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Biotechnology — Biobanking — Implementation guide for ISO 20387

Biotechnologie — Biobanking — Guide de mise en oeuvre de l'ISO 20387

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 276, *Biotechnology*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document is intended to be a supplement to, rather than a substitute for, ISO 20387; as such, it is not a stand-alone document. It can be helpful for the reader to first review ISO 20387, and refer to this technical report in parallel or thereafter.

The following is noted in regards to the contents of this document:

— A technical report, by definition, contains no requirements. For this reason, the language is intentionally non-prescriptive to avoid the introduction of new requirements.

— This document does not address those clauses and subclauses of ISO 20387 which are considered to be self-explanatory (e.g. ISO 20387:2018, Clauses 1, 2, and 3, and Annexes A, B, and C, etc.).

— Clauses 4, 5, 6 and 7 of this document address some general concepts that underlie the requirements of ISO 20387.

— Clause 8 of this document addresses a selection of the specific requirements in ISO 20387, as noted above.

— Examples are provided throughout the text of this document, and are used to illustrate a non-exhaustive list of possibilities.

— Acronyms are used to simplify the text:

1) BMaD: ISO 20387 defines *biological material* (ISO 20387:2018, 3.7) and *associated data* (ISO 20387:2018, 3.3). For the purpose of this document the terms are combined as "biological materials and/or associated data" (BMaD). There are places where references are made to either biological material or associated data. The term is spelled out in these cases.

2) FIP: *Fit for purpose* or *fitness for intended purpose* (ISO 20387:2018, 3.24) is also defined by ISO 20387. For the purpose of this document this term is denoted by FIP.

The term biobank has been previously defined in a number of ways and no single definition has yet been universally accepted by the scientific community.

ISO 20387 defines a *biobank* (ISO 20387:2018, 3.5) as *a legal entity or part of a legal entity that performs biobanking*, and the term *biobanking* (ISO 20387:2018, 3.6) as *the process of acquisitioning and storing, together with some or all of the activities related to collection, preparation, preservation, testing, analysing and distributing defined biological material as well as related information and data*. For the purposes of this document, the term *biobank* includes the personnel performing biobanking activities on behalf of the biobank, as well as the entity itself.

Biobanks can vary widely in:

— domains that are managed, e.g., human, animal, fungus, microbial, and/or plant, etc. or a multiple of these;

— types of biological material and data in the biobank, e.g. nucleic acids, tissue, etc.;

— activities being performed;

— types of organizations that are involved; and

— structure, governance, oversight, and operation.

At the time of acquisition, biobanks can perform acquisition, processing and storage of BMaD for not-yet-identified future use(s). In these cases, the biobank can acquire the BMaD according to standard operating procedures (SOPs) appropriate for the projected end-use(s). Alternatively, biobanks can acquire BMaD in response to a request from a user. The user can specify criteria for the BMaD and/or SOPs developed or applied for that specific use.

Biobanks can acquire BMaD for investigators studying new methods of collecting, storing, or processing biological materials and the effects of these new methods on various analytes. In these cases, the biobank can tailor the procedures to specifically meet the investigator's needs rather than following widely-accepted SOPs for handling of the BMaD.

Biobanks vary in the types of activities they perform. They can either perform the full range of activities included in the definition of biobanking in ISO 20387, i.e. collecting/acquisitioning, preparing, preserving, testing, storage, analysing and distributing BMaD or a subset of these activities for example collecting/acquisitioning and distributing.

Biobanks can involve different types of organizations. They can be independent legal entities or reside within governmental entities, academic institutions, hospitals, non-profit or commercial organizations.

Biobanks can include multiple sites of operation and can sometimes involve parties at multiple institutions or organizations. In addition, they can involve sites of operations within different regions or sometimes even different countries.

It is up to the biobank to identify the scope of biobank activities for which it wants to implement ISO 20387.

Biotechnology — Biobanking — Implementation guide for ISO 20387

1 Scope

This document provides guidance to biobanks on how to implement the quality management, management, and technical requirements of ISO 20387. It expands on aspects of ISO 20387 and provides examples for illustration purposes. The aim of this document is to assist biobanks to address competency of personnel and appropriate quality of biological material and data collections. This document is equally applicable to newly established and existing biobanks.

This document is applicable to all organizations performing biobanking, including biobanking of biological material from multicellular organisms (e.g., human, animal, fungus and plant) and microorganisms for research and development.

This document does not apply to biological material intended for feed/food production, laboratories undertaking analysis for food/feed production and/or therapeutic use.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 20387:2018, *Biotechnology — Biobanking — General requirements for biobanking*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 20387 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Background information for the development of ISO 20387

4.1 General

ISO 20387 was developed to benefit biobanks of all sizes, types, resources and levels of maturity and/or complexity as covered by the scope.

The motivation for the development of ISO 20387 was to enable robustness and reliability of research undertaken with these BMaD, supporting quality and reproducibility in research and development. This in turn can contribute to increased and broader utilization of biological materials and associated data. It is intended that conformity to ISO 20387 can help demonstrate a commitment to professionalism within biobanking, promoting trust for key stakeholders, such as the public, donors, patients, users, or funders. Benefits such as increased efficiency of biobank operations and interoperability among biobanks, and improved marketability can result from a commitment to ISO 20387. These benefits can also facilitate sustainability at a time of increasing complexity of research requirements.

4.2 Intended audience for ISO 20387 and this document

Because ISO 20387 covers a wide variety of biobanks, the intended audience is broad. This document serves as a tool to assist with implementation of ISO 20387 for the spectrum of biobanks and their activities, such as:

a) multicellular organism (e.g., human, animal, plant) and microorganism biobanks (for implementation and self-assessment);

b) biobanks with a wide range of processes such as collecting/procuring and/or acquiring and receiving, tagging, accessioning/logging, cataloguing/classifying, examining, preparing, preserving, storing, managing data, destroying, packaging as well as safeguarding, distributing and transporting (ISO 20387:2018, 4.1.1);

c) biobanks with a focus on some of the above processes such as acquisition and storage;

d) biobanks at different stages of implementation, such as newly established and existing biobanks;

e) biobanks located in countries of diverse economical scales, such as high, middle or low-income countries;

f) biobanks, assessors and others interested in biobanking conformity assessment schemes, such as first party (self-declaration), second party (contract/agreement), and third party (certification/accreditation) approaches;

g) biobanks that wish to incorporate innovative approaches such as biological material-related data repositories (virtual biobanking).

Biological material from multicellular organisms and microorganisms share many common requirements in the implementation of ISO 20387, but each of these fields has its own needs. Domain specificity can influence biobanking and subsequently the quality management due to the different nature of biological material, special regulations, ethical guidelines, procedural needs or scientific and user-based requirements. More specific biobanking-related standards are currently under development in ISO/TC 276 *Biotechnology*.

4.3 Implementation of ISO 20387

Implementing ISO 20387 and the guidance as set out in this document can provide confidence in the quality of the samples and subsequent data analysis. However, implementing the standard will require resources. A gap analysis of a biobank's current practice against these standard requirements can be beneficial, and can lead to a plan for implementation of requirements. This can be done in a phased approach and can take some time, particularly for smaller organizations where resources can be constrained.

Each biobank can identify and implement corresponding requirements according to its defined and documented individual activities (ISO 20387:2018, 5.7). ISO 20387, as a conformity assessment enabling standard, can be described as having three types of requirements – general, QMS, and competence:

a) General requirements are found in all standards by definition. By demonstrating that a product or service meets specific requirements in a standard, a potential user has a basis for assessing a product's fitness for an intended purpose.

b) A Quality Management System (QMS) addresses quality policies and objectives in its processes, thus enabling the demonstration of efficient use of resources, improved risk management, and increased robustness of practices, plans, and records, all of which serves to further increase user confidence.

c) Technical competence adds the assessment of personnel to the evaluation, and provides means of demonstrating that an entity has the ability to apply knowledge and skill to successfully achieve an intended result, such as meeting the requirements in a standard. Technical competence provides opportunity to the biobank to demonstrate that not only is it able to meet requirements, but its personnel has the ability to consistently support the quality environment to promote further user confidence.

The combined implementation of all three elements above can result in increased robustness and confidence in biobanking operations and the resultant biobanking output. It is recognized that the implementation of all these elements can be both complex and expensive, and the pursuit of all three of these elements may or may not have sufficient business justification from the point of view of the biobank. It can be prudent to build up the implementation of ISO 20387 in steps. Therefore, as a step towards implementation of some parts or all of the standard, a biobank can choose to address certain requirements earlier than others, e.g.:

— Emerging biobanks have the opportunity to initially implement only certain sections of ISO 20387 and can then later implement other sections.

— Specialized biobanks can decide to implement only the portions of ISO 20387 (ISO 20387:2018, 5.7) that are relevant to their activities.

— Biobanks that have already implemented a robust QMS can choose to complement their efforts with requirements of ISO 20387.

Biobanks can choose to differentiate themselves from competitors by pursuing the demonstration of technical competence (e.g., through third party conformity assessment, or accreditation).

Note that the technical competence element cannot be implemented in isolation from the other two elements, as the assessment of competence can only be done if there are other requirements to assess.

5 Fitness for the intended purpose (FIP) (ISO 20387:2018, 3.24) in biobanking

5.1 General

The driving force for the development of ISO 20387 was the necessity for BMaD of appropriate quality for an intended purpose, to enable robust and reliable research and development. While the concept of *fitness for an intended purpose* (FIP) can be new to some, it underpins many of the requirements in ISO 20387. Quality is often considered a key target for the individual outputs from biobanks. Fitness for the intended purpose is broader in that it incorporates quality management and quality control, specifically targeting an intended purpose or end-use. This can extend to legal or ethical requirements, resource availability, biological characteristics of the BMaD, and other factors.

As the biobank evolves its understanding of potential FIP, it can also evolve the way it treats the BMaD, thus adding value in the context of an intended purpose. The user, when known, can also provide input.

The term 'fit for purpose', or 'fitness for the intended purpose', is defined in ISO 20387:2018 (3.24).

5.2 Fitness for the intended purpose and biological material and/or associated data (BMaD) life cycle

Considerations related to FIP can come into play during the design and various stages of biobanking. Figure 1 traces the progression of BMaD and the potential for continual revisions of the definition of FIP. During all stages of the life cycle, processing and analysis are important as they contribute to the FIP criteria. During all steps, relevant documentation will be maintained.

While Figure 1 is drawn as a linear progression, steps can be repeated, skipped, or ordered differently than shown. This customization of BMaD and its intended end-use can be further supported by continual refinement related to FIP by both the biobank and the user (or the projected range of intended end-use where a user has not yet been identified).

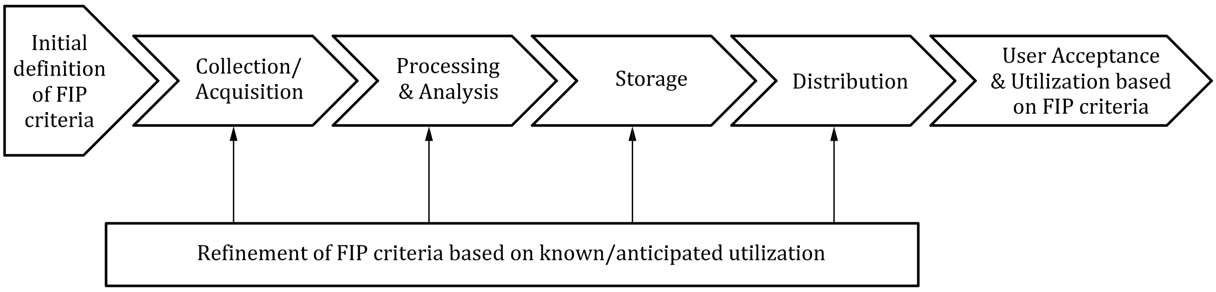

Figure 1 — The progression of BMaD and associated FIP criteria over its life cycle

Biological materials and associated data are subject to research, development and/or many other forms of utilization over time. The range of these potential uses is dependent on the known and documented condition of the biological materials and associated data. BMaD users and biobanks can play complementary roles during this life cycle.

Biobanks usually cover only parts of the BMaD life cycle and contribute mutually with the users of BMaD to their sustainable research and utilization. Each biobank has an individual share on the life cycle.

While BMaD is under the control of the biobank, there is the opportunity to support and add value by a range of means, such as tightly controlling the environment, enriching data and analysis, maintaining a chain of custody, and minimizing degradation through the use of appropriate long-term preservation and storage. The addition of value through these activities can extend the useful life of BMaD and broaden the range of potential end-uses, i.e., expand BMaD fitness for the intended purpose. Whether the specific end-use and/or user is known or unknown, a biobank can still establish and refine FIP criteria and/or activities over time, focusing on BMaDs and the range of potential end-uses.

From a user's perspective, BMaD life cycle can take a wide range of paths, but often begins with identification or sourcing of materials based on a research purpose or intended application and leading to BMaD utilization — the criteria that are set for the BMaD relate to fitness for the intended purpose. The user can design its research plan to tie requirements to intended end-use, and later assess both whether established requirements have been met, and whether these established requirements render the BMaD as fit for purpose for the intended end-use.

Early and/or iterative communications between the biobank and end-user can often result in BMaD that are optimally fit for an intended end-use.

Examples of possible pre-arranged requirements to ensure fitness for the intended purpose are documented in ISO 20387:2018, Annexes A and B, and can include choice of BMaD (including selection of specific data variables), testing methods, storage conditions, handling, and choice of consumables, etc.

5.3 Factors affecting fitness for the intended purpose

Given the wide variety of biobanks, their nature and purpose, and the biological materials and associated data therein, the factors affecting FIP will be context-specific. Requirements (or anticipated requirements) to ensure FIP can be affected by study design, analytical techniques, ethical/legal, and other factors.

EXAMPLE 1 If the purpose of the biobank is to provide biological material from which DNA can be extracted for molecular analysis, then handling the biological material according to International Standards (ISO 20166-3, CEN/TS 16826-3 (soon ISO 20184-3), ISO 20186-3, CEN/TS 17305 or best practices for molecular techniques can help to ensure fitness for purpose (unless the end-use involves evaluation of exploratory approaches for DNA extraction).

Considerations for the determination of FIP for a particular use might include pre-analytical variables, the characterization of the biological material, the level of understanding of the specimen's and its data's provenance, and/or other factors as appropriate.

Fitness for one application does not necessarily imply fitness for other applications.

EXAMPLE 2 Formalin fixed biological material can be of sufficient quality for histological assessment and immunohistochemical stains. However, some evidence suggests that these specimens might not always be suitable (fit for purpose) for RNA analysis due to RNA degradation.

Quality of the BMaD is only one component of FIP. Other components that allow a specific purpose or user's needs to be met include sufficient quantity of BMaD to meet an intended need/analysis; access and distribution policies and procedures; ethical or legal requirements, etc.

5.4 Determination of the pre-arranged requirements for FIP

Both the biobank and its user (when known) can influence the choice of requirements to ensure FIP either individually or cooperatively. This can be based on the purpose and nature of the biobank and evidence-based criteria, where available, for the intended analyses. In cases where the user has not been identified prior to collection/acquisition of the BMaD, the choice can lie with the biobank. Distribution of these responsibilities is dependent on many factors, including biobank type, size, function, user base, management, etc. and can vary from collection to collection and from project to project.

BMaD can be collected for a pre-identified user. In such cases, the user defines a set of pre-arranged requirements, often in collaboration with the biobank, potentially including the acceptable characteristics of the BMaD and an acceptable range of quality, related to the purpose of the research and the various analyses to be performed. Conversely, when users have not been individually pre-identified, BMaD can be collected and stored for anticipated future applications, as in many classic biobank models. In such cases, a set of requirements is established upfront for the collection, storage, distribution and use of the biological materials and associated data based on the anticipated needs of users. In that sense, the biobank can forecast and pre-determine the requirements for FIP.

5.5 Decision whether the biological material and associated data is truly fit for an intended purpose

Ultimately, the user decides whether BMaD is truly acceptable for an intended use, but this decision can also be made in collaboration with the biobank. Fitness for the intended purpose can change over time; factors such as long-term storage, technology evolution, increased understanding of requirements for a specific use, and evolution of the original intended use can all affect BMaD fitness for a specific use. This can be facilitated through close and continual interaction between the biobank and its user. It is ultimately up to the user to decide whether to use the BMaD for the intended purpose.

6 Process landscape

While the life cycle covers the range of key activities in the lifespan of a BMaD, process landscapes are a process-oriented view of a biobank's individual portfolio and provide an overview of its main processes and their interdependencies. They enable all involved parties to understand the function/ mandate of a biobank and how the biobank supports the involved parties in gaining access to biological material and associated data fit for an intended purpose.

Each phase of the life cycle of biological material and associated data is characterized by specific processes, as shown in Figure 2. These processes can be arranged in a hierarchical order so that certain process areas can be broken down into detailed procedures and requirements. The process portfolios of a biobank are usually structured into three process types:

a) Biobanking core processes directly create and/or add value for the users. They reflect the life cycle of biological material and associated data from collection, analysis, preservation and storage to distribution.

b) Biobanking support processes accompany and are used by the core processes. Typical examples include quality control, management of information, control of nonconformities, transport and traceability.

c) Biobanking management processes implement the governance of a biobank by defining structural requirements, managing resources, establishing reports and documentation and assuring impartiality and confidentiality.

The process landscape model in Figure 2 illustrates the overall requirements of ISO 20387 and identifies clauses with relevant individual processes. It is complemented by the application of a quality management system established according to ISO 20387. It is up to the discretion of a biobank to define its own path through the landscape according its individual activities and to incorporate its processes in an appropriate management system.

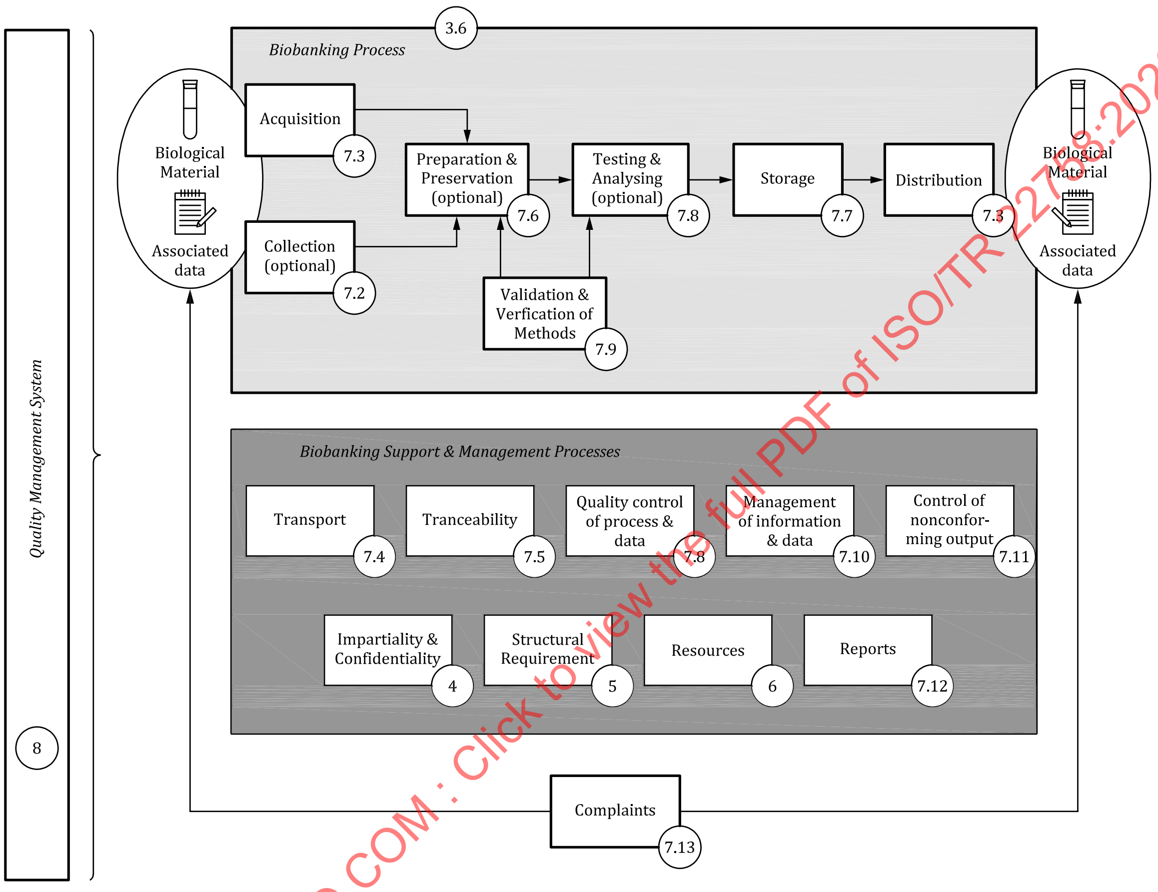

Figure 2 — Components of the biobanking process and its related support and management processes, with encircled numbers corresponding to Clauses of ISO 20387:2018

Each biobank can evaluate its quality management system, encompassing the various requirements for biobanking, supporting fitness of BMaD for intended purpose(s). Biobank management can take the first step in building a quality management system leading to compliance with ISO 20387 by setting appropriate priorities based on their providers' and users' needs, their resources, and their local, regional and national mandates.

It is acknowledged that certain geographical locations can have specific regulations or requirements applicable to professional personnel, their activities, and their responsibilities in this domain. Where biobanking requires adherence to specific standards (e.g., ISO 15189, ISO/IEC 17020) or specific regulations (e.g., Nagoya Protocol[16]), the biobank seeking such recognition can obtain additional appropriate guidance relating to those standards and or regulations. International, national or regional guidance documents also help a biobank in meeting both local requirements as well as those in ISO 20387.

7 Conformity with ISO 20387

7.1 Scopes of Conformity

7.1.1 General

Conformity assessment requires an established scope with relevant objective(s), addressing process goals and the method(s) being used. Each biobank determines the processes or activities that are performed to ensure BMaD FIP in the context of fulfilment of requirements in ISO 20387. This set of compliant processes constitutes the biobank's scope of application, or scope of conformity, of ISO 20387. This scope can be different for every biobank, and addresses each of the following:

a) the range of BMaD pertinent to the biobank. This can include BMaD from multicellular organisms and microorganisms, such as DNA, cell cultures, tissues, viruses, blood, bone marrow, urine, living cultures, seeds, plants and/or data such as characteristics and intended purpose(s);

b) various biobank activities such as acquisition, collection, preparation, preservation, testing, analysis, storage, and distribution;

c) procedure(s) corresponding to the biobank activities including in-house method, standard method and/or cited method for, e.g., snap freezing, deep freezing freeze drying or other preservation techniques, isolation, sequencing, STR DNA Typing, ELISA, PCR, microscopy, stability tests.

NOTE Procedures can include examination technique/method, type of test/analysis, or test/analysis parameters.

For the classification of the biological material, a biobank can choose to follow Globally Unique Identifiers such as Life Science Identifiers[17] or another appropriate source to facilitate interoperability across application domains. Similarly, for the associated data, biobanks can choose to use internationally recognised ontologies such as Minimum Information About BIobank data Sharing (MIABIS).

Figure 3 shows how this translates into practice for an example biobank.

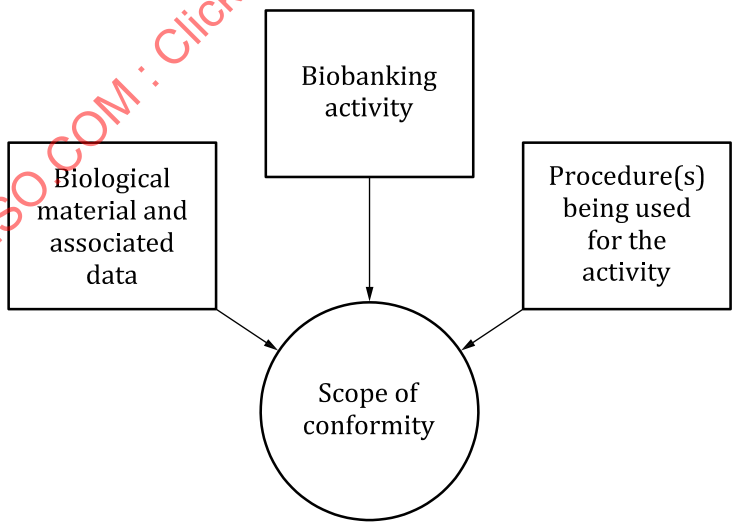

Figure 3 — Scope of conformity in a biobank

7.1.2 Determination of the scope of conformity

An assessment of conformity to ISO 20387 provides an opportunity to demonstrate competence within a defined scope. The scope is defined by the biobank and includes all activities that the biobank wishes to have assessed.

The following is an example of a scope of conformity for a biobank that handles microorganisms:

a) acquisition;

b) preparation and testing:

   1) inoculation;

   2) sequencing;

   3) microscopy;

c) preservation and long time storage:

   1) freeze drying;

   2) liquid nitrogen;

   3) ultra-low temperature;

d) distribution.

7.2 Conformity Assessment (CA) Practices (General aspects and applicability for biobanks)

There are three levels of attestation, or demonstration, of conformity as shown in Table 1. ISO 20387 can be used as a tool for attestation at all three levels of conformity assessment (CA). There are a number of sources that provide guidance on the application of conformity assessment – some of these can be found in the CASCO Toolbox[18].

Table 1 — Levels of possible CA attestation for ISO 20387

Type	Party performing CA	Examples of evidence of attestation
First party CA	Manufacturer or service provider (e.g., biobank)	Self-declaration of conformity
Second party CA	Purchaser or user (e.g., medical researcher)	Conformity assessment report
Third party CA[a]	Accreditation body	Certificate
[a] Accreditation is a form of third party CA.		

Third party assessment for technical competence, which involves an objective independent body evaluation, is known as accreditation. In this case, a certificate of conformity is issued, giving written assurance that a product, process or service conforms to specified requirements.

Links to additional resources materials, including international and national standards settings and accreditation bodies, are provided in the bibliography.

8 Guidance on the interpretation of selected ISO 20387:2018 text parts

8.1 General Requirements (ISO 20387:2018, Clause 4)

8.1.1 General

Clause 4 of ISO 20387:2018 contains a number of general requirements. This document provides further elucidation on the primary concepts treated in ISO 20387:2018, Clause 4.

8.1.2 Impartiality (ISO 20387:2018, 4.2)

ISO 20387 defines impartiality as *presence of objectivity* (according to ISO/IEC 17021-1:2015, 3.2). Biobanks can address the requirements for impartiality by basing actions on objective criteria, thereby avoiding any potential bias, prejudice and/or conflict of interest. Conflicts of interest can arise when the interests of a party could compromise the independent, impartial and objective exercise of an activity.

It can be challenging to avoid conflict of interest in a biobank where quite often the projects are based on scientific collaboration. In many instances the principal investigator is collecting BMaD for a research project in which biobank personnel are co-authors. In such cases, impartiality in biobanking can be supported by following policies and instructions that enable access to biological resources in a fair and equitable manner. Mechanisms for mitigation can include oversight by advisory boards such as science advisory boards, biological material access committees, etc. Additionally, these policies can help support transparency.

8.1.3 Confidentiality (ISO 20387:2018, 4.3)

The requirement to protect confidential information relating to BMaD and involved parties is part of the legal and ethical duty of the biobank. The types of confidential information and its management can vary according to the specific BMaD. Appropriate handling of confidential information can be defined in collaboration with relevant interested parties, considering any legal and/or ethical constraints.

8.2 Structural requirements (20387:2018, Clause 5)

8.2.1 General

The organizational, financial, governance and other structural components of a biobank are often interdependent. Clause 5 of ISO 20387:2018 addresses requirements related to these components. This document provides elucidation on selected sub-clauses treated in ISO 20387:2018, Clause 5.

8.2.2 ISO 20387:2018, 5.1

As long as applicable legal requirements are met, a biobank can be any of the following:

a) a public, private, or other legal entity,

b) an identifiable division or in-house activity of a public, private or other legal entity. The biobank can be part of one or more of the following list: governments, institutions, universities, hospitals, pharma enterprises or non-governmental organizations, etc.

8.2.3 ISO 20387:2018, 5.3

The complexity of the biobank is frequently reflected in the composition and scope of the governance body or advisory board.

8.2.4 ISO 20387:2018, 5.5

In this context, a liability is a legal consequence of a biobank activity.

Examples of potential courses of action are:

a) creation of a statement/agreement of limits of liability;

b) consultation with appropriate legal professionals; or

c) development of a clause within a contract that addresses liability.

Internal audit systems can contribute to risk mitigation. Possession of legal liability insurance or governmental protection from liability can also be appropriate.

A biobank that uses externally provided processes, products and services to conduct any portion of its activities can also consider how to address any associated potential liability issues.

See ISO 20387:2018, 6.4 for externally provided processes, products and services.

8.2.5 ISO 20387:2018, 5.7

The biobank is not obliged to include its entire spectrum of activities under the range of activities for which it conforms to ISO 20387. Typically, a biobank determines the specific activities for which it wishes to claim conformance with ISO 20387; this is also known as the scope of conformity. For example, a biobank can have the ability to perform activities A, B and C; however, it can decide only to claim conformity with ISO 20387 for activity A. The scope of conformity is further addressed in the introduction of this document.

8.2.6 ISO 20387:2018, 5.8, a)

Scientific direction, policy development and implementation, decision making, sponsorship, and oversight are examples of considerations that can help define the governance structure. The structural organization and management components illustrate how functions and responsibilities are assigned, controlled and coordinated in the biobank. The position of the biobank in a parent/host/governing organization (e.g., in a hospital or university), if applicable, is an important part of this assignment. Structure definition may include partnership and interrelationship between partners, in particular when policy responsibilities are shared. An organizational chart and/or a matrix can support the biobank to illustrate and describe its structure.

8.2.7 ISO 20387:2018, 5.9

Depending on the organizational structure of the biobank and/or available resources (such as time, access to relevant information, tools, and management), duties can be distributed among multiple people rather than being assigned to a single person.

If the duties laid out in ISO 20387:2018, 5.7 are covered by more than one person, coordination among these people is important to avoid gaps or overlaps that can threaten consistency affecting quality and quality management.

The biobank can also consider section ISO 20387:2018, 4.2 Impartiality, and ISO 20387:2018, 6.2 Personnel, for further guidance.

This clause addresses the need to ensure that tools, such as the process approach or the Plan-Do-Check-Act (PDCA) cycle (see ISO 20387:2018, 8.2 to 8.9), are consistently applied to strive for continuous improvement and to achieve compliance with the requirements of ISO 20387.

According to ISO 9001:2015, the PDCA cycle can be briefly described as follows:

— Plan: establish the objectives of the system and its processes, and the resources needed to deliver results in accordance with users' requirements and the organizations policies, and identify and address risks and opportunities;

— Do: implement what was planned;

— Check: monitor and (where applicable) measure processes and the resulting products and services against policies, objectives, requirements and planned activities, and report the results;

— Act: take actions to improve the performance as necessary.

The anticipation and consideration of risks and opportunities is an inherent part of the quality management system planning (i.e., setting objectives, defining processes). Examples include:

a) Addressing risks;

EXAMPLE The instability of RNA at room temperature leads to its storage at low temperatures, e.g., in a -80° C freezer. Storing RNA in such a freezer is linked to the risk of freezer failure (e.g., due to power cut or breakdown). Consequently, measures like temperature monitoring and alarm systems are implemented.

b) Addressing opportunities.

EXAMPLE The instability of RNA at room temperature led researchers to develop stabilizing methods. Usage of such stabilizers provides the opportunity to prolong the time between sample collection and processing start (at room temperature) without compromising the quality of RNA.

The risk-based approach is intended to systematically integrate considerations of risks and opportunities into the planning of processes, and to link those to the expected quantity or quality of the process output. This can lead to the observation that some activities in a process are less prone to have a negative impact on the process output than others; consequently they are submitted to less control than others. Or, it can be found out that a specific step in a process is extremely important to achieve the intended sample quality, so that only trained staff and validated equipment can be used.

8.3 Resource requirements (ISO 20387:2018, Clause 6)

8.3.1 General

ISO 20387:2018, Clause 6 contains a number of resource requirements. Resources addressed include personnel, as well as their training and competence, facilities, equipment, and externally provided processes, products, and services. This document provides further elucidation of some primary concepts treated in ISO 20387:2018, Clause 6.

Required resources can vary according to BMaD type, research type, and other activities being performed by the biobank.

8.3.2 ISO 20387:2018, 6.1.2

ISO 20387 requires the biobank to document a strategy to address financial viability. This can be incorporated within some or all of the following:

a) a strategic plan;

b) a business plan;

c) an agreement between the biobank and its funders;

d) a compendium of relevant needs;

e) a sustainability plan.

Periodic strategy reviews can provide an opportunity to assess and refine the needs of the biobank in the context of its current and projected activities.

The biobank can develop a plan to fulfil these needs. Examples include:

— establishing a cost recovery strategy for the provision of services;

— establishing a plan for diversifying funding sources; or

— reviewing the scope of activities, relating this to the availability of resources over time, and adjusting accordingly.

It is acknowledged that change occurs over time. Such changes can be availability of resources, funding sources, scope, or user needs. In such cases, the biobank can adjust its activities accordingly (for example, scaling down of activities, change in custodianship).

8.3.3 ISO 20387:2018, 6.2.1.2

Confidentiality in the context of biobanking is defined in section ISO 20387:2018, 4.3. Binding to confidentiality can be achieved by requiring biobank personnel to sign a confidentiality agreement or non-disclosure agreement.

8.3.4 ISO 20387:2018, 6.2.1.4

It is important that biobank personnel are informed of their duties, responsibilities and authorities. The biobank can consider sharing a complete list of everyone's job responsibilities among its personnel.

8.3.5 ISO 20387:2018, 6.2.2.1

Competent personnel contribute to proficient execution of biobanking tasks, including support functions (e.g., IT, facilities infrastructures, human resources, legal). Job or task descriptions can address any general, managerial and operational activities for which qualification is required. Individual descriptions can include responsibilities, and authorities of biobank personnel, and skills or competencies required to fulfil these activities. Any regulatory or statutory requirements can also be considered (e.g., board certification for pathologists or veterinary pathologists).

These job or task descriptions can be regularly reviewed and updated as appropriate.

8.3.6 ISO 20387:2018, 6.2.2.3

Documented evidence of personnel competence can include job descriptions, training certificates and competence declarations.

A matrix describing personnel and completed training can be useful in the demonstration of competence (see ISO 20387:2018, 6.2.3.1). Consider that some information can be confidential (e.g., personnel details). Auditors can require access even to such confidential information.

8.3.7 ISO 20387:2018, 6.2.3

Training plans aligned with biobank competence needs can be useful. Such training plans can be established for all personnel in the biobank entity and/or for individuals. Identified training needs can be fulfilled by internal training provided by personnel of the organization, or by external training organizations. The biobank can periodically assess the effectiveness of the training, e.g., by a test or evaluation.

8.3.8 ISO 20387:2018, 6.2.3.3

New personnel typically go through a multi-faceted orientation, parts of which are applicable to all (e.g., familiarization with the organization, principles of confidentiality and impartiality, use of information and communication technology tools) and other parts of which are specific to the job (e.g., health and safety requirements, job-specific tasks and tools). This orientation can conclude with approval of the competence of the trainee, and formal authorization to perform the trained activities (see ISO 20387:2018, 6.2.3.2). Depending on biobank competence criteria, the approval can be provisional and subject to further on-the-job evaluation. For specific technical tasks (e.g., quality control tests) it can be helpful to let the job holder perform the test and then compare the obtained results with expected results.

8.3.9 ISO 20387:2018, 6.3

The biobank facilities and environmental conditions can have a significant impact on quality, integrity, security, and FIP of BMaD as well as health and safety of personnel. Some potential considerations are shown in Figure 4.

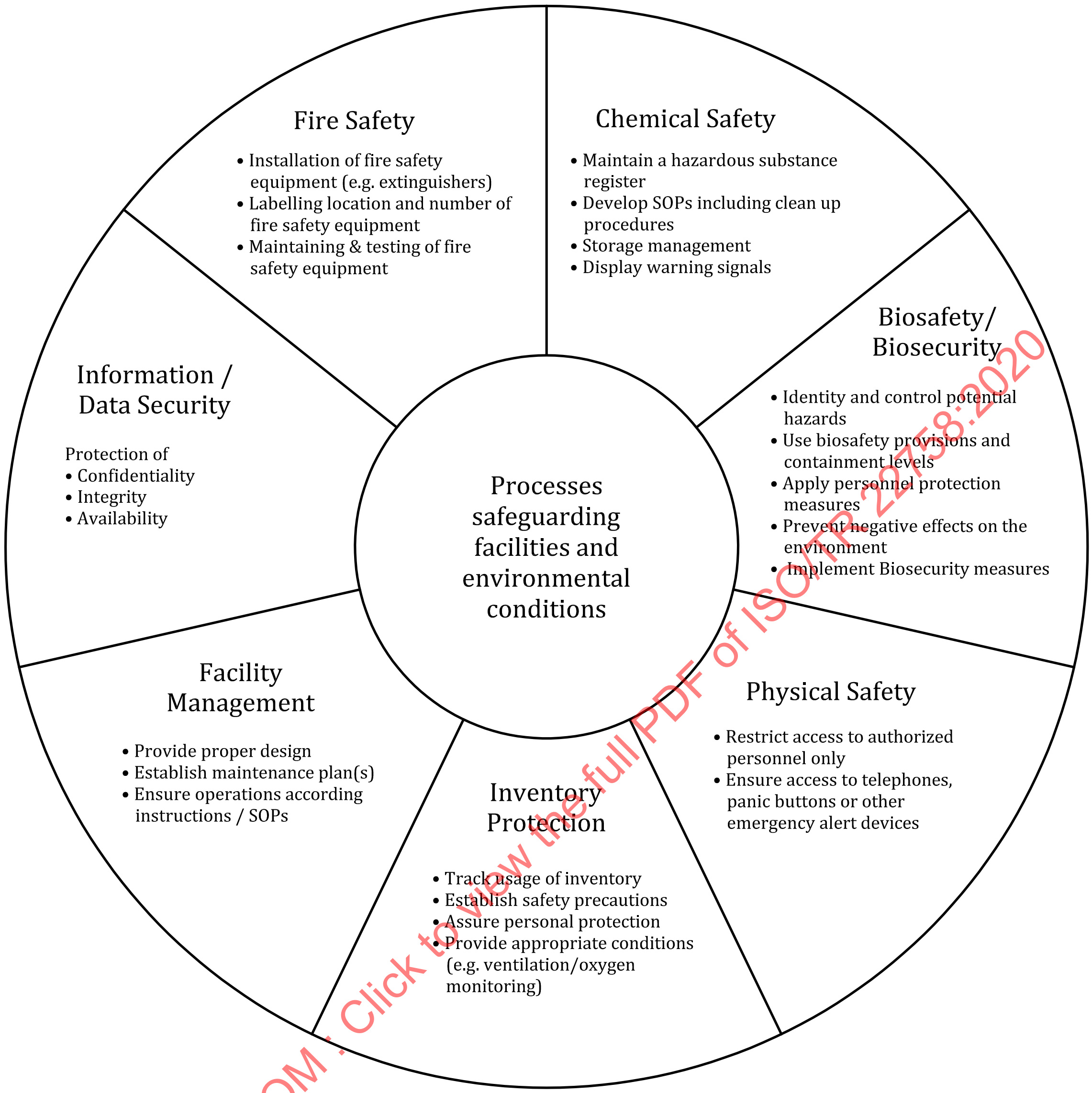

Figure 4 — Considerations related to Processes for Safeguarding Facilities and Environmental Conditions

Facilities/dedicated areas and environmental conditions can include a number of structural and organisational components, such as buildings, utilities and workspaces used for biobank operations as well as biobank policies and practices. In addition, this includes equipment such as hardware and software, information and communication technology, security and other services (environmental monitoring, control and recording access, remote control, etc.). Any required redundancies (e.g., back-up storage units, alternative energy supplies) whether or not the sole property of the biobank, can also be included.

8.3.10 ISO 20387:2018, 6.3.2

A biobank can consider having a maintenance plan in place to ensure conformity with defined quality control criteria.

A biosecurity policy can include restriction and controlled access to critical areas, biological resources, and confidential data, as appropriate. A biobank's access procedure can refer to records of external visitors and appropriate visitor protection.

Further information on "fitness for the intended purpose" is found in Clause 5 of this document.

8.3.11 ISO 20387:2018, 6.3.3

Incompatible activities include any actions taken by personnel or any activities adversely affecting the quality of BMaD within the biobank, e.g., cross-contamination. Each occurrence of an incompatible activity can be evaluated and resolved on a case-by-case basis.

Separation of incompatible activities can be achieved by, for example:

a) performing such activities in separate rooms or dedicated areas;

b) performing such activities at different time points with adequate preparation (e.g., cleaning, calibration, etc.); and/or

c) defining pathways that avoid crossing of incompatible BMaD.

If the biobank shares its infrastructure with other organizations, it is particularly important to assess activities for potential incompatibilities. In addition to the measures mentioned above, a safety policy can be established such as clear indication of infectious risks, appropriate decontamination, sterility, and confinement regimes, etc. A collaboration agreement or operational procedure between the biobank and the parties with which it shares the infrastructure can be implemented.

8.3.12 ISO 20387:2018, 6.3.5

Environmental conditions can impact the results of biobank activities and fitness for the intended purpose of BMaD, and/or the health and safety of personnel. It is therefore helpful that the biobank monitors and controls the relevant environmental conditions within its infrastructure.

The biobank can use a risk-based approach to identify environmental conditions (e.g., temperature, humidity, air pressure, etc.) likely to affect BMaD, and/or health and safety of personnel. The biobank can consider supplier specifications, relevant regulations, best practices, or other sources, including those published in the literature.

The biobank can then develop and implement a monitoring and control plan for the identified environmental conditions. Monitoring can be performed and recorded on a continuous basis or at regular predefined intervals. The biobank can document actions taken for environmental conditions outside acceptable ranges.

8.3.13 ISO 20387:2018, 6.3.7

The biobank can evaluate the risk of potential damage to BMaD. A contingency plan based on this risk evaluation supports mitigation of the effects. Mitigation examples that can support a contingency plan can include alternative storage sites, avoidance of basement and surface level storage, and post disaster activities such as disinfection of environment, etc. Mitigation of the risk of data loss can also be considered (such as an information back-up system). See also ISO 20387:2018, 7.7.1, 7.7.2 and 8.5.2.

Further references are given in ISBER Best Practices 4th Edition B5, B7, B8, C9, I2 and I12[19].

8.3.14 ISO 20387:2018, 6.4.1.1

Externally provided processes, products and services are characterized as being supplied by a legal entity (or part thereof) that is not the biobank. An agreement between the provider and the biobank can contribute to compliance with the requirements described in ISO 20387:2018, 6.4.

8.3.15 ISO 20387:2018, 6.4.1.5

Verification of compliance can be performed by the external provider according to agreed-upon processes and/or by the biobank based on pre-determined quality control measures. Examples of how external providers can be monitored are:

a) review of external provider internal audits (first party audits); and/or

b) biobank audits of the external provider (second party audits).

8.3.16 ISO 20387:2018, 6.4.1.6

For externally provided activities addressed in this sub-clause, validation is discussed in ISO 20387:2018, 7.9.2.

8.3.17 ISO 20387:2018, 6.5.1

The objective of controlled access is to be able to use equipment in a controlled way, at the time of need.

Before use, equipment can be checked to ensure fitness for purpose. This can for example be achieved through an assurance that equipment is stable with respect to any characteristics that can affect BMaD quality.

If the biobank does not have complete ownership of all equipment needed for accomplishing its tasks, it needs to have access to equipment outside its ownership. In such circumstances, the biobank needs to have adequate knowledge of the conditions under which it is being utilized, e.g., by verification.

8.3.18 ISO 20387:2018, 6.5.3

The manufacturer instructions can be sufficient as instructions for use.

8.3.19 ISO 20387:2018, 6.5.6

This task can be done by the supplier, a service contractor or the biobank.

8.3.20 ISO 20387:2018, 6.5.10

Metrological traceability supports comparability among biobanks. For example, many biobanks need confidence in their temperature measurements during transport and storage. This confidence can be established and quantified by comparison of the measurement result with that of a reference material with a known (“true”) value and its related uncertainty.

For measurements based upon SI or SI-derived units, this comparison is achieved via internationally acknowledged (standard or certified) reference materials (e.g., calibration of a balance with a reference weight or a temperature probe calibrated against an international or national reference standard).

In the case of measurements not based upon SI or SI-derived units (e.g., Fluometric units), such standards either do not exist or are not internationally recognized. In such cases, the biobank can produce and use its own standards or reference materials to establish at least internal confidence of constantly reliable measurements.

Participation in external quality assessment programs or proficiency testing programs can also be appropriate.

NOTE Further information can be found in ISO 9001, ISO/IEC 17025, and ISO/IEC Guide 99:2007.

8.3.21 ISO 20387:2018, 6.5.11

The biobank can designate a person to be responsible for taking care of equipment which has been found to be non-compliant. The designated person(s) can label such equipment as non-compliant and take actions as appropriate.

8.3.22 ISO 20387:2018, 6.5.12

For example, during a calibration, personnel might notice that a thermometer has failed. Such a discovery can imply that temperature measurements taken prior to discovery of the failure could be compromised, warranting further investigation of historical measurements.

8.4 Process requirements (ISO 20387:2018, Clause 7)

8.4.1 General

ISO 20387:2018, Clause 7 contains process requirements for biobanking. This document provides further elucidation on the primary concepts treated in ISO 20387:2018, Clause 7.

8.4.2 ISO 20387:2018, 7.1.1

The biobank can meet this series of requirements by describing all processes that occur during the life cycle of a BMaD that potentially affect its FIP.

The life cycle stages typically include collection/acquisition, analysis, processing, storage, access, and distribution, and can vary from biobank to biobank. BMaD life cycle is usually influenced by the biobank's scope, quality control requirements, and user agreements.

The biobank's responsibility is limited to BMaD life cycle stages under its control, and includes internal as well as external subcontracted processes, when applicable. A schematic workflow scheme supports the biobank through a concise description of the processes and their sequence from collection to disposal.

See 5.2 for more information.

8.4.3 ISO 20387:2018, 7.2.1.1

During collection and/or acquisition the biobank defines and acquires all relevant information regarded as necessary to accomplish the objectives of the biobank. This can include information that supports the achievement of fitness for an intended purpose.

Information such as taxonomic data, timestamp, date, place and procedure of collection or proliferation is predetermined per ISO 20387:2018 and as documented in its Annex A with examples as shown in its Annex B. Note that the date and timestamp are documented in a standard format according to ISO 8601-1, where possible.

8.4.4 ISO 20387:2018, 7.2.3.4

A wide variety of ethical requirements can apply to biobanks, depending upon the nature and type of biobank, the BMaD, and any applicable international, national and local regulations and policies. Ethical requirements do specifically apply to biobanking of human BMaD and can include:

a) ethics committee review(s) and approval(s);

b) either informed consent from the patient/donor/legal representative, or waiver of informed consent in certain circumstances.

In addition, other relevant requirements can apply to the associated data, such as those related to privacy, confidentiality and data protection as well as specific data, such as medical record, and genetic and genomic data.

Prior to collection of BMaD, biobanks can consult with appropriate regulatory and ethical officials to determine any relevant ethical requirements.

8.4.5 ISO 20387:2018, 7.3.1.1

Different parties can be involved in the definition of the principles governing access to and distribution of BMaD and can include, consistent with the established governance plan:

— the biobank manager and/or manager of a specific collection of BMaD;

— the "custodian" or an individual designated with decision-making authority on behalf of the biobank;

— institutional leadership; and/or

— those involved in the governance of the biobank.

Important principles to keep in mind when developing policies and procedures for access and distribution of BMaD can include transparency, accountability, freedom from conflicts of interests, and responsible use of resources.

Principles governing access to and distribution of BMaD can include scientific considerations such as:

a) appropriateness of the use of the biological materials;

b) scientific merit and potential impact of the use;

c) research design;

d) availability of funding, experience and qualifications of the investigators; and

e) availability and adequacy of research facilities and equipment, etc.

Ethical and legal considerations and requirements can also guide access to and distribution of BMaD. These can include:

— compliance with ethical and regulatory requirements (such as human subjects, privacy and data protection regulations or the Convention on Biological Diversity – Nagoya Protocol[16]);

— benefits and risks to donors, populations and society at large;

— protection of the privacy of donors and the confidentiality of their data;

— consistency of the research use with informed consent (where relevant);

— any contractual obligations associated with the use of the materials; and

— documentation of any regulatory approvals.

The principles governing access to and distribution of BMaD can be documented in a variety of ways such as through SOPs, governance or custodianship plans and can be described and published on the biobank website or any other appropriate media, particularly if the intent of the biobank is to provide BMaD for research purposes beyond local (i.e., intra-institutional) use.

Biobanks can use a variety of ways to ensure that the documented requirements that are established with interested parties comply with these principles. This can be achieved through the use of Material Transfer or Data Use Agreements, or other contractual or non-contractual agreements that describe the obligations of the user of the BMaD.

8.4.6 ISO 20387:2018, 7.3.2.4

The segregation of BMaD can be in assigned and/or marked areas. This segregation can be physical or virtual, as long as it is identifiable. Quality compliance is further explored in ISO 20387:2018, 7.8.

8.4.7 ISO 20387:2018, 7.3.2.5

BMaD characteristics associated with 'fitness for the intended purpose' are defined and documented by the biobank, and, when applicable, in conjunction with the recipient/user.