

Professor Berthold Huppertz, director of Europe's largest clinical biobank, Biobank Graz, highlights the importance of combining specialised education for biobankers and maintaining samples at highest quality levels

# Education for high quality research

The number of biobanks has increased tremendously over the last decade, and still numerous biobanks, particularly in the field of human samples, are yet to come. In countries like those in Central Eastern Europe and the Middle Eastern region, Africa and South America, as well as China, the number of emerging biobanks is especially huge. Although the increase in the number and size of biobanks has not yet been paralleled by increased training efforts and increased efforts to harmonise sample qualities, the emerging biobanks are seeking advice at renowned biobanks to ensure the right pathway to high sample quality. One of the ways to ensure quality is recruiting adequately qualified personnel.

## Understanding the importance of high quality research

Scientific publishing has been one of the major tasks of researchers seeking to contribute to the knowledge increase of humanity. Today, scientific publishing has become a major task of researchers to ensure sustainability of their funding, their co-workers and their own positions. This is called the obligation to 'publish or perish'. This change in focus of publishing in combination with the pressure on scientists at each level of their career to publish or perish means that quality of research has not been the major focus during the last decades.

This can easily be illustrated by looking at simple numbers. Retractions of already published scientific papers were extremely rare events up to the end of the 1990s. In the last 15-20 years, the number of retractions has increased enormously, mostly in the field of biology and medicine.<sup>1</sup> While the last ten years have seen an increase in literature by 44%, at the same time the number of retractions has increased more than ten-fold.<sup>2</sup>

Today, there is an increasing awareness in scientists of how important it is to identify sample quality and thus the handling of samples prior to analysis. This can be recognised by the increasing number of projects looking for biobanks to collaborate in terms of sample handling, storage and distribution.

## Understanding the importance of bi-unique sample labelling

Samples that are stored for research as well as routine clinical purposes need to be labelled in a way that ensures unambiguous and bi-unique identification of a sample. No-one wants to have a sample from one group within a cohort used as sample for another group. And, of course, no-one wants to have a sample from one patient used as the basis for the treatment of another.

However, looking into the archives of pathology departments or into the freezers of researchers, manual labelling with adhesive labels that may or may not stick to the sample over time is still the most widely used method for labelling. It has recently been pointed out that in the USA



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nearly 100,000 people die each in year in hospitals due to misdiagnosis.<sup>3</sup> And one of the most common reasons for misdiagnosis is labelling of samples, especially tissue samples.<sup>3</sup>

What can be done to overcome this major issue? There is definitely the need to introduce barcoded labels to archives and science. 2D dot matrix codes in combination with human readable alphanumeric codes are clearly advantageous compared to handwritten codes. At the same time it needs to be stressed that manually typing a given code should be avoided. Here is an example: if a hospital uses a laboratory information and management system (LIMS), the patient-related codes should be taken from the LIMS and printed directly on the specimen mount. Looking up the code and manually typing it for printing will clearly create opportunities for errors in mixing up numbers within the code. Such wrongly labelled samples will never be found in the system since their original code cannot be found in the database of the archive or biobank.

In conclusion, the bi-unique labelling of samples for clinical routine and research should become mandatory to guarantee the proper retrieval of samples for the safety of patients and to provide correct scientific data that do not need to be retracted.

## Understanding the importance of educating biobankers

Besides proper labelling of samples, much more needs to be taken into account when working in a biobank. Fields that need to be covered by a biobank include: 1) Skills and knowledge in sample management including pre-analytic handling, logistics, storage and shipment; 2) a deeper understanding of quality management and ELSI (ethical, legal and societal issues of biobanking); 3) understanding the basics of biobanking IT landscapes and the IT requirements of a biobank; 4) knowledge on biobank budgeting, business planning and sustainability; 5) skills in management and communication; and 6) basics in risk management of a biobank. It also



includes knowledge on: 7) the organisation of a biobank; 8) the implementation of a biobank in the healthcare system and in existing research infrastructures; and 9) representing a biobank and networking in the national and international area.

Today, all of these skills and capabilities need to be implemented through training on the job while working in a biobank since respective courses and education platforms are mostly missing. The job profile of a biobanker still needs to be developed, although there is already an urgent need for such people.

Luckily, this need has been identified by a number of local biobanks that have set up respective training and master's courses. Looking at the postgraduate education level, today there are a few courses offered throughout Europe. King's College London, UK, and the University of Nice, France, offer master's courses in biobanking as on-site courses for one year in English (UK) or for two years mostly in French (France). The University of Valencia, Spain, offers a two-year master's in biobanking as a distance learning course in Spanish, while Biobank Graz at the Medical University of Graz, Austria, offers a two-year master's in biobanking as a distance learning, part-time course in English.

The part-time distance learning master's course at Biobank Graz is organised in specific modules

**There is an urgent need for more biobankers, although the job profile still needs to be developed**

based on the list of fields mentioned above. It is possible to take all modules, write a master's thesis and receive a master's degree in biobanking. At the same time, it is possible to book a single or several modules for further education and to receive a certificate of attending the module. This can all be done at home worldwide without the need to stay in Austria for the whole duration of the module/course.

In conclusion, based on the development in biomedical sciences of the last decades, the urgent need has been identified to train people in the organisation, management, infrastructure and emerging challenges of biobanking. Only having this knowledge present at the running and emerging biobanks will allow for a new generation of highly skilled and trained people who can easily deal with the requirements of the quality of biobanking samples and data. Only then will the highly sophisticated technology platforms used for analysis provide data that lead to knowledge increase rather than additional confusion.

#### References

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- 2 Van Noorden R. Science publishing: The trouble with retractions. *Nature* 2011; 478: 26.
- 3 Rasanen M. Specimen tracking: Helping prevent misdiagnosis. *Leica Biosystems* 2016.

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