The Accidental Collector

Webinar

About Today’s Event:
ISBER’s Enviro-Bio Working Group members will provide an overview of biobanking concepts, case studies, and tools to organize your biospecimens into a collection.

Event Details:
July 14, 2016, 11 am EST
THE ACCIDENTAL COLLECTOR
How to Manage an Incidental, Long-Term Frozen Collection

Presented by:
Piper Mullins - Judith Giri - Mariel Campbell - Marta Castelhano
From ISBER’s Enviro-Bio Working Group

Contributing Members:
Breda Zimkus - Jackie Mackenzie-Dodds - Rebecca Pugh
Objectives

- Learn about biobanks and sample management, with 3 case studies
- Gain tools to implement your own sample management practices
- Learn about ISBER’s resources to help you manage your own biobank system
Topics

• Definitions and Concepts (Piper Mullins)
• Why Archive: Case Studies
  – Public Health (Judith Giri)
  – Natural History Museum (Mariel Campbell)
  – Veterinary & Clinical (Marta Castelhano)
• Tools for Implementation (Judith Giri/Piper Mullins)
• Audience Q & A
Tools for Today’s Event

• **Question & Answer Panel**

Use the chat box at left to ask questions during the webinar. We will answer questions during our 10-minute Q&A panel.

*Chat Monitor and Q&A organizer:*
*Jackie Mackenzie-Dodds, Natural History Museum, London*
DEFINITIONS AND CONCEPTS
PIPER MULLINS
Collection: (US Interagency Working Group on Scientific Collections): A long-term research asset, as opposed to an expendable research supply; can be considered to be a set of specimens that are catalogued together in one database or numbering system.

Images: Getty Collection; https://www.flickr.com/photos/bionicteaching/2920562020;
Collection: (US Interagency Working Group on Scientific Collections): A long-term research asset, as opposed to an expendable research supply; can be considered to be a set of specimens that are catalogued together in one database or numbering system.

Biorepository: An entity that receives, stores, processes, and distributes biospecimens and data, as needed.

physical location AND activities AND data for operations and scientific advancement¹:

- Information technology/ data management
- access and benefits sharing policies
- standards²

Biorepository Activities:

- Handle specimens as appropriate for specimen type and study design
- Annotate specimens with key collection, processing and storage data
- Monitor specimen inventory with a tracking system/database
- Store specimens in a stabilized state without unnecessary thawing/freezing
- Dispose of specimens no longer needed according to clear rules/policies
- Review and document storage equipment performance on a regular basis
• Follow specimen-appropriate biosafety, packaging and shipping procedures
• Develop SOPs to document all protocols and training
Images: Getty Collection; https://www.flickr.com/photos/bionicteaching/2920562020;
- **Archival collection**: a set of samples with well-documented records
  - collected in a formal systematic manner for long-term preservation
  - maintained because of their continuing value
  - (as opposed to project collections for short-term use)

- **Specimen Archival Collections**: are a group of specimens or samples collected in a formal systematic manner for long-term preservation and have well-documented information about those specimens

Photo credits:
- [http://store.4cryo.com/Dry-Vapor-Shippers-s/1514.htm](http://store.4cryo.com/Dry-Vapor-Shippers-s/1514.htm)
- **Well-managed collection**: specimens or samples that are:
  - collected handled, and processed according to a defined procedures and protocols
  - accessioned into a database and are inventoried and tracked
  - stored in an optimal manner to preserve long term integrity for future research

- Biobanks offer value-added services which ensure Good quality samples, linked to current database, with appropriate and secure handling/storage. Standardization is crucial.
Collections preserved for future research need to develop plans for:

- long term sustainability, including financial plans and contingency plans in case of funding loss or lab closure
- quality and risk management, e.g. address how to maintain standards across collections
- access and sharing policies for data and specimens, ex. Nagoya Protocol's Access and Benefits Sharing

Biobanks offer value-added services with ensure Good quality samples, linked to current database, with appropriate and secure handling/storage. Standardization is crucial.
• If your samples are not collected, processed, and stored with standard procedures, methods, and data, then you cannot ensure quality research results.

• As NCI says: “Garbage samples (with no associated data) = Garbage results (irreproducible findings)”.

• It’s the concept of “Fit for Purpose”, does the sample’s original collection have relevance and use to the current study?
• Do you have samples amassed for research?
  - Number of samples not a factor
  - Salaried personnel and/or budget not essential
  - Sample storage locations may vary

• Do you receive, process, store or distribute specimens and/or their associated data in support of a study or multiple studies?
  - Control over access, handling, storage, and use of samples by researcher and/or organization is essential for those operating a collection
• **Collection**: consists of similar physical objects obtained for research. For biological and environmental collections these “objects” are designated *specimens* or *samples*. The collection may have a finite lifecycle, or be stored indefinitely.

• **Archival Specimen Collections**: a group of specimens or samples collected in a formal systematic manner for long-term preservation and have well-documented information about those specimens.

• **Biobank/Biorepository**: An entity that receives, stores, processes, and distributes biospecimens, as needed.

• **Well-managed collection**: comprised of specimens or samples that are:
  - collected, handled, and processed according to a defined procedures and protocols
  - accessioned into a database and are inventoried and tracked
  - stored in an optimal manner to preserve long term integrity for future research

• **Collection Checklist**:
  - Do you have samples amassed for research?
    - Number of samples not a factor
- Salaried personnel and/or budget not essential
- Sample storage locations may vary

• Do you receive, process, store or distribute specimens and/or their associated data in support of a study or multiple studies?
• Control over access, handling, storage, and use of samples by researcher and/or organization is essential for those operating a collection
WHY ARCHIVE: CASE STUDIES
EXAMPLES OF LEGACY COLLECTIONS THAT EVOLVED INTO BIOBANKS
Why Archive?
Public Health Case Study

Judith Giri

About Judith:
Biorepository Consultant, formerly at CDC:
• Specimen Management
• CDC & ATSDR Specimen Packaging, Inventory and Repository (CASPIR)

Contributed also: Elaine Gunter
• Collections are located across CDC laboratories and at the Centralized Facility: working collections
CDC and ATSDR Specimen Packaging, Inventory and Repository (CASPIR): long term preservation

• CASPIR: Centralized facility established in 1997, designed to provide uniform, optimal conditions to ensure preservation of valuable and irreplaceable specimens for future public health needs.
• Specimens are critical for public health work

• Specimens are obtained and sent to CDC for many purposes

• Examples of the value of archived collections for Public Health research: Legionnaire’s disease, AIDS collections, Influenza, NHANES
The National Health and Nutrition Examination Survey (NHANES) is a program of studies designed to assess the health and nutritional status of adults and children in the United States.

- NHANES collections consist of serum, plasma, urine and DNA
- NHANES specimens are made available for research use
  - after the survey cycle has ended
  - data produced is added to a database available to the public

Visit website for more information

http://www.cdc.gov/nchs/nhanes/index.htm
NHANES collections, such as NHANES III provided researchers access to large numbers of specimens across the US population (more than 18 thousand for the infectious disease examples shown)

Infectious disease:

- Determining immunity to diphtheria and tetanus in the US population: found that substantial proportion of US adults did not have protective antibodies to both (McQuillan, G. et. al., Ann Intern Med (2002) 136:660)
- Seroprevalence of Hepatitis E (HEV) in US population: found that exposure to HEV is more common in the US (civilian non-institutionalized) population than previously appreciated, but is under reported. (Kuniholm M.H et. al., JID (2009) 200:48)

Environmental exposure:

• CASPIR operations are guided by ISBER Best Practices for management of repositories, described later in this webinar

• CASPIR has implemented a Quality Management System, including:
  - SOPs
  - Back ups and continuous monitoring; disaster planning
  - Inventory management system: database for annotation of specimens
  - Tracking: unique identifiers, barcodes

• ISBER’s Self Assessment tool is used to audit implementation of best practices and identifying areas for improvement

• CASPIR is guided by institutional specimen management policies
BIO on Mariel Campbell

Managing museum-based genomics collection
Mammal, Bird, Reptile, Amphibian, Fish, Parasite tissues, associated DNA, RNA, viruses
**Why Archive?**

**Natural History Case Study**

**Background**

Division of Genomic Resources, Museum of Southwestern Biology (MSB DGR)

In 1979, from 1 researcher and ultra-low freezer....

- Mammal tissues only
- Protein electrophoresis, Karyology
- Single tracking number, paper catalogs, spreadsheets

...to 2016, with multiple researchers and 18 freezers...

- Frozen tissues, DNA, RNA from mammals, birds, fish, herps, parasites, viruses
- DNA sequencing, genomic analysis, transcriptomes, stable isotopes
- Unique barcodes, object tracking system, online database

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**Museum of Southwestern Biology (MSB)**

- University of New Mexico
- Research-based Natural History Collection
- Tissues backed by museum specimens
- [https://msb.unm.edu/index.html](https://msb.unm.edu/index.html)

- Future growth and use of the collection was not anticipated by original researcher; Current technology unknown
- Use of a single tracking number linking tissues with museum specimens enabled data tracking through time and through the transition from paper catalogs to barcodes and online databases.
Unanticipated uses of an archival collection:
MSB tissue collection used in 1993 Hantavirus outbreak, Southwestern US

- In 1993, a sudden-onset pulmonary illness of unknown origin caused a number of deaths in the Southwestern United States.
- These deaths of young, previously healthy individuals prompted an investigation by the U.S. Centers for Disease Control (CDC).
- Researchers quickly identified the illness as caused by a new type of hantavirus, termed “Sin Nombre” virus, similar to a hantavirus previously described by US Army personnel in Korea.
- Because the Korean hantavirus had been determined to be transmitted by rodents, an investigation was begun into possible rodent vectors for the sin nombre virus.
- Field surveys pointed to the deer mouse, *Peromyscus maniculatus*, as the likely reservoir.
- MSB tissue collection used in 1993 Hantavirus outbreak, Southwestern US
Archived tissue samples from the MSB archive were sent to the CDC for analysis: Deer mice were confirmed as the vector in samples dating back to the 1970s.

The historical archive of the MSB biobank was critical in identifying the presence of hantavirus in the Southwest prior to the outbreak.

Data continuity was key – association of the tissues with rodent museum specimens with confirmed species IDs, collection dates and localities.

In the decades since the identification of this virus, the MSB biobank has continued to be used by multiple investigators to identify novel hantaviruses and their mammalian hosts for emerging pathogen and virus discovery research and to research the association between climatic variables, vector population dynamics, and disease transmission:

Why Archive?
Natural History Case Study

Archival collections are valuable because they are:

**Historical**
- **“Time Machine” effect**: historical samples allow researchers to go back in time to address new questions unanticipated at time of collection using modern techniques.

**Managed**
- **Sample Management**: Samples are labeled, stored appropriately, and data accessible.
- **Best Practices**: Maximize collection’s future potential by following organizational and Best Practices, no matter collection’s size!

Archival collections are valuable for:

- the Historical “Time Machine” effect:
  - Tissue archives provide a window back in time, allowing researchers to ask historical questions using modern techniques.
  - Researchers can address questions for which the samples may not have been originally collected.
  - Tissue samples collected by a single researcher decades before can be studied with techniques unknown at the time of collection to answer novel questions that could not have been anticipated at the time the samples were originally archived.

- the Managed services provided:
  - Archival collections are only valuable if samples are labeled and stored appropriately, and the associated data is available.
  - *It is, therefore, best to follow organizational and ISBER Best Practices even if you have a small collection within a single laboratory to maximize the future potential of the collection.*
Use best practices from the outset whenever possible to maximize the future value of the collection.
Why Archive?
Veterinary Biobank Case Study

Marta Castelhano, DVM

About Marta:
Director, Cornell Veterinary Biobank

About Cornell Veterinary Biobank™:
The Cornell Veterinary Biobank is a hospital based academic biobank that was developed in early 2006 to accelerate biomedical research and improve animal and human health.
Why Archive?
Veterinary Biobank Case Study
Cornell Veterinary Biobank™

• Biobank Products:
  – Nucleic Acid samples (DNA/RNA)
  – Blood samples (Serum, Whole Blood)
  – Urine samples
  – Tissue controlled for preanalytical variables
    • Matched FFPE/Frozen, tumor/normal biospecimens, patient-derived xenografts (PDX)
  – Custom genomic products (genotypes, WGS)
  – Comprehensive clinical data (with outcome)
Why Archive?
Veterinary Biobank Case Study
Cornell Veterinary Biobank™

• Biobank Services:
  – In-house pathology services
  – Evaluation contracts for new Biobank equipment
  – Customized collection protocols for clinical trials - pilot studies to optimize collection and processing
  – Biospecimen research (preanalytical factors affecting sample quality)
Why Archive? Veterinary Biobank Case Study

Patient Selection
  Appointment Schedule
  Open Study Enrollment

Client Informed Consent

Sample collection
Why Archive?
Veterinary Biobank Case Study
Cornell Veterinary Biobank™

- Customized collection protocols
  - Alert collection team
    - collection nurse and technician
    - pathologist(s)
    - timekeeper
  - Dispatch collection team - hospital receiving, operating room (OR), necropsy room
  - Transport biospecimens to processing or storage laboratories

www.isber.org leading since 1999

Connecting Researchers Globally through Best Practices
Why Archive?
Veterinary Biobank Case Study
Cornell Veterinary Biobank™

- Biobank activity:
  - Immediate withdrawal
  - Short term storage
  - Long term storage

Biobank Impact
Performance Indicators

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SUMMARY

✓ Each case study featured a managed archival collection used for future research

✓ Collections’ values were demonstrated after their initial or intended use

✓ Protocols and Data Management are in place from initial collection
HOW TO CREATE YOUR OWN COLLECTION...
TOOLS FOR IMPLEMENTATION
JUDITH GIRI & PIPER MULLINS
Available to public online

Two previous versions – 2004 and 2008.
- First version addressed best practices for human biological materials for research.
- Second version expanded to include best practices for environmental specimen collections.

Addresses all aspects of repository operations:
- Specimen collection, processing, storage, retrieval, distribution and destruction, specimen access; distribution and use
- Data management
- Repository planning: facilities, equipment
- Quality management and safety including disaster planning
- Legal ethical issues
- Cost management and long term sustainability

The Best Practices are an excellent source for guidance and recommendations for continuous improvement
**Self Assessment Tool**: http://www.isber.org/?page=SAT

- Based on ISBER BPs 3rd edition, 158 questions
- Confidential
- Risk balanced global compliance score (%)
- Highlight on highest and intermediate risk items
- Risk evaluation based on
  - Severity
  - Frequency
  - Ease of detection
- Usefulness in:
  - Quantitative QI in biobank certification
  - Continuous improvement
  - Accountability to stakeholders
  - Assessment by biobank funding agencies (eg. Australia)
Membership in ISBER is a valuable resource for your organization. Members benefit from connecting with global experts to discuss current trends and issues and to develop solutions.

The ISBER Forums are available to all ISBER members and are intended as an informational, educational, and problem-solving resource.

*Biopreservation and Biobanking* (BIO) is the first journal to provide a unifying forum for the peer-reviewed communication of recent advances; LINK http://www.isber.org/?page=BIO

Publications (Best Practices, Newsletters, WG Publications), LINK - http://www.isber.org/?page=WGP

Biobankingjobs.com (Job seekers and Employers)
Everything you need to have in place to create an archival collection

0. Application of ISBER Best Practices

1. Audit: what have you got, how much, and where is it? Species, sample type, format, volume.


3. Logistics: Loans/Cold Chain transportation of material to and from your institute/country.

The ISBER Best Practices for Repositories presents the most effective practices for the management of specimen collections and repositories. These are either evidence-based or consensus-based practices for collection, long-term storage, retrieval and distribution of specimens.

- **Self-Assessment Tool (SAT):** [http://www.isber.org/?page=SAT](http://www.isber.org/?page=SAT)
- **ISBER Membership:** [http://www.isber.org/?page=Membership](http://www.isber.org/?page=Membership)
- **Biopreservation and Biobanking (BIO):** [http://www.isber.org/?page=BIO](http://www.isber.org/?page=BIO)
- **ISBER Publications:** [http://www.isber.org/?page=WGP](http://www.isber.org/?page=WGP)
- **ISBER Tools:** [http://www.isber.org/?page=ISBERTools](http://www.isber.org/?page=ISBERTools)
- **Biobankingjobs.com** is a job board for Job seekers and Employers alike to find their required skill set in the biobanking community.
How to get Involved

• Become an ISBER Member
• Visit www.isber.org/ > Membership > Get Involved
  – Committees: Contact Head Office (info@isber.org)
  – Working Group:
    • Complete on-line form
    • Send CV or resume to Debra Garcia at
      garcia@acsr.ucsf.edu
• Join Enviro-Bio Working Group meetings at annual meeting