://effectivehealthcare.ahrq.gov/sites/default/files/pdf/registries-guide-2nd-edition_research.pdf
Workman, AHRQ 2013. https://www.ncbi.nlm.nih.gov/books/NBK164514/

Patient-Generated Data=Real-World Data

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Patient-generated data excels because the information is:

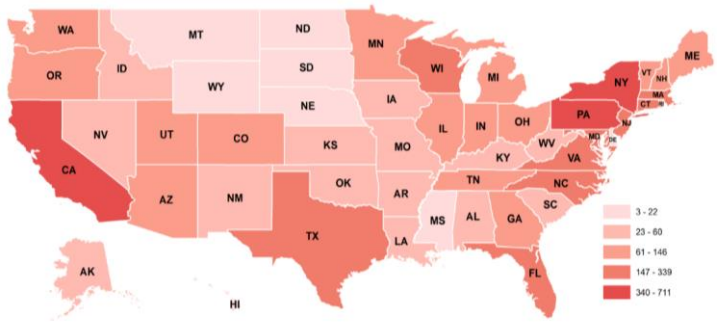
- Designed for registry research (not EHR and claims system artifacts)
- The most complete data (cross silo)
- Data that only patients may know
- Includes patients outside the insurance system (roughly 50%)
- Not limited by single center geographic, practice-based constraints, or research study limits

Patient registries excel at:

- Characterizing the disease and patient populations
- Identifying subgroups
- Defining patient centered outcomes and endpoints
- Assessing treatment effectiveness
- Capturing patient treatment innovation

MyLymeData

A PROJECT OF LYMEDISEASE.ORG



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>18,000 Enrolled

Diagnosis validation questions:

- Diagnosis by a clinician
- Signs or symptoms
- Exposure
- Recall tick bite
- EM rash
- Positive lab tests
- Co-infections
- Functional impairment

Diagnosis

- Recollection of tick bite
- Diagnosis by clinician
- Supporting lab tests
- Stage of illness at diagnosis

Demographics

- Sex
- Race
- Education
- State of residence

Quality of Life

- Health status
- Bad physical days
- Bad mental days
- Bed days

Functional Impairment

- Ability to work
- Ability to go to school
- Impact on social activities
- Disability

Treatments

- Antibiotics
- Alternative
- No treatment
- Treatment duration

Symptoms

- Severity
- Present at diagnosis
- Most Common
- Percent of Improvement

(Gliklich, AHRQ 2014)

L. Johnson, JD, MLymeData

Biobanks

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- Collect, store, and manage biological samples used in research
  - *"Infrastructure for the collection, archiving, and storage of biospecimens and their associated data, and the procedures and related services connected to the biospecimens and associated data. The services include informing individuals who are approached to participate in a study, obtaining their consent, collecting and processing specimens for secure long-term storage, accessing and retrieving specimens appropriate for analysis, processing for preparation of biomaterials (e.g. DNA, RNA, proteins), quality control, and packaging and shipping of specimens".[Mendy 2017]*
- No consistent definition of "biobank" used in research
- Not all sample collections are biobanks

Mendy, IARC 2017. https://www.ncbi.nlm.nih.gov/books/NBK567256/
https://www.nih.gov/allofus-research-program/biobank

Well-characterized Samples are Key!

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Collecting well characterized samples takes time/effort/resources

Samples that are not well characterized may not be very useful

Lyme IACI Sample Collections

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People with Lyme IACI are Heterogeneous AND Enrollment Criteria Unique to Each Collection!

Collection Name	Institution	Lyme IACI Subgroup	Acute Cohort	Ability to Share Samples
Lyme and TBD Biorepository	Columbia	PTLDS	Yes	Yes
SLICE 3*	Johns Hopkins	PTLDS	Yes	Yes
Lyme Disease Biobank	Bay Area Lyme Foundation	Persistent	Yes	Yes
MGH Multidisciplinary Lyme and TBD Clinic	Massachusetts General Hospital	PTLDS	Yes	Yes
MAESTRO^	MIT	Chronic	Yes	Yes
PROSECCO	Tufts	Unknown	Yes	Yes
Lyme Clinical Trial Networks (CTN)	Multiple	Site Specific	No	For CTN studies

TBD=Tick-borne Disease

*Rebman, 2017. https://pubmed.ncbi.nlm.nih.gov/29312942/
^https://talresearchgroup.mit.edu/mitmaestro

Individual vs Centralized Collections

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- *Fragmentation*
- *Sample acquisition required for each project*
- *High costs/ redundant infrastructure*
- *Limited sharing/ incentives to not share*
- *Limited ability to compare results*
- *Variable collection quality*

- *Centralization adds efficiencies*
- *Multiple projects per blood draw*
- *Lower costs for centralized resource*
- *Designed to share/ attract new researchers*
- *Ability to compare results with same samples*
- *Consistent quality across collection*

LDB Post-Mortem Tissue Collection

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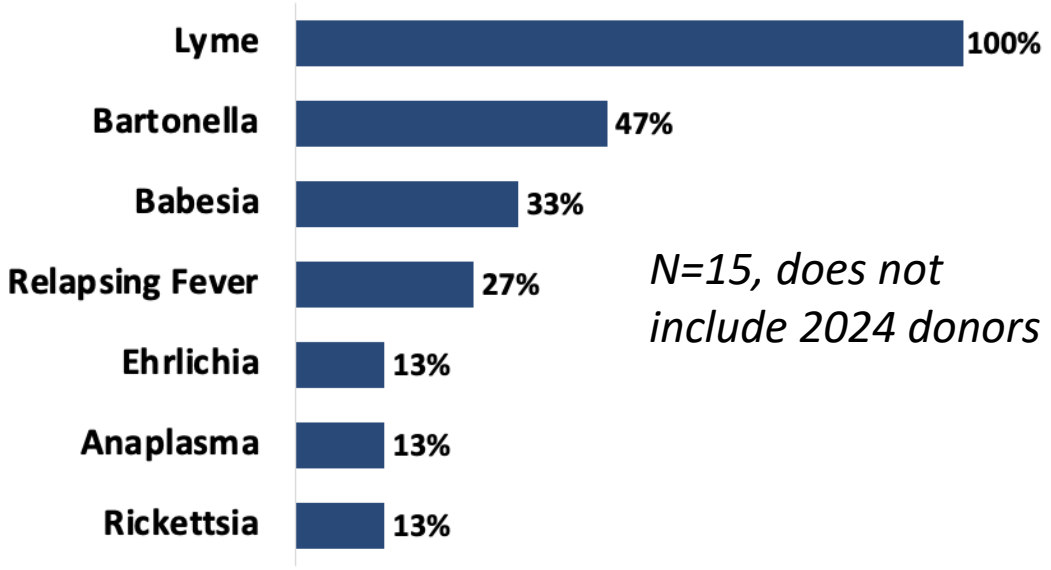
Fixed and Frozen Post-Mortem Tissues

- Aortic Arch
- Bladder
- Blood
- Bone Marrow
- **Brain** (~11 regions)
- Cartilage and Synovium (knee)
- Cerebral Spinal Fluid
- **Heart**
- Liver
- Lymph Node (mesenteric)
- Muscle (deltoid and quadriceps)
- Nerve (sciatic and tibial)
- **Spinal cord**
- Spleen

Purple: Additional Processing by Andrew Dwork, MD, New York Foundation for Mental Hygiene

- 18 brain donors
- Mean age=67; Median age=70; (Range 32-97)
- 67% men; 33% women
- 63% diagnosed with at least 1 additional infection



N=15, does not include 2024 donors

https://ndriresource.org/lyme-disease

Tissue Analysis Pipeline

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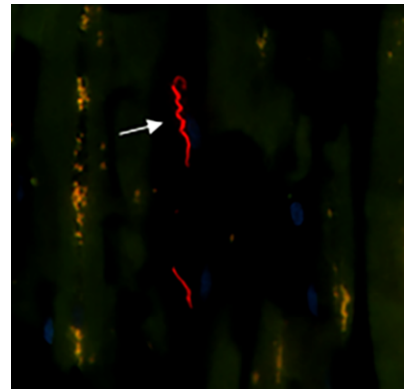
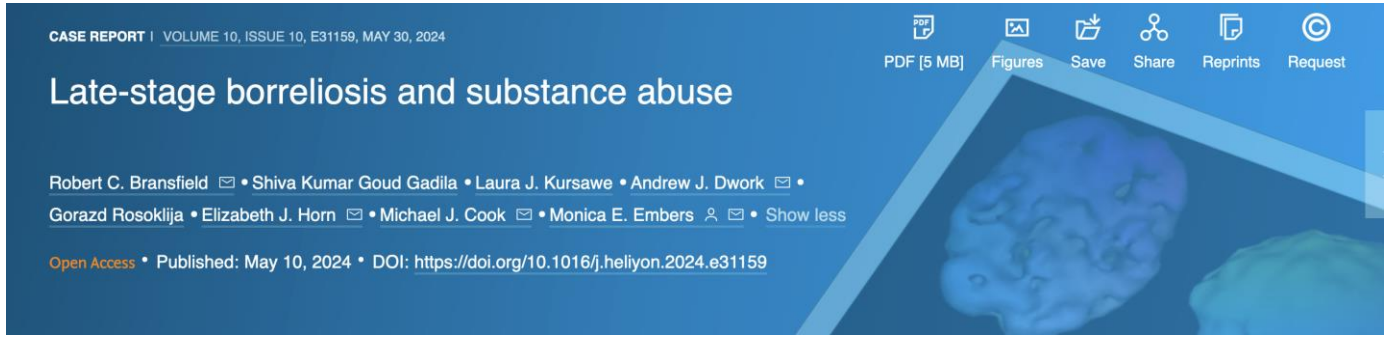
Post-Mortem Tissue Evaluation

Neuropathologic Evaluation → Pathogen Evaluation → Pathogen Sequencing → Potential Biomarkers



Intact spirochete in heart



https://www.cell.com/heliyon/fulltext/S2405-8440(24)07190-1

Considerations for Sample Collection

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Collecting well-characterized samples takes time/effort/resources

- Purpose of collection (eg diagnostic test development, disease pathophysiology, clinical trial)
- Types of sample(s), from which patient population(s), and at what timepoints
- Inclusion/exclusion criteria; documentation of disease
- Collaborators and partners
- Administrative/legal/regulatory tasks and ***governance***
- Ability to recontact and share samples in informed consent document
- Participant compensation
- Prospective collection is time and resource (human and $) intensive
- Limited federal funding for infrastructure projects like biobanks

Well-characterized samples are essential

- Standardized protocols/ chain of custody/ pre-analytic variables
- Clinical information, patient questionnaires, standardized instruments, medical records
- Laboratory/ diagnostic test results
- Additional data sources (eg patient registries)

Samples that are not well-characterized may not be very useful!