Chapter 3
Biobanks and Research: Scientific Potential and Regulatory Challenge

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3.1 Biobanks and Research: The Scientific Potential

In 2000, the completion of the draft human genome sequence was announced (Butler 2010). During the past 10 years the technical possibilities of automated data analysis of DNA samples and their bioinformatic processing have continuously and dramatically evolved. There has been considerable criticism of the "hype" around the sequencing. This is due to its focus on a race between rivalling scientific institutions and its overemphasis on the relevance of knowing the sequence of the "whole" human genome, fostering a public misunderstanding that "it's all in the genes", that simple gene defects could serve as a model for the most common diseases and that quick cures were virtually around the corner. Still, the sequencing of the human genome can be considered a milestone towards what has been termed the "GWAS era" (Latourelle et al. 2009; O'Brien 2009): human biospecimens, DNA, genotype, and clinical data are combined in so-called biobanks to carry out genome wide association studies (GWAS). They explore the interaction between genes and the environment as well as the implications for human diseases and medical therapies. The rising demand for human tissue in research illustrates the rapid expansion of the field (Womack and Gray 2009).

In Europe as well as globally, these collections of specimens, also called biobanks or genetic databases,[1] represent a significant amount of public investment and have become an important research tool comprising studies in new fields such as epigenetics (Kavikondala et al. 2010; Talens et al. 2010), systems

[1] In this chapter, the terms "biobank" and "genetic database" are used interchangeably to signify a collection of human biological samples that can be used for genetic analysis, including those that combine such samples with the results of genetic analyses and health or other data about the persons from whom the samples were collected. The category encompasses pathology collections, repositories for specific diseases (e.g. cancer registries), and population databases created to permit longitudinal studies of any disease or condition (see Elger et al. 2008, p. 1 note 1).

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biology (Diez et al. 2010), toxigenomics (Chung et al. 2009) and translational and basic science stem cell research (Bardelli 2010), including research on somatic-cell nuclear transfer (Jones and MacKellar 2009).

The European Science Foundation published a report in May 2009 which acknowledges the scientific importance of biobanks. The slogan "good biobanks for better health" (Reed and Bjugn 2010) characterizes the underlying public health objective. By combining data about environmental exposure with health outcomes and genetic analysis, epidemiological research, as well as research concerning specific diseases, can be advanced significantly.

3.1.1 Disease Types

Most cohort studies on different diseases nowadays have their own attached biobank (Garcia-Merino et al. 2010; Jiang et al. 2009). Biobanks are increasingly considered an indispensible tool in the search for answers to many health related questions, including public health concerns, as the titles of recent studies suggest:

> Do evolving practices improve survival in operated lung cancer patients? A biobank may answer. (Vlastos et al. 2009)
>
> Is smoking an independent risk factor for invasive cervical cancer? A nested case-control study within Nordic biobanks. (Kapeu et al. 2009)
>
> Overcoming the global crisis . . . also for TB . . . ? – yes, we can [if we use biobanks]. (Ottenhoff 2009)

Ottenhoff reminds the reader that tuberculosis (TB) causes almost two million deaths every year and argues that "high-quality clinical trial capacity and biobanks for TB biomarker identification" are important tools. They are increasingly used by public health researchers as well as WHO surveillance centres. Biobanks have become a "must" for research on many infectious diseases, as is illustrated by the opening of the King's College London (KCL) Infectious Diseases BioBank in 2007, which collects peripheral venous blood from patients infected with various pathogens including human immunodeficiency virus (HIV) (Williams, Mant, and Cason 2009). Another field in which biobank research contributes to an important public health goal is the use of blood products for transfusion purposes. The Blood and Organ Transmissible Infectious Agents (BOTIA) project has their own biobank in which paired donor-recipient samples are stocked for research (Lefrere and Coudurier 2009).

Human biobanks are of great scientific value to researching diseases where gene-environment interactions are complex. Examples are cardiovascular disease (Posch et al. 2009), neurological diseases (Teunissen et al. 2009), and especially most cancer types (Clement, Chene, and Degos 2009; Riegman, de Jong, and Llombart-Bosch 2010). Indeed, repositories of DNA, RNA, and serum samples play a key part in the investigation of the underlying causes of cancer development, progression, and prognosis. They are indispensable resources for the investigation

of biomarkers which serve to detect cancers early and to predict treatment response (Ennis et al. 2009).

The past years have also shown a tremendous increase in the establishment of paediatric biobanks, beginning in oncology, but extending their scope recently to all sorts of paediatric diseases (Ebner et al. 2010). This rise has been triggered, among other things, by the fact that research with children is highly regulated since children are a vulnerable population. Biobank research has the advantage of being considered in most cases as minimal risk research, since there is no direct harm to children if their samples are examined (Garcia-Merino et al. 2010; Gurwitz et al. 2009).

3.1.2 Pharmacogenomics

Although disease-related biobanks were among the initial biobanks to have been established, media attention was first significantly raised in the context of population biobanks that announced "personalized medicine" as their main goal, as shown by the title of this journal article:

> With your genes? Take one of these, three times a day. (Abbott 2003)

The aim of pharmacogenetics is to lead to personalised therapy based on genetic profiling. Biobanks therefore have a noticeable place in drug discovery research. In the great majority of clinical trials drug companies submit to the FDA for approval, and provisions are made to sample and store blood for future genetic analyses (Abbott 2003). Pharmacogenetic and pharmacodiagnostic tools are used to improve drug efficacy and safety margins. For several years, interest has been centred on the genetic polymorphism of drug-metabolising enzymes such as cytochrome P450s (CYPs) and N-acetyltransferases (NATs), which have been studied in Caucasian, Asian and African populations (Gurwitz et al. 2005; Gurwitz and Pirmohamed 2010; Matimba et al. 2009). The pharmaceutical industry has expressed interest in using population biobanks to develop new targeted medicines. The pharmaceutical company Hoffmann-la Roche is said to have paid $200 million in order to obtain the rights to develop and market drugs resulting from genes that deCode had hoped to find for a dozen disorders through research involving the Icelandic national biobank (Durham and Hall 1999; Enserink 1998a, b; Lemonick 2006; Nutley 2002; Schwartz 1999).

3.1.3 National Biobanks

Many common diseases, such as cardiovascular and psychiatric conditions, are influenced by multiple genes. In order to determine the influence of groups of SNPs (single nucleotide polymorphisms, i.e. a form of DNA sequence variations) on drug responses in diseases, a large number of samples is required, and SNPs need to be searched across the entire genome (Abbott 2003). Modern high-throughput testing

has enabled the establishment of research using large national biobanks at less cost. Iceland, Estonia, Denmark, Spain, and Croatia are examples of countries that have established their own national biobank. More and more countries are following their example (Andorno 2006; Kaiser 2002; Modin et al. 2010; Rudan et al. 2009; Zika et al. 2010). National biobanks are often advertised as the creation of "biovalue" (Mitchell 2010): Advocates call them an economic "resource" of interest not only to basic researchers and academic biologists, but also to pharmaceutical genomics companies that invest in diagnostic and clinical products. Yet, many large European DNA biobanks have encountered difficulties. The promises regarding their scientific or medical benefits were not fulfilled as quickly as researchers and industry had announced (Rose 2006).

3.1.4 The Importance of National and International Collaboration

One of the most critical factors in biobank research is the availability of a sufficient number of samples in order to ensure adequate powering of studies. Suitable sample sizes often cannot be obtained in single-center studies (Teunissen et al. 2009). Large national biobanks have been established to carry out research mostly on common diseases. In contrast to these national biobanks, sample collections dedicated to research on specific, less common diseases tend to be small and attached to a single university or hospital. Even in large national biobanks, the frequency of certain diseases is too low to justify specific studies. Networking between different biobanks, albeit still rare (Zika et al. 2010), therefore becomes more and more critical to remedy these shortcomings (Asslaber and Zatloukal 2007; Clement et al. 2009; Salvaterra et al. 2008; Yuille et al. 2009).

National and international collaborations between biobanks can only be efficient if a certain number of conditions are fulfilled. In order to carry out meaningful comparisons between samples and data, phenotypic information needs to be detailed and well standardized (Gurwitz and Pirmohamed 2010; Ritchie et al. 2010). The way in which samples are obtained and processed, including the time that elapses between the taking of samples and conservation measures, such as freezing, are of immense influence on the quality of samples, and the results of certain studies might vary simply because of different preparation procedures (Botling et al. 2009; Cardoso et al. 2010; Johnsen et al. 2009; Rudloff et al. 2010). Another important organisational aspect of collaboration and networking is the communication about availability of samples. A common way to do this is the establishment of catalogues that are widely accessible via the Internet, providing information on which institutions hold which types of samples (Chabannon et al. 2010). This requires, however, that institutions agree to collaborate and have policies as well as material transfer agreements that ensure comparable ethical and legal standards. Collaborations are hampered significantly if regulations of ethical and legal issues vary between different countries or even between institutions within the same jurisdiction.

It is therefore not surprising that major European funding agencies, such as the European Science Foundation, acknowledge not only the scientific importance of biobanks, but also the need for harmonization of databank structures and their regulation (Ballantyne 2008; European Science Foundation 2008).

3.2 Harmonization of Technical Procedures for the Preparation, Handling and Storage of Samples and Data

While biobanks have enormous and almost ubiquitous scientific potential in various areas of medicine, their impact and efficiency is significantly decreased if collections remain fragmented. The collection and storage of DNA, cell tissue samples, as well as the collection of phenotypic, environmental and lifestyle data from medical records and patient questionnaires need to be standardized in order to achieve sufficient quality of research and to permit collaboration within biobank networks.

International and European organizations of scientists are working on the standardization of technical procedures with varied success. Many technical aspects of biobanking, as well as the influence of epigenetics and metagenetics, concern both human and non human biobanks. International initiatives are therefore aiming to ensure global harmonized standards that overcome the traditional borders between human subject (human biobanks) and non-human subject (non-human biobanks) research (Day and Stacey 2008; ISBER 2009).

In the US, the National Cancer Institute (NCI 2007) has put considerable work into the elaboration of technical SOPs (standard operating procedures). In Europe, the Biological and Biomolecular Research Infrastructure (BBMRI) Program has convened a Pathology Expert Group Meeting that produced its own recommendations. These emphasize the role of pathologists (Bevilacqua et al. 2010). Worldwide, pathologists are handling the bulk of available specimens. They also act as gatekeepers to essential information which permits the identification of specimens.

> [Pathologists] make decisions on what should be biobanked, making sure that the timing of all operations is consistent with both the requirements of clinical diagnosis and the optimal preservation of biological products. (Bevilacqua et al. 2010)

Appropriate training of pathologists in institutions that are hosting biobanks is crucial in order to ensure not only that "the timing of all operations is consistent with both the requirements of clinical diagnosis and the optimal preservation of biological products" (Bevilacqua et al. 2010), but also to harmonize standard operating procedures (SOPs) and to fulfill international standards.

Among the technical aspects, the linkage of the biobank with existing databases, a hospital database or, often, local or national cancer registries is an overlooked aspect of the standardization of biobank-based studies. Up to now, the linkage of biobank material to cancer registry data as a way to enhance research protocols has rarely been examined and included in published recommendations (Langseth et al. 2010).

3.3 Harmonization of Ethical and Legal Issues Concerning Biobanks

The linkage between samples and data, especially if the latter are obtained from registries that contain personal identifiers, raises important ethical and legal questions regarding consent, privacy and management of information (Netzer and Biller-Andorno 2004). The harmonization of ethical and legal frameworks regarding biobanks has proven to be particularly thorny (Elger et al. 2008; Elger 2010). While the need for international guidelines has been widely recognized (O'Brien 2009), the existing regulatory framework remains a complicated patchwork of more or less contradictory local guidelines and laws. The Council of Europe's recommendation on research with biological material is a promising step in the right direction that has taken many years of preparation. The Organisation for Economic Co-operation and Development (OECD) published its own guidelines in autumn 2009, which will hopefully help to catalyze future harmonization of domestic laws. Indeed, following the example of Iceland, Estonia and Sweden, other European countries have issued laws during the past year (Spain) or have prepared law projects (Switzerland).

3.3.1 Biobanks and Classical Health Research Ethics

The development of international guidelines is taking time because biobank research is a challenge to classical health research ethics (Elger 2010; Elger and Caplan 2006). If fundamental principles such as informed consent and a strict definition of personal data are applied, biobank research becomes largely unfeasible or at least disproportionately costly. There is an ongoing dispute as to whether biobank research requires a redefinition of the balance between patients' rights and science/society's quest for efficient and affordable beneficial research, or whether problems can simply be resolved through an adequate interpretation of research ethics principles when applied to biobanks.[2] The latter approach means that the balance itself will not change, including the high value given to individual human rights concerning privacy, individual choices and control over body parts, and tissues. According to the former approach a value shift is necessary towards a greater weighting of community values, such as solidarity and altruism of tissue donors, and a restriction to individual autonomy based rights.

The debate might also be framed as including a question about paternalism: should individuals who participate in biobank research be allowed to wave future rights to control the use of their samples and data when they provide broad consent to future research studies, though they have not been informed about yet unknown details of these projects? Traditionally, research ethics contains a paternalistic element: the decision whether a human research study is considered too dangerous

[2]Indeed, using existing data and samples for secondary research purposes does not imply direct physical risks and could therefore justify broad, less informed consent.

to be acceptable is taken by a research ethics committee (REC). Research participants are not allowed to take risks if the REC considers them disproportionate to the benefits (Belmont Report 1979). Those who argue that the overall balance of individual rights and the interests of science/society should remain unchanged, claim that biobank research implies mostly minimal risk (Caulfield and Weijer 2009; Gurwitz et al. 2009; National [NBAC] 1999, pp. v, vi and 7). Allowing biobank participants to wave their individual right to truly informed consent for future studies involving their samples and data would therefore be acceptable without questioning the importance of classical informed consent in traditional clinical trials.

When it comes to discussing the ethical problems in their concrete contexts, the debate about whether fundamental values or their balance are changed or only adapted becomes less predominant. New guidelines show that advocates from both sides may interpret changes as being in line with their own framework and agree about the proposed measures. In the following part we will sketch out the recently proposed compromises and solutions for the three most important controversial issues: informed consent, privacy and returning of research results to participants.

3.3.2 Recent Developments Concerning Controversial Ethical Issues

Informed consent remains a controversial issue. If biobank research is evaluated within the framework of classical research ethics, it does not seem acceptable to allow research participants to consent to future studies with having received sufficient information. However, in recent years some evolution towards the acceptance of broad (partially uninformed) consent occurred in international guidelines. In 2008, the Declaration of Helsinki was revised, including a paragraph that softens consent requirements concerning research with identifiable human material and data:

> 25. For medical research using identifiable human material or data, physicians must normally seek consent for the collection, analysis, storage and/or reuse. There may be situations where consent would be impossible or impractical to obtain for such research or would pose a threat to the validity of the research. In such situations the research may be done only after consideration and approval of a research ethics committee. (World Medical Association [WMA] 2008)

Overall the ethical discussion has moved away from the almost exclusive concentration on one-time original consent towards the management of future new uses of collected material that had not been anticipated at the time of original consent. The OECD guidelines on human biobanks and genetic research databases (HBGRD) admit alternatives to traditional informed consent when they discuss the four major problems (see the bullet points in paragraph 3.1 of the OECD guidelines below) with which biobanks may be confronted if the original consent did not precisely cover future research uses of biological material and data.

> 3.1 Review processes, in accordance with applicable law, including research ethics committees or comparable oversight mechanisms, should be in place for use in cases where human biological materials or data are to be used in a manner not anticipated in the original informed consent process, including:
>
> - for previously collected human biological materials or data where the use might deviate from the original consent;
> - for cases where informed consent may not have been obtained at the time of collection;
> - for determining when to seek re-consent;
> - for use of human biological materials or data where consent was obtained using a broader or layered format for uses unspecified at the time of collection, especially in the case of large-scale genetic epidemiology studies (OECD 2009)

The OECD guidelines propose three different solutions to deal with future yet unknown projects involving human biological material and data from biobanks. Paragraph 4.5 presents the first two: new consent or a waiver of consent.

> 4.5 Where subsequent use of human biological materials or data is envisaged that would not be consistent with the original informed consent, a new consent should be obtained from the participant or from the appropriate substitute decision-maker, or a waiver of consent should be obtained from a research ethics committee or an appropriate authority, in accordance with applicable law and ethical principles pertaining to the protection of human subjects. (OECD 2009)

While new consent and waivers have been tools permitted in traditional research ethics, the acceptance of broad consent, according to the following paragraph of the OECD, is a step towards an adaptation of classical informed consent with respect to biobanks.

> 4.6 Where authorized by applicable law and the appropriate authorities, the operators of the HBGRD could consider obtaining a consent that will permit human biological specimens and/or data to be used to address unforeseen research questions. Participants should be fully informed of the breadth of such consent and there should be additional safeguards in place to ensure that participants are protected. (OECD 2009)

With this statement the OECD goes a step further than the Council of Europe, which does not use the term broad or general consent, although it contains a description of consent that could be interpreted as compatible with the broader type of consent.

> 10.2 Information and consent or authorisation to obtain such materials should be as specific as possible with regard to any foreseen research uses and the choices available in that respect. (COE 2006)

However, it should be noted that the OECD guidelines permit broad consent only if "additional safeguards" are in place. This is again an example of the regulations' shift of attention towards ongoing monitoring and management, away from a one time consent when participants enter a biobank study (Meslin 2010). The way in which ongoing control and oversight mechanisms could be standardized remains at present vague. A *cantus firmus* of the debate seems to be the fact that oversight mechanisms should be independent from funders and researchers (Secko et al. 2009).

The OECD frames their support for broad consent very cautiously by narrowing its use to jurisdictions where such practice is "authorised by applicable law and the appropriate authorities". In many European (?) countries, the legal framework concerning informed consent does not at present accomodate any broader standards. The same holds true for the United States. Since 2004, the Office for Human Research Protection (OHRP 2004) has somewhat circumvented the consent issue and enacted adaptations instead in the domain of *privacy* (Elger and Caplan 2006). It broadened the definition of non-identifiable (non-personal) samples and data. Coded material and data are considered non-identifiable if researchers or other users do not have access to the code. This permits researchers to use samples and data for further projects without the need of renewed consent or new approval of a REC as long as they use coded material in the aforementioned way.

In Europe, the position on the definition of personal data has not changed in the same way as in the US, although some evolution took place. A data protection working party of the European Commission proposed the following definition of anonymous data:

> Article 29 [. . .] "Anonymous data" in the sense of the Directive can be defined as any information relating to a natural person where the person cannot be identified, whether by the data controller or by any other person, taking account of all the means likely reasonably to be used either by the controller or by any other person to identify that individual. (Data Protection Working Party 2007)

The interesting development is that data could be considered anonymous even-though it could still be possible to identify individual persons. However, protocols and procedures are in place that exclude this from happening, for example through technical means such as "cryptographic, irreversible hashing". Article 29 might, however, also be read in the sense that protocols and procedures are in line with a reversible coding of samples and data where it is a contractual arrangement that guarantees that researchers and users of the data do not have access to identifying information.

> Article 29 [. . .] In other areas of research or of the same project, re-identification of the data subject may have been excluded in the design of protocols and procedure, for instance because there is no therapeutical aspects [sic!] involved. For technical or other reasons, there may still be a way to find out to what persons correspond what clinical data, but the identification is not supposed or expected to take place under any circumstance. (Data Protection Working Party 2007)

It is noteworthy that the Working Party examined only the case of data. Whether the possible expansion of the definition of anonymous data may be extended to biological samples remains questionable. Therefore, biobanks in Europe are at present not allowed to circumvent consent and REC approval in the same way as is possible for government-funded research under OHRP provisions in the US to do so.

Besides some evolution concerning the issues of consent and privacy, the question of whether biobanks and/or researchers should *return research results to participants* has moved somewhat forward (Bovenberg et al. 2009). While in the past researchers were free to decide whether to communicate individual research

results that fulfilled the requirements of validity, significance and health benefit, to the participants recent international norms seem to have moved towards an ethical obligation for researchers to disclose all research results meeting these requirements (Knoppers et al. 2006). One example is the obligation stipulated in the Council of Europe's Additional Protocol to the Convention on Human Rights and Biomedicine, concerning Biomedical Research. The Additional Protocol came into force in 2007 and is legally binding for countries that have ratified it. It is the reflection of the human rights based approach of the Council of Europe and stipulates a right to know:

> Article 27. If research gives rise to information of relevance to the current or future health or quality of life of research participants, this information must be offered to them. (COE 2005)

This stance is affirmed by the OECD guidelines, which take informing the study participant as the default version, of which the individual can opt out.

> 4.14 In certain circumstances, as permitted by applicable law and the appropriate authorities, where the participants may be provided with feedback of individual-level results arising from research, the operators of the HBGRD should provide clear information to the participant of the consequences of receiving such results and should inform the participant of their right to opt out from receiving such results. Non-validated results from scientific research using an HBGRD's human biological materials and data should not be reported back to the participants and this should be explained to them during the consent process.

Indeed, a provision, and especially an obligation, to return individual research results is seen by biobank managers and researchers as a significant burden that might hamper research or at least render projects more expensive while being of questionable benefit. Solutions that are in open conflict with the strong tradition of the human rights framework in Europe are not likely to be collectively acceptable nor is it desirable to undermine the strong focus of citizens' rights. Ethical positions that motivate a general practice of not returning results (Forsberg, Hansson, and Eriksson 2009) and lobby for a "shift of focus from autonomy and individual rights toward collective responsibility and solidarity" are not even necessarily in the interest of researchers and science. At present, article 27 of the Additional Protocol does not create a significant burden on researchers: It is compatible with a practice of not returning results in the majority of cases of biobank research, because this research does not generate results that are of "relevance to the current or future health or quality of life of research participants". It is unlikely that RECs will approve a non-return-results policy if a project generates this type of results. In addition, trust of research participants and society could be significantly undermined – with a reduced willingness to participate in biobanks as a likely consequence – if biobanks adopted a rigid approach of not feeding back results under any conditions.

The three major themes outlined above are not the only issues that are discussed in the international literature. With their focus on privacy concerns of citizens in (mostly rich) countries they are certainly most pertinent to European policy-making today. However, in the future, other concerns remain to be addressed, among them issues such as collective consent or benefit sharing, particularly in the context of

research carried out with participation of resource-poor populations. If biobanks aim at international collaboration, negotiating fair conditions that aim to prevent the dangers of discrimination and exploitation will be a highly relevant task.

3.3.3 Legal Risks

Although ethical issues are not fully resolved and controversy persists between different ethical traditions, recent guidelines have the potential to further harmonization. The guidelines provide enough options for biobank managers and researchers to choose a research friendly approach, while still granting sufficient protection of individuals who participate in biobank research. The crucial task is in the hands of international research and biobank organizations and networks. In order to use biobank resources in a responsible and efficient way – which implies facilitating international collaborations – they need to adopt the same options or at least mutually compatible technical and ethical frameworks. Although scholars have called repeatedly for a clarification of guidelines and the legal context (Deplanque et al. 2009), lessons learned from the past show that legal frameworks evolve slowly. Indeed, since in most countries the legal framework concerning biobanks remains poorly defined, uncertainty persists as to whether biobanks are taking legal risks, for example if they use broad consent. However, this is not likely to change within a short timeframe. In addition, any legal framework is always open to interpretation. Not infrequently, legislators have deliberately opted in favour of a somewhat vague legal framework, especially in areas that are rapidly changing, such as biotechnology. It may be assumed that if a biobank case is ever brought before a court the interpretation of present laws will take into account the directions provided by national or international guidelines. In Switzerland, for example, the federal court has taken into account guidelines of the Swiss Academy of Medical Sciences in order to clarify legally unresolved issues. In light of the absent, uncertain or patchy framework of different legal provisions internationally or even within the same country, the most efficient and pragmatic way forward for researchers and biobank managers is to choose a well-argued, harmonized framework in line with international guidelines. This approach could mean some legal risks, but these may be minimized if any regulatory uncertainties are explicitly addressed in formal contractual agreements (Goebel et al. 2010). In order to favour harmonization, template contractual agreements should be proposed by international networks involved in biobank research.

3.4 Conclusions

Proponents of biobank research promise personalized diagnostic and therapeutic approaches and public health benefits through a better understanding of the interactions between genes and the environment. Although such promises need to be

taken with a grain of salt, the remarkable potential of biobanks as a research tool is uncontroversial. A realistic view is important. Researchers and private investors are at risk to exaggerate the potential in order to obtain funding. The tension between the true potential of biobanks and the ubiquitous hype is not beneficial for the scientific endeavor. If too much is promised public trust is undermined and valid future projects could be hampered.

Collaborations, at a national as well as an international level, are an indispensable strategy to maximize the benefit of biobanks. The necessary harmonization of technical procedures and ethico-legal provisions is in the interest of all stakeholders: it will foster the efficiency of research as well as the global protection of research participants. Without adequate protection and fair, transparent standards it is unlikely that the public – individuals, communities, populations – will be able to provide the trust and endorsement biobank research needs for its advancement.

The potential of biobank research is highly dependent on efficient solutions for the regulatory challenges. Europe can only take advantage of the wealth of information contained in its collections of samples and data if the ethical debate about research involving biobanks is adequately resolved. The main goal of this debate is to ensure the protection of the rights of those who have provided the human material, without unduly hampering research. International guidelines provide at present sufficient options to achieve this goal.

Concerning the three major issues discussed in this chapter – informed consent, privacy, and returning results to participants – a consensus is evolving towards (1) more acceptance of broad consent, if it comes with additional safeguards in the form of suitable oversight mechanisms, and (2) requiring researchers to offer informing research participants about individual study results under certain conditions.

The challenge for researchers, biobank managers, biobanks participants and society is today to choose and adhere to a harmonized approach in line with international guidelines, even if – or rather, because – the legal frameworks in different countries remain vague and open to interpretation.

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