# Rigor in collaborative research

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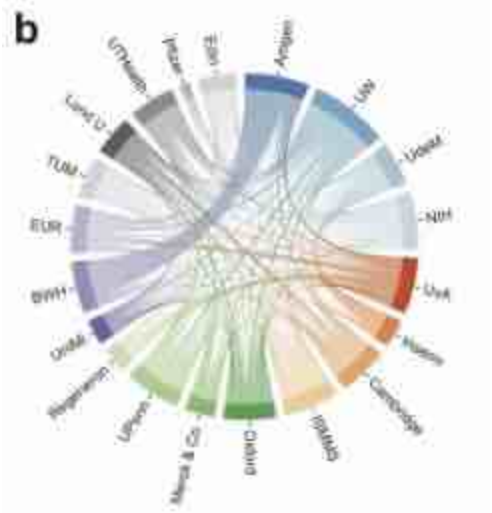
# Importance of scientific collaborations

**Increased complexity of modern research led to rise in the scale and importance of scientific collaboration:**

- Collaboration means greater creativity, more experience, higher number of available techniques
- Collaboration enables to carry out “deeper” research, test novel approaches, new technologies, new hypotheses

**With whom do researchers collaborate:**

- Researchers from the same organization (in-house)
- Researchers from academic and non-academic organizations (institutional - pharma)
- Core facilities (in-house & institutional)
- Researchers from other countries (international)

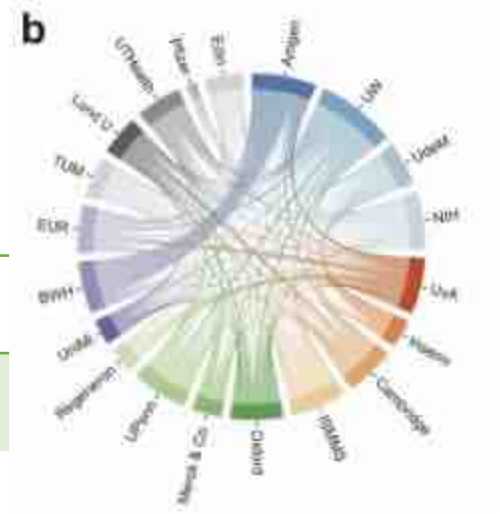



*BMC Biol* **18,** 138 (2020) Collaboration network in the discovery of PCSK9

# Importance of scientific collaborations - Industry

## Need for collaborations is driven by rising complexity of the R&D process

| External R&D models | Description |
|---|---|
| Pharma-academic partnership | Funding an academic investigator |
| Open crowdsourcing | Awarding proposals of external scientists |
| Academic centers of excellence | Master agreements with one (or more) universities |
| Biotech co-creation | Funding biotech start-ups |
| Pharmaceutical peers risk sharing | Two (or more) pharmaceutical companies co-develop clinical candidates |
| Innovation centres | Creating a regional centre in a biomedical hub |



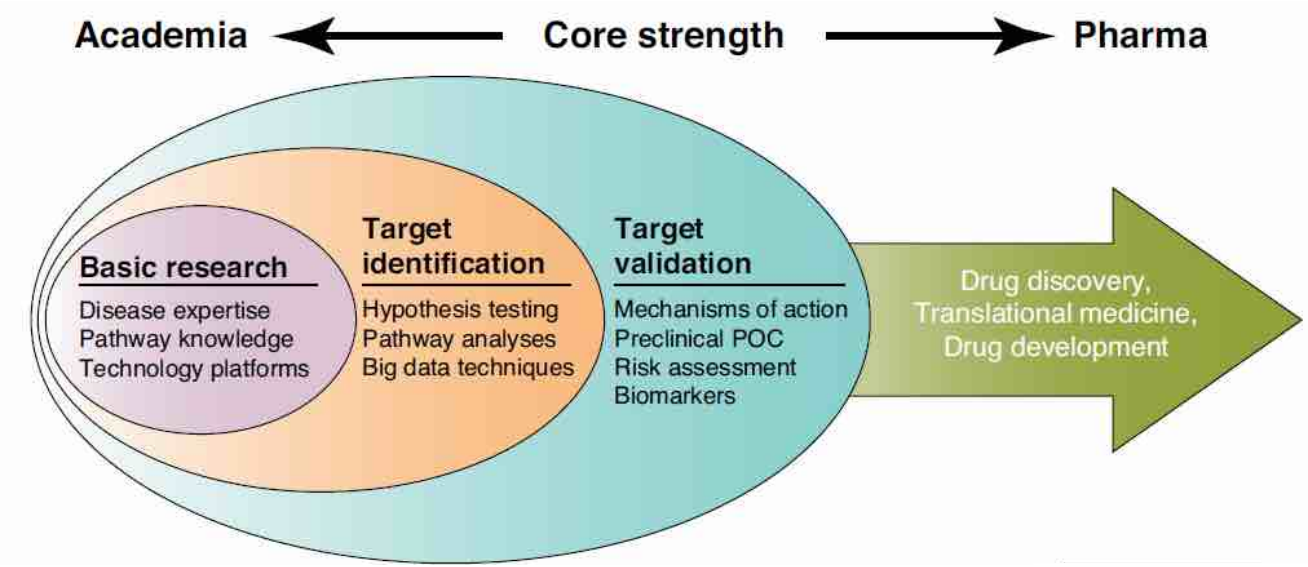

*BMC Biol* **18,** 138 (2020) Collaboration network in the discovery of PCSK9

Wang et al., Drug Discovery Today, 2015

# Benefits of scientific collaborations – Industry

## Knowledge

- Profit from highly qualified human resources such as academic researchers or students
- Gain access to technology and research infrastructure
- Lower R&D costs
- Faster discovery and development of new medicines

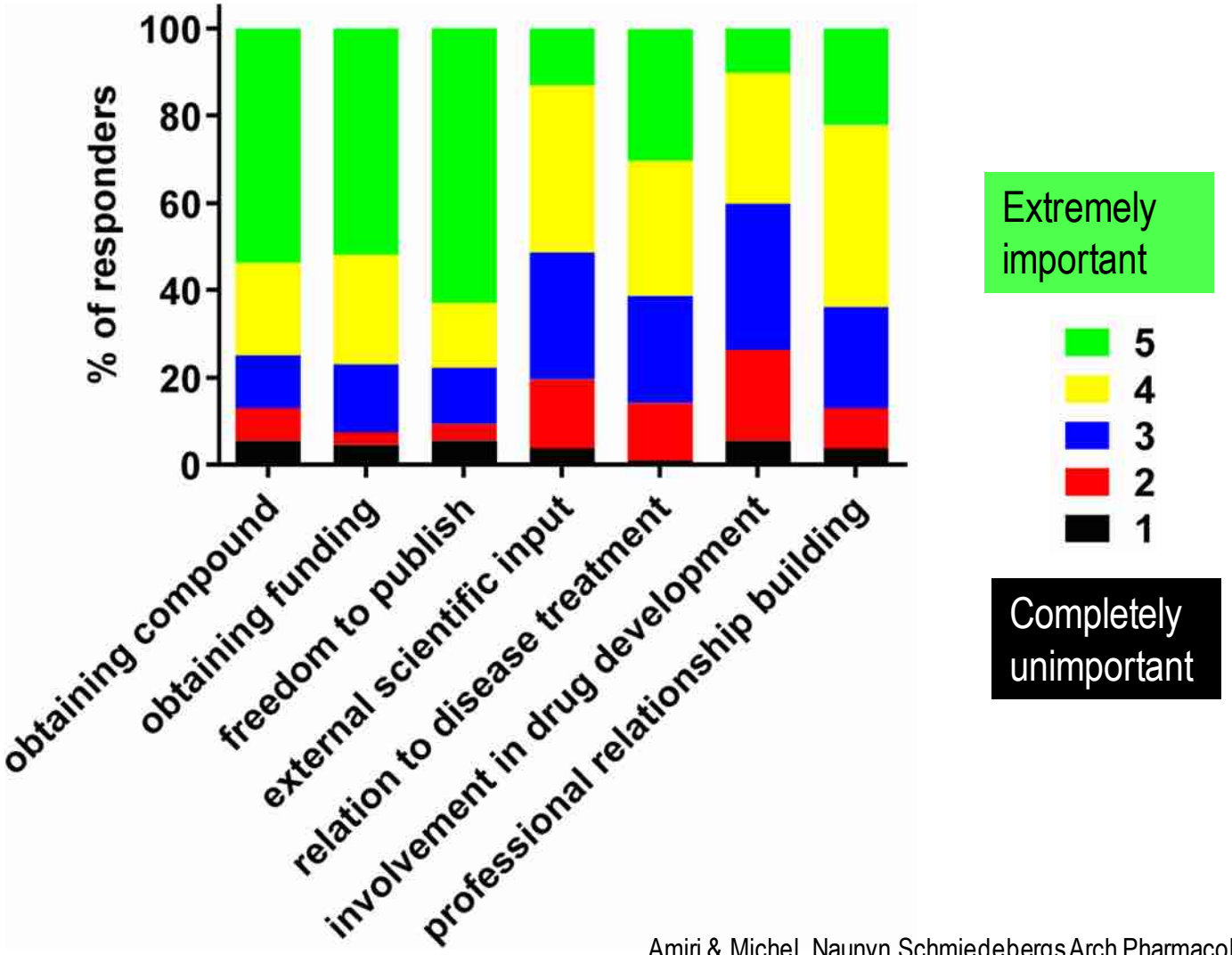



Wang et al., Drug Discovery Today, 2015

# Importance of scientific collaborations - Academia

Why collaborations with the pharmaceutical industry are important for academic researchers?

- Not important for external scientific input and involvement in drug development
- Extremely important for obtaining compounds and funding, for publishing




Amiri & Michel, Naunyn Schmiedebergs Arch Pharmacol, 2015

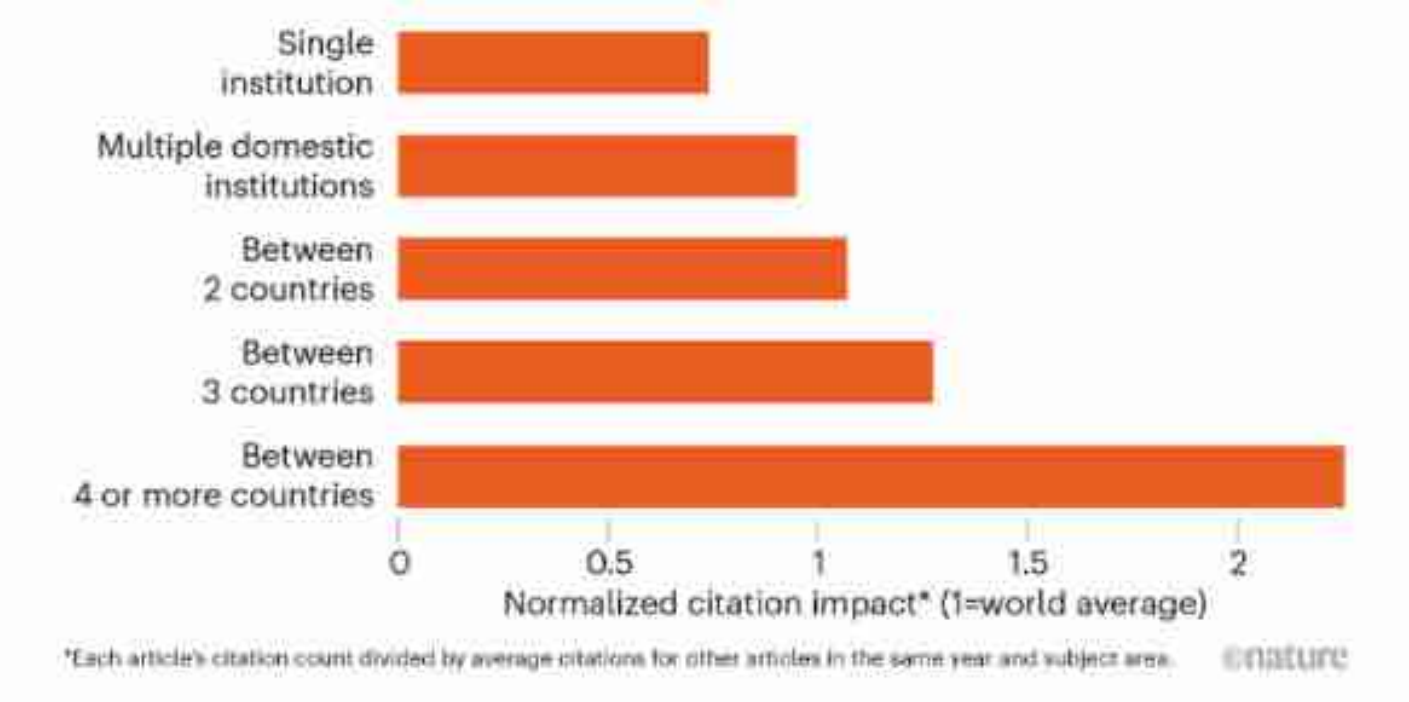
# Benefits of scientific collaborations – Academia

- Collaboration with industry has become a considerable part of academia funding
- Getting funding is easier in the context of a collaboration
- Many funders support (or require) partnerships between countries.
  - The European Commission established a mechanism to support partnership between countries:
    - Teaming: 2 collaborators
    - Twinning: min. 3 collaborators
    - European Cooperation in Science and Technology (COST): min. 20 collaborators
    - Innovative Medicines Initiative (IMI): diverse range of partners in a Public Private Partnership

# Benefits of scientific collaborations – Academia Publishing

## Citation counts increase with collaboration

Web of Sciences articles data, publication years 2009-2018




Quantifying the benefits of international scientific collaboration demonstrate that the impact of scientific production increases with an increase in the number of collaborating countries.

Maher & Van Noorden, 594: 316-319, Nature 2021

# COVID-19 pandemic – Effects in collaboration?

- Greater connectivity and blurred geographical boundaries
- "**Hyper-collaboration**" as innovation ecosystems

- Open mind-set to share knowledge, data, information
- Pre-competitive information sharing has accelerated competitive novel product development
- Use of "pre-print servers" to share findings in real time for review by a broad community of peers
- Some journals have even required submissions on a pre-print server first

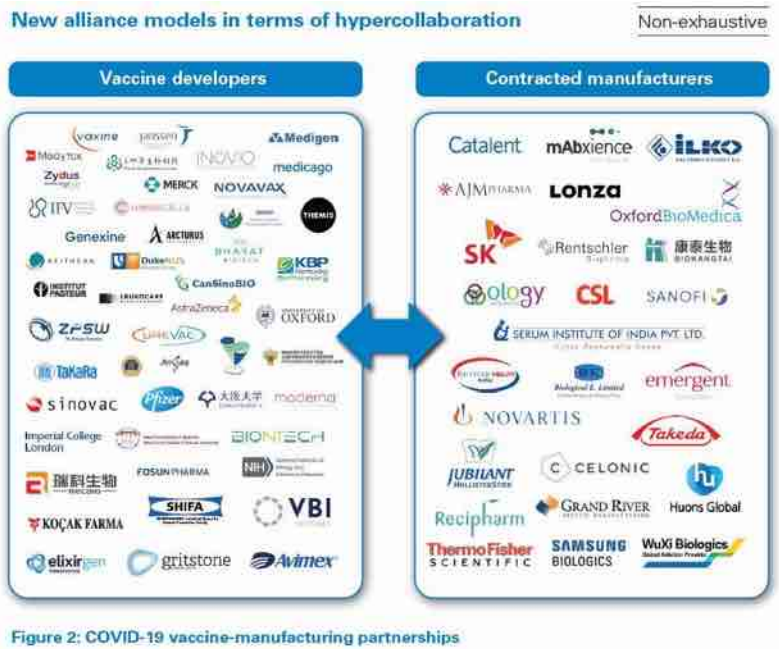


Figure 2: COVID-19 vaccine-manufacturing partnerships

- This trend has not been without controversy, sometimes elevating **premature or lower quality work**!
- The open-access platforms recognize the need for **more rigor and standards** and are moving in that direction

https://www.adlittle.com/en/insights/prism/hyper-collaboration-healthcare-and-life-science-industry

# Benefits of scientific collaborations

Collaborations increase your chances of being successful…

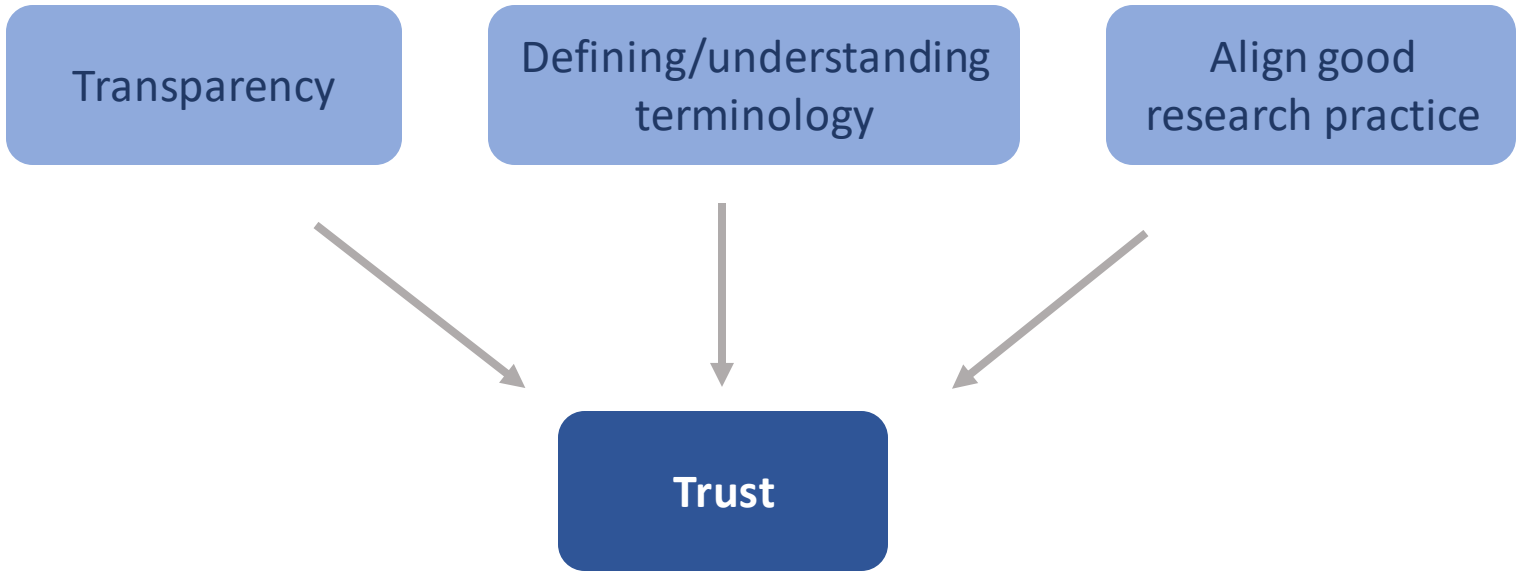
…but there are challenges!

# Challenges related to scientific collaborations

What if

- You started a collaboration with someone you do not know
- You don't speak the same 'language' as your partner and have different (*quality*) expectations:
  - Understanding of terms (e.g. "randomization") between collaboration partners turns out to be different
  - You received data with "broken" or missing traceability and meta-data was not clearly reported

# What can you do to support successful collaborations?



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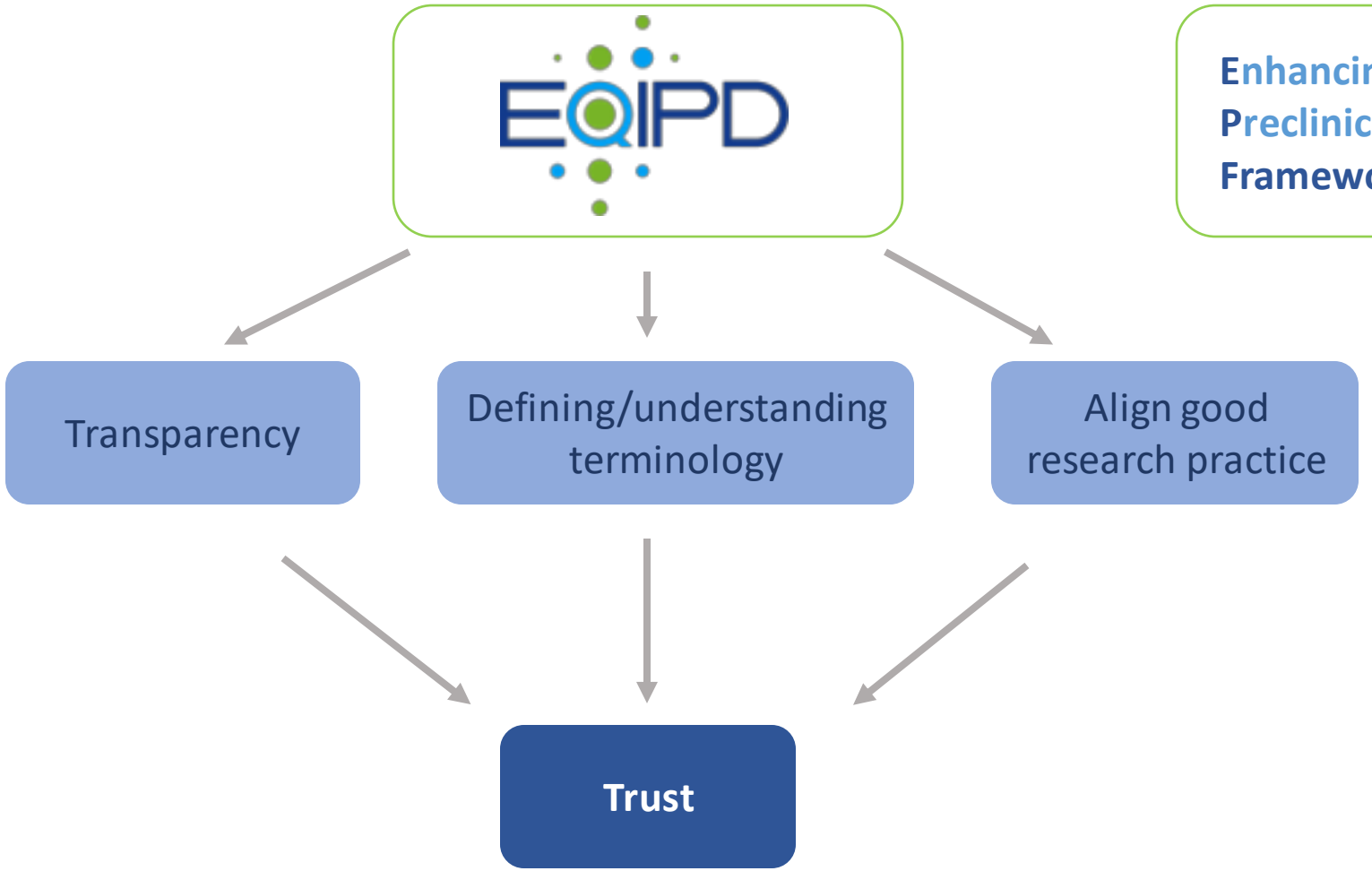



**Enhancing Quality In Preclinical Data (EQIPD) Framework**

# EQIPD Solutions

**Framework** supports research collaboration by:

- Providing recommendations regarding various aspects of research rigor
- Facilitating decision-making regarding selection of research partners
- Increasing confidence in data delivered by collaborators

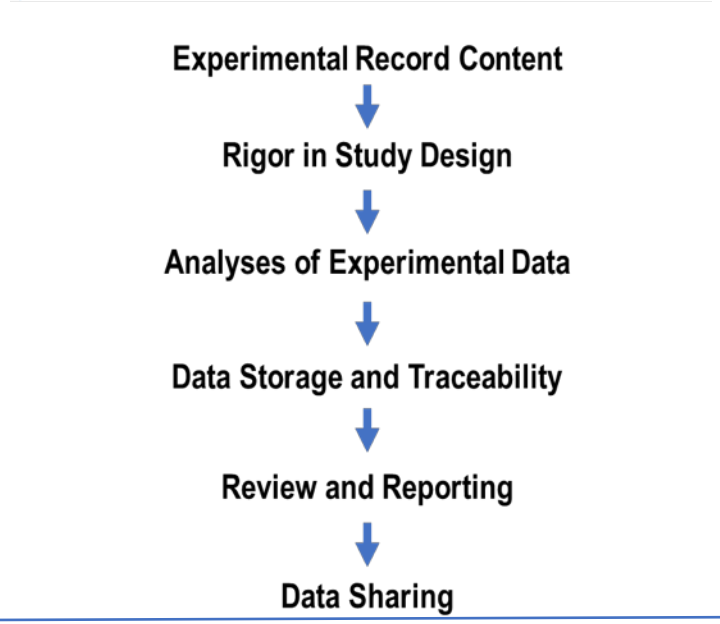
1.
EQIPD guidance on
**Industry-Academia collaboration**

2.
EQIPD guidance on
**Academia-Academia Service from Core Facilities**

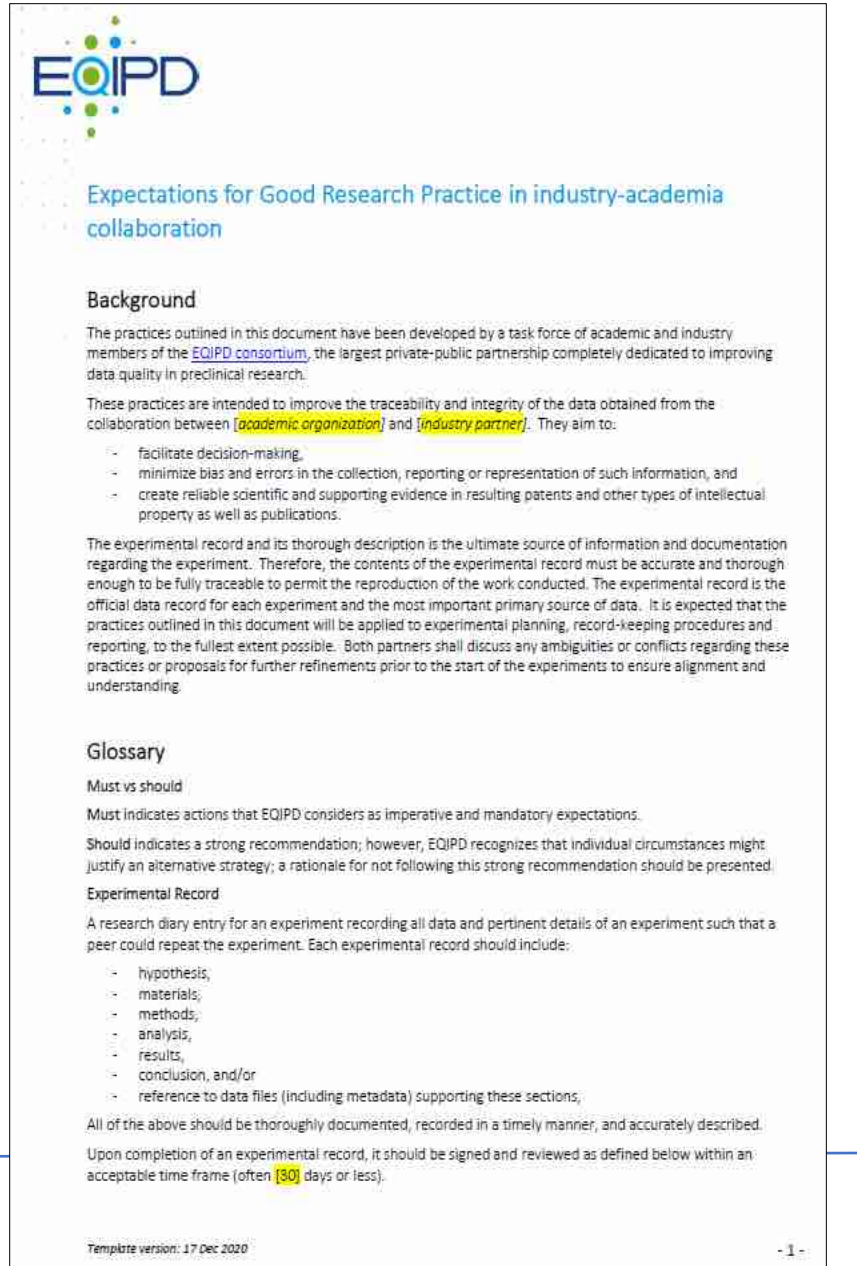
# 1. Guidance on Industry-Academia collaboration

## A joint effort by academia and industry to:

- Facilitate decision-making
- Minimize bias and errors in the collection, reporting or representation of the data
- Improve data storage, traceability and integrity
- Create reliable scientific and supporting evidence for different types of research output (publications, patents)




https://eqipd-toolbox.paasp.net/wiki/1.4.3.3_Academia-academia:_Research_as_service



EQIPD

Expectations for Good Research Practice in industry-academia collaboration

Background

The practices outlined in this document have been developed by a task force of academic and industry members of the EQIPD consortium, the largest private-public partnership completely dedicated to improving data quality in preclinical research.

These practices are intended to improve the traceability and integrity of the data obtained from the collaboration between [*academic organization*] and [*industry partner*]. They aim to:

- facilitate decision-making,
- minimize bias and errors in the collection, reporting or representation of such information, and
- create reliable scientific and supporting evidence in resulting patents and other types of intellectual property as well as publications.

The experimental record and its thorough description is the ultimate source of information and documentation regarding the experiment. Therefore, the contents of the experimental record must be accurate and thorough enough to be fully traceable to permit the reproduction of the work conducted. The experimental record is the official data record for each experiment and the most important primary source of data. It is expected that the practices outlined in this document will be applied to experimental planning, record-keeping procedures and reporting, to the fullest extent possible. Both partners shall discuss any ambiguities or conflicts regarding these practices or proposals for further refinements prior to the start of the experiments to ensure alignment and understanding.

Glossary

Must vs should

Must indicates actions that EQIPD considers as imperative and mandatory expectations.

Should indicates a strong recommendation; however, EQIPD recognizes that individual circumstances might justify an alternative strategy; a rationale for not following this strong recommendation should be presented.

Experimental Record

A research diary entry for an experiment recording all data and pertinent details of an experiment such that a peer could repeat the experiment. Each experimental record should include:

- hypothesis,
- materials,
- methods,
- analysis,
- results,
- conclusion, and/or
- reference to data files (including metadata) supporting these sections,

All of the above should be thoroughly documented, recorded in a timely manner, and accurately described.

Upon completion of an experimental record, it should be signed and reviewed as defined below within an acceptable time frame (often [30] days or less).

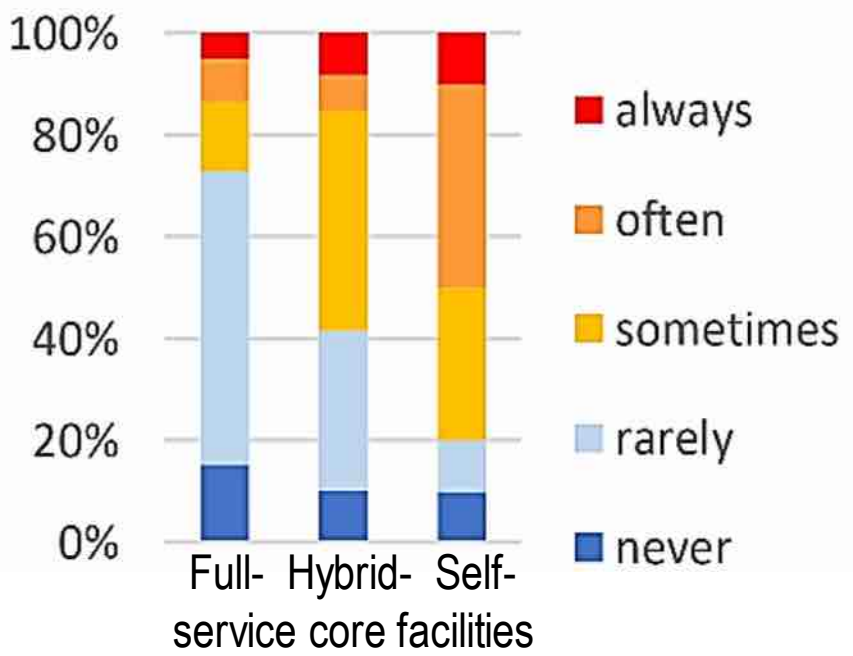
*Template version: 17 Dec 2020*

# Research quality in core facilities

Core facilities have a central position in many areas of research in the life sciences because they:

- Provide access to state-of-the-art equipment and advanced skills
- Develop new technologies and transfer their technical and research expertise to scientists
- Connect institutions and foster collaborations and interdisciplinary research
- Generate a substantial fraction of the scientific data, thereby offering protection against bias in the design and analysis of experiments, and supporting transparency, rigor and reproducibility.

Can a user proceed with samples of poor quality?



# 2. Guidance on research supported by CF

## A working group drafted a Memorandum of Understanding

**Training**

↓

**Experimental Record**

↓

**Data Storage and Traceability**

↓

**Review and Reporting**

**Towards best practices in research**
**Role of academic core facilities**
Restivo et.al EMBO Rep (2021)e53824
https://doi.org/10.15252/embr.202153824

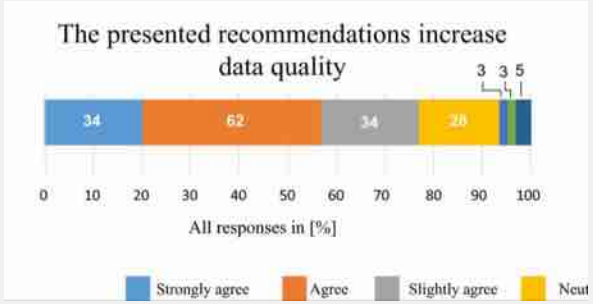



Figure 1. E
Responses to the survey
from 172 Core Facilities

EQIPD

### Expectations for Best Practices in Research Supported by Academic Core Facilities

#### 1. Background

The recommendations outlined in this document have been developed by a working group of members and stakeholders of the EQIPD consortium, the largest private-public partnership completely dedicated to improving data quality in preclinical research.

These recommendations are intended to improve the robustness, reliability, traceability and integrity of the data obtained from the research activities supported by academic core facilities (CF).

By sharing these recommendation, they aim to:

- clarify communication between CF and the users of the services and infrastructure provided by the CF in respect to best practices,
- minimize bias and errors in the collection, reporting or representation of data, and
- create reliable scientific and supporting evidence in resulting publications, presentations, reports, patents and other types of research output.

The experimental record is the ultimate source of information and documentation regarding the experiment. Therefore, the contents of the experimental record must be accurate and traceable to permit the reproduction of the work. The experimental record is the official data record for each experiment and the primary source of data. It is expected that the recommendations outlined in this document will be applied to experimental planning, record-keeping procedures and reporting, to the fullest extent possible.

Recognizing the diversity of environments and settings in which core facilities operate, the current recommendations can be used in two modes - "Regular Service" and "EQIPD Service".

It is expected that CF and their users discuss both types of services, any ambiguities or conflicts regarding the recommended practices, and ensure alignment and understanding prior to the start of the experiments.

Core Facilities provide the users with information about research practices recommended by EQIPD (link) and offers to support best research practices.

**The user has the choice between two different types of service**

**Regular Service**

- The Core Facility decides how information about research practices recommended by EQIPD is shared with the users (e.g., made part of a training program, shared as a written summary in paper or electronic form).
- Unless requested by the users or otherwise enabled, **the Core Facility does not assume any further role** in supporting or monitoring the implementation of recommended practices for the user.

**EQIPD Service**

- The Core Facility has implemented the EQIPD recommendations to enable support of EQIPD compliant research to the user.
- Together with the user (and supervisor/PI if necessary), the Core Facility identifies the best solutions to implement specific recommendations for the user's research.
- Core Facility assumes responsibility over spot checks (requires acceptance by the user if certain recommendations are implemented on the user's side)
- **Core Facility confirms to the user that the study was conducted as "EQIPD compliant"** or not (e.g. to be stated in the report or in a publication)

*Template version: 3 August 2021*

https://doi.org/10.15252/embr.202153824

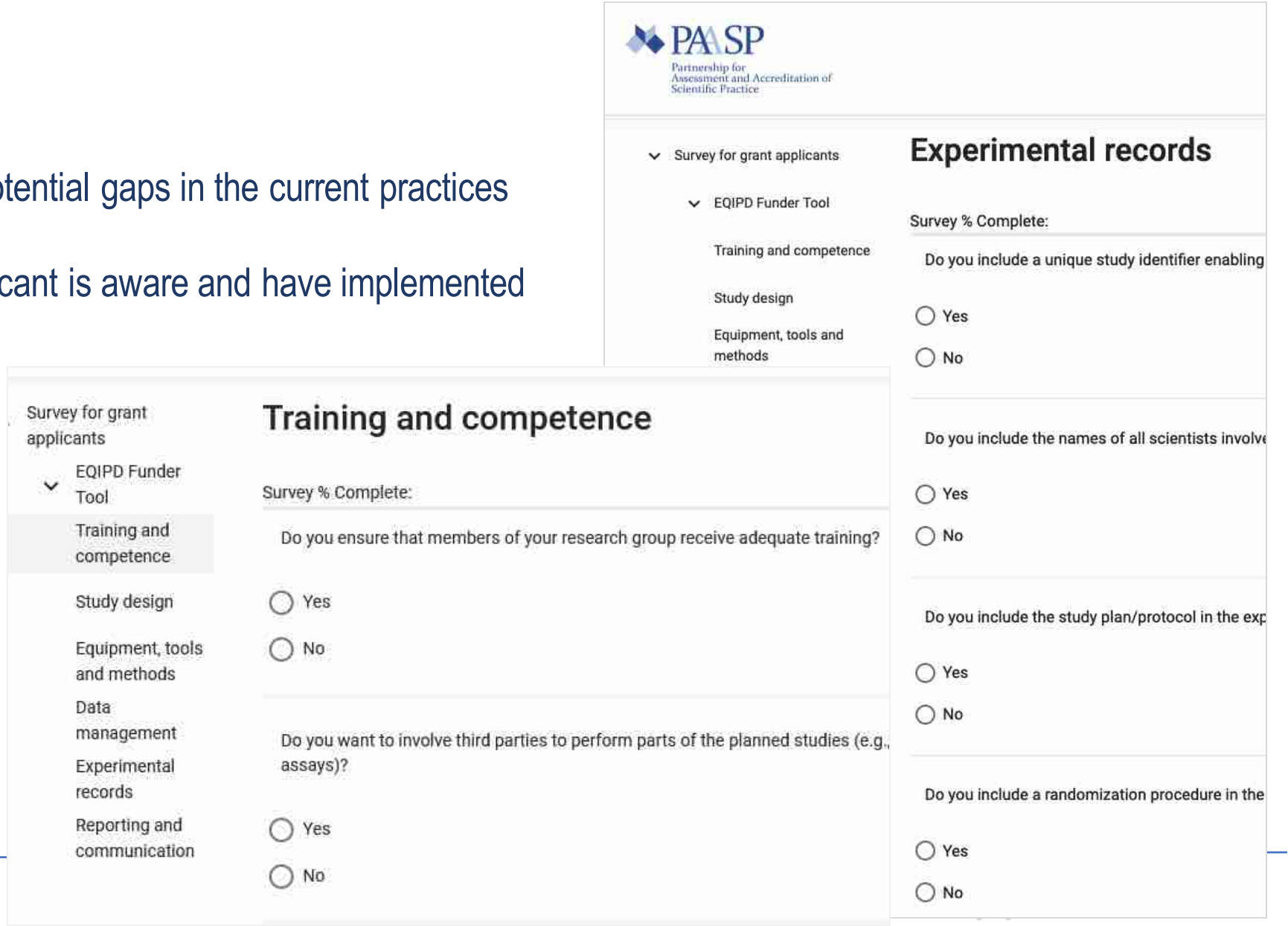
# Other Tools

## Tool for Funders

Designed by an EQIPD working group
Primary use to help scientists identify potential gaps in the current practices
Creates a "snapshot"
To demonstrate to funders that the applicant is aware and have implemented quality measures

- 20 minutes to complete
- Free for anyone to use
- Available on-line

https://public-funding-tool.paasp.net/home



# Other Tools

## Quality modules for grant applications

Example

Module 1 – Initial assessments and research rigor planning
Module 2 – General training
Module 3 – Spot checks, critical incident and error management
Module 4 – Data quality control (QC), final report
Module 5 – EQIPD implementation and certification

# Discussion

- Do you have experience with collaborative research? Current, past, planned
- Is there a push for collaboration in Brazil?
- What was positive in your experience?
- What was not so positive?
- How would you define a good collaboration?
- What would you recommend to do to identify good collaboration opportunity?
- What can be done to avoid bad experiences?
- How do you feel about pre-prints?