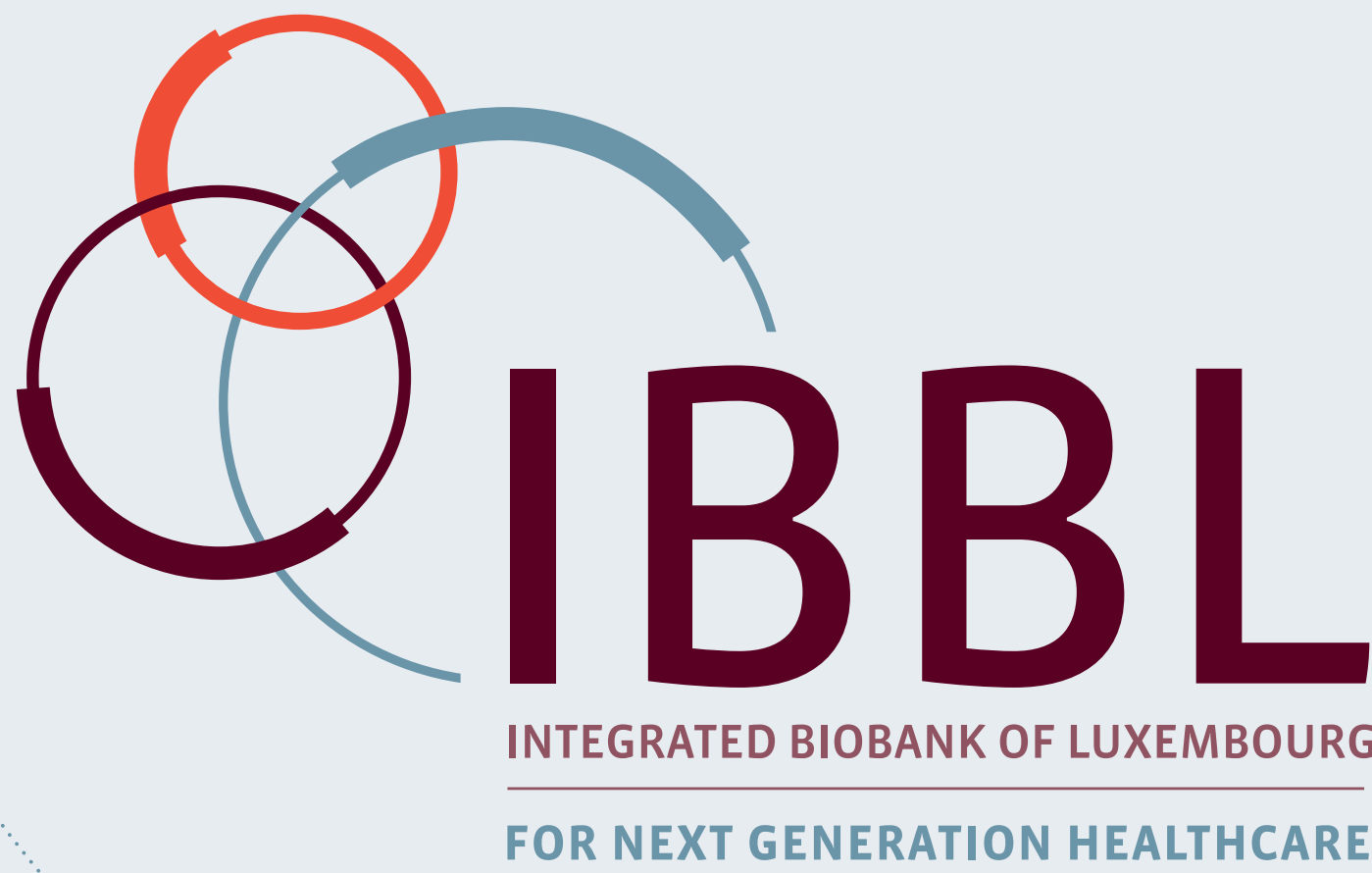


The important role of control population collections in biobanks



Authors

Mark Keipes⁽¹⁾, William Mathieson⁽²⁾, Angela Hogan⁽²⁾ and Fay Betsou⁽²⁾
⁽¹⁾ Hôpital Robert Schuman, 9 rue Edward Steichen, Luxembourg
⁽²⁾ Integrated BioBank of Luxembourg, 6 rue Nicolas Ernest Barblé, 1210 Luxembourg, Luxembourg

Introduction

Biospecimens from a healthy population are required for method validation, the definition of reference ranges, the production of quality control materials and for controls in case-control research studies. We describe how an ongoing collaboration between IBBL and the ZithaKlinik has implemented a prospective collection of (blood) clinical samples from a healthy population, serving multiple scientific purposes.

Examples of use

Processing method validation
When validating new processing methods, biospecimens from a population cohort that reflects “real-life” diversity and sample quality are needed (Fig.1).^{1,2,3}

Definition of reference ranges
When new biomarkers have been identified and validated, reference ranges need to be established that correspond as closely as possible to the actual population, reflecting the inherent variabilities in the analyte concentration that occur over time and across the community (by age, sex, etc.). (Fig.2)
We have defined the reference ranges for sCD40L in serum and plasma. Definition of these reference ranges was necessary for the validation of this biomarker of preanalytical quality of human serum and plasma.⁴

Production of quality control materials
Internal quality control materials are needed in order to monitor the performance of analytical methods in the laboratory. DNA, RNA, serum and plasma have been produced, their homogeneity and stability have been assessed. They have been implemented and are being used to help us follow the performance of our analytical methods with Levey Jennings charts (Fig.3), in assays such as hemoglobin measurement in plasma, sCD40L in serum, DNA quantification, RNA quantification.
In-process quality control materials are also needed in order to compare and/or monitor the efficiency of processing methods. Plasma has been provided to the CANCERID consortium (supported by the Innovative Medicines Initiative Joint Undertaking under grant agreement n° 115749, resources of which are composed of financial contribution from the European Union's Seventh Framework Programme (FP7/2007-2013) and EFPIA companies' in kind contribution), in the context of the comparison between different methods of extraction of cfDNA and of circulating miRNA.

Procurement of controls in case-control research studies
In case-control studies, the research community requires controls that have been collected and processed during the same period of time and using the same protocols as the disease cases that are being studied. Plasma controls have been provided to researchers from LIH for the validation of proteomic biomarkers of lung cancer.⁵

Conclusions

The implementation of the healthy population cohort has enabled us to validate several processing methods, establish reference ranges for new biomarkers, and to provide reliable controls to end users conducting research in particular disease areas.

References

1 W. Ammerlaan, JP. Trezzi, P. Lescuyer, C. Mathay, K. Hiller, F. Betsou. Method validation for preparing serum and plasma samples from human blood for downstream proteomic, metabolomic and circulating nucleic acid-based applications. *Biopreservation and Biobanking* 2014;12:269-280.
2 G. Hamot, W. Ammerlaan, C. Mathay, O. Kofanova, F. Betsou. Method validation for automated isolation of viable peripheral blood mononuclear cells. *Biopreservation and Biobanking* 2015;13:152-163.
3 C. Mathay, G. Hamot, E. Henry, K. Mommaerts, A. Thorlaksdottir, J. Trouet, F. Betsou. Method validation for extraction of nucleic acids from peripheral whole blood. *Biopreservation and Biobanking*. 2016; Aug 22. [Epub ahead of print]x
4 J. Lengellé, E. Panopoulos, F. Betsou. Soluble CD40-Ligand as a biomarker for storage-related preanalytic variations of human serum. *Cytokine* 2008; 44:275-282.
5 Y. J. Kim, K. Sertano, M.-A. Pierrard, C. Mesmin, S. Y. Kim, M. Schlessner, G. Berchem, B. Domon. Verification of the biomarker candidates for non-small-cell lung cancer using a targeted proteomics approach. *J. Proteome Res.* 2015; Jan 16. [Epub ahead of print]



The ZithaKlinik is one of the Hospitals Robert Schuman focused on medicine and surgery for adults, and employing 110 medical specialists.



Fig.1 Examples of scientific publications referring to processing method validation^{1,2,3}

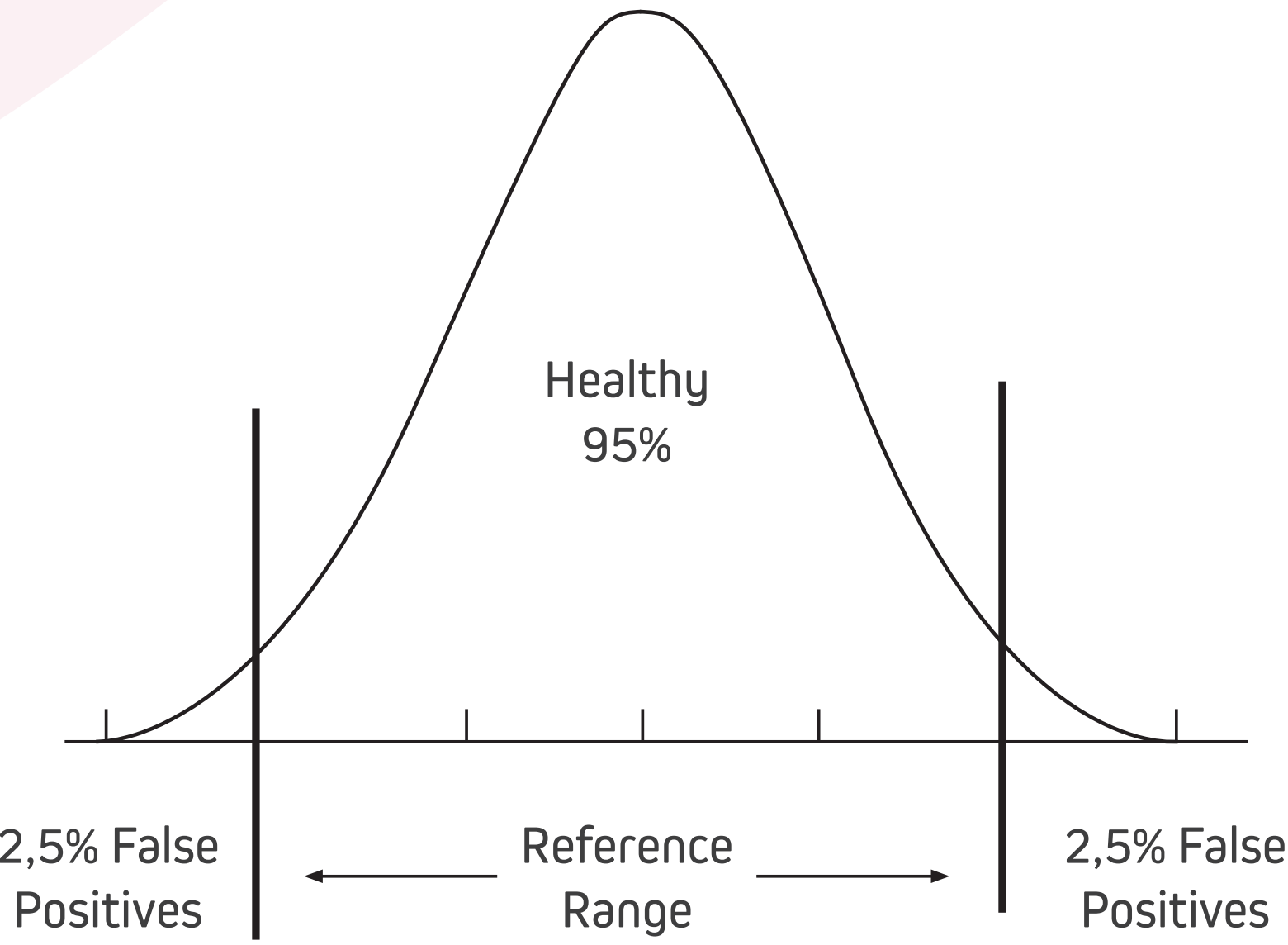


Fig.2

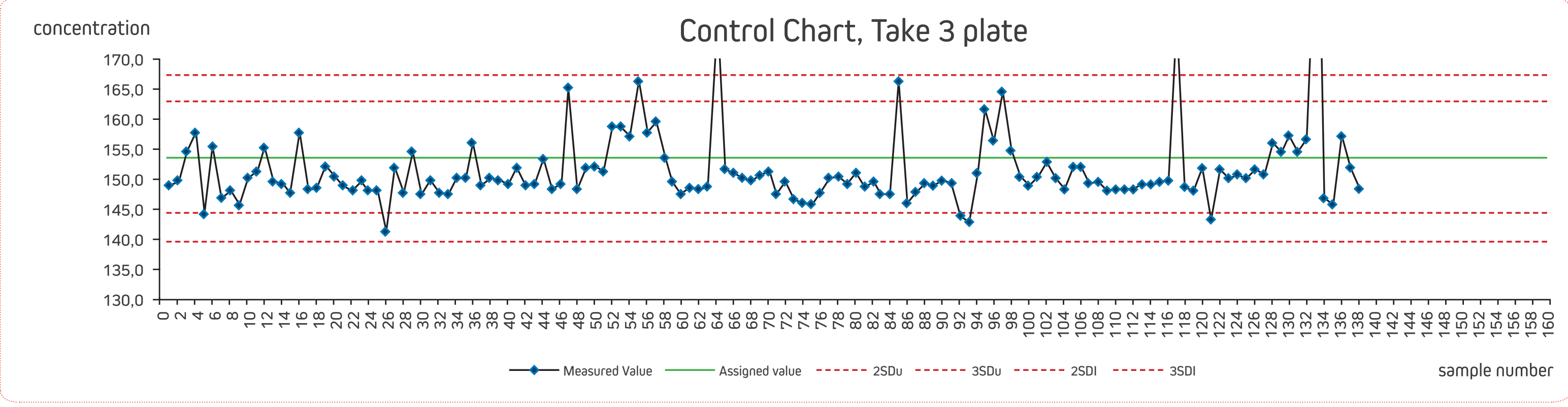


Fig.3 DNA quantification by spectrophotometry

