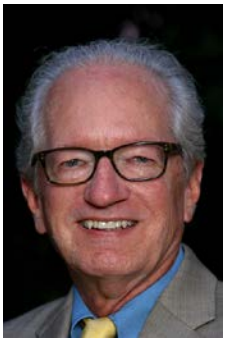

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Guest:
Dr. Jim Vaught is President-elect of the International Society for Biological and Environmental Repositories and Editor-in-Chief of *Biopreservation & Biobanking*.

Bob Barrett: This is a podcast from *Clinical Chemistry*, sponsored by the Department of Laboratory Medicine at Boston Children's Hospital. I am Bob Barrett.

Biobanking for clinical or research purposes includes the collection, processing, storage and analysis of biological specimens. It is now well-recognized that biobanking involves a complex array of technical, ethical, and regulatory considerations.

Biobanking policies and procedures are often documented by best practices that are usually voluntary, but also may arise from rules and regulations that govern informed consent, privacy, quality control, and other critical issues.

The November 2014 issue of *Clinical Chemistry* published a question and answer feature on "Critical Issues in International Biobanking."

Dr. Jim Vaught is lead author of the article. He is President-elect of the International Society for Biological and Environmental Repositories, and Editor-in-Chief of *Biopreservation & Biobanking*. He is our guest in today's podcast.

Dr. Vaught, how would you define biobanking, and how is biobanking important to medical research and public health?

Dr. Jim Vaught: Well, biobanking, and for our purposes here I am only going to speak about human biospecimen biobanking, and biobanking is the collection of human biological samples, which would include blood, tissue samples, urine, and the like, for medical research purposes and also for diagnostic purposes.

So biobanking could include collecting samples initially for diagnosis of a disease such as a biopsy, but then continuing to use those samples for research purposes.

Bob Barrett: Do you have an example of where biobanking has contributed to research into a particular disease?

Dr. Jim Vaught: Yes, I think the best example would be some of the previous work that I was involved in at the U.S. National Cancer Institute, where samples were collected over a number of years from patients who had pre-malignant conditions related to cervical cancer.

So samples were collected from women in various areas of the U.S. and also in foreign locations such as Costa Rica, where cervical cancer was prevalent. And those samples were analyzed to determine how certain human papillomavirus types were related to cervical cancer.

And once it was found that certain types of the HPV, or human papillomavirus, were related to cervical cancer, then the research continued into what then turned out a few year ago to be to vaccines that are given to young women to help prevent cervical cancer.

And biobanking was involved all along the way in collecting large numbers of samples and having them analyzed initially to determine the relationship between the HPV virus and cervical cancer, and then ultimately collecting a lot of samples in Costa Rica, that resulted in the development of the vaccines.

There have also been some really good examples of how biobanking contributed to understanding what we call the natural history of a disease. So that, for example, when Legionnaires' Disease broke out in Philadelphia in 1976, the CDC was able, over the next couple of years, to analyze many of its samples in its biobank in Atlanta, and determine that the bacterium that causes Legionnaires' Disease existed in similar or exactly the same form in the biobank many years before the outbreak in Philadelphia. So that was an example of a biobank contributing to knowing how a disease had developed over time.

Bob Barrett: Well, let's talk about the biobanks themselves, where are they generally located and how are they financed, and are there any national biobanks in the U.S. or elsewhere?

Dr. Jim Vaught: Yes, biobanks, many of them originated with the collection of samples by pathologists for disease diagnosis and then over time those samples began to be saved and used for research purposes.

For example, if a tissue sample or a blood sample is taken from a patient during surgery or if a biopsy is performed, the surgeons and the pathologists use those samples to determine the disease diagnosis and also the course of

treatment, but if there are remaining samples from those collections, then they have been banked over time, i.e. biobanks have been formed and then those same samples are used for research purposes. So pathology labs are some of the largest biobanks and some of the original biobanks.

There are other biobanks that have been created by the NIH, the National Institutes of Health that exist here in the local Bethesda, Maryland, area and around the country in various medical research centers. And some of the biobanks are locally developed and funded within clinical centers and some of them have a more national scope, but there is no single national biobank within the U.S.

There are national biobanks in other countries in Europe and biobanking networks in Europe, Asia, Australia, for example, and also in the Far East, where those are publicly funded by institutes similar to the U.S. NIH.

Bob Barrett: Well, what are some of the most important issues to consider in starting and operating a biobank? I am sure funding has to be on the top of that list. Are they well funded, and where do those funds usually come from?

Dr. Jim Vaught: That's a really good question! Many of them are well funded by the NIH and other research organizations. In some countries the funding is not as good and the biobanks struggle to meet their financial goals. And especially if they are funded by the central government, then continued funding over a long period of time is sometimes an issue because biobanks are actually very difficult to maintain over a long period of time without substantial funding, due to the storage cost and so forth. So that's a real issue.

Other issues related to starting or operating a biobank include developing a strong quality management system, information system, such as systems to track samples and track their location and their analyses, and those are also very important and expensive propositions in operating a biobank.

Quality management systems are really important, because the quality of samples that are collected for research and stored for research need to be of a consistent quality. Because as you can imagine these days there are various global research enterprises where samples need to be exchange between United States and other countries, for example, and those samples need to be of a consistent quality, because if they are collected in different locations and used for one large research project, an international collaboration, for example, then they have to be of equal or similar quality so that the research results are verifiable and reliable.

Bob Barrett: Well, given that international nature of medical research, are there standards that all biobanks have to adhere to in the U.S. and other countries, and what are the obstacles to coordinating and harmonizing all those biobanking standards?

Dr. Jim Vaught: Yes, unfortunately there are standards that some biobanks adhere to, but there is no one international standard. The International Society for Biological and Environmental Repositories, or ISBER, created a set of best practices; the latest edition is from 2012.

The U.S. National Cancer Institute has a set of biobanking best practices that was last published in 2011, and there are other international standards and best practices for biobanks, but unfortunately there is no overarching standard that all international biobanks adhere to. And the obstacles to coordinate and harmonize those biobanking standards relate to issues that are different in different countries.

The technical standards for collecting samples, processing them, and storing them are generally agreed on and will be fairly consistent among those best practices. But the problem usually rests on the ethical and regulatory issues, such as informed consent, privacy, and so forth that govern the collection and processing of samples. And many of those types of issues, i.e., the ethical and regulatory issues, differ among countries and are very difficult to standardize and harmonize.

Bob Barrett: Well, finally doctor, just a couple of more questions, what are some of the important ethical and regulatory issues facing biobanks? And why are the issues of return of research results and incidental findings important to biobanks?

Dr. Jim Vaught: Yes, the ethical and regulatory issues are, as I said previously, some of the issues that are most difficult to control and harmonize and standardize, and that's because those ethical and regulatory standards are often changing within countries.

In the U.S. we have had for many years standards related to informed consent and privacy, the HIPAA regulations; we have standards regarding what are called material transfer agreements to exchange samples and data between organizations; and all of those are changing from time to time and difficult to keep up with and, also as I said, differ in other countries in terms of the specifics.

And some of the, what I would call, hot issues, in ethical and regulatory affairs involve return of research results and incidental findings.

As biobanks have become more important in the medical research enterprise and patients have become more informed about how their diseases are formed and developed and are cured or treated, then patients want to know more about how samples that they donate for research purposes are used, and what those results mean.

And on the other hand, many biobankers are reluctant to share results with patients because often they are preliminary research results and they aren't really in a form that is near final enough to share with patients or to publicize widely.

Sometimes it takes years of research to read some firm conclusion on the progression of disease based on the analysis of those biobank samples. So that's a very difficult issue to be addressed and there are many varying opinions on how it should be handled. Many biobankers and researchers are happy to return research results to patients, but many others are reluctant and it's a very hot topic that's widely discussed in biobanking meetings.

Incidental findings is a similar issue that is possibly even more difficult to manage. Incidental findings means that a finding has been made by a research project based on samples that were analyzed after they were donated by a patient, for example.

And this analysis of samples after the initial diagnosis has been made on the patient's disease, sometimes in a small percentage of patients result in additional finding of some disease that the patient may have that was not discovered in the initial diagnostic phase. That may be based on samples being analyzed from the biobank some period of time after the initial diagnosis. So those are called incidental findings because they are incidental or secondary to the initial diagnosis of the patient.

And so then that becomes an ethical issue, because doctors who are analyzing those samples from biobanks feel an obligation to inform the initial patient and the primary physician of those incidental findings.

But, on the other hand, there are regulations that relate to reporting back results from research projects and the researchers are often under an obligation not to report back those incidental findings because they are not really an approved clinical research facility.

So those are dilemmas in the ethical and regulatory area that are hotly debated in the literature and at biobanking meetings and are still awaiting resolution.

Bob Barrett: Dr. Jim Vaught is President-elect of the International Society for Biological and Environmental Repositories and Editor-in-Chief of *Biopreservation & Biobanking*. He has been our guest in this podcast from *Clinical Chemistry*.

I am Bob Barrett. Thanks for listening!