



*Innovative Tools for Assessment and Authentication  
of chicken meat, beef and dairy products' QualiTies*

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## Deliverable 5.1

# Data Management Plan (DMP)

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<b>DEC</b>	Websites, patent fillings, videos, etc.	<input type="checkbox"/>	
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# 1. Executive Summary

This document describes the first version of the INTAQT Data Management Plan (DMP). The first part of this report will describe the datasets analysed in the different workpackages as foreseen by the initial workplan. The second part of this report will indicate the rules implemented by INTAQT to comply with the Open Research Data policy in the context of EU-funded projects. Because most of the protocols are still under development, the description of datasets and of their metadata will be updated in the coming months and years.

## **Summary of the project:**

The INTAQT project launched in June 2021, gathers 20 partners from 10 countries, among which different actors of the production chain from farmers to consumers. It will perform a multi-criteria assessment of the relationships between animal husbandry and intrinsic qualities of products (chicken, beef and dairy products).

## **The precise objectives are:**

- i. to develop comprehensive models of the impact of farming systems on quality traits (safety, nutritional value and sensory features),
- ii. to co-construct with food chain actors rapid and cost-effective analytical tools for the prediction of the intrinsic quality of livestock products and authentication of the production systems,
- iii. to co-construct with the food chain actors and consumers multi-criteria scoring tools of the various components of the intrinsic quality of products,
- iv. to promote innovative husbandry practices complying with high product quality and sustainability in both extensive and intensive farming systems.

The **objectives of this Data Management Plan** are to:

- i. describe the nature of data used or generated and collected by the project (dataset reference and name, dataset description, standards and metadata),
- ii. define the data sharing strategy based on the FAIR principles (data should be findable, accessible, interoperable and re-usable),
- iii. identify the data management tools (data archiving and preservation),
- iv. ensure that data management policy is in line with the project consortium agreement.

## 2. Introduction

INTAQT partners participate in the Pilot on Open Research Data in Horizon 2020, which aims to improve and maximise access to and re-use of research data generated by actions. However, participation in the Pilot is flexible in the sense that it does not mean that all research data needs to be open. Thereafter, participants have formulated this Data Management Plan (DMP), which addresses the relevant aspects of making data FAIR – findable, accessible, interoperable and re-usable, including what data the project will use or generate, whether and how it will be made accessible for verification and re-use, and how it will be curated and preserved. Through this DMP, projects can define certain datasets to remain closed according to the principle "as open as possible, as closed as necessary".

## 3. Datasets analysed in the different workpackages

### 3.1. Brief presentation of project data

Owing to the 'INTAQT interdisciplinary approach, several types of data are expected to be generated and collected: (1) data from the literature (both scientific and grey), discussions and interviews of relevant stakeholders through the multi-actor approach (WP1), (2) questionnaire and datasets to characterise farming systems, sustainability of farms, innovative practices and animal product samples (WP2), (3) intrinsic quality measurements to better characterise animal products in terms of safety, nutritional value and sensory features (WP3), (4) data generated by innovative analytical tools for rapid quality assessment (e.g. infrared spectra, molecular markers, DNA genotyping) (WP4), (5) predictive models using specific informatic tools (WP5). All the experimental datasets from WP1, WP2, WP3 and WP4, as well as from literature and public repositories, will be collected, curated and ontologically annotated for the 'INTAQT' Database (WP5).

The following datasets have been therefore identified from the INTAQT work plan and are covered by this first version of the Data Management Plan (DMP). Not all protocols to acquire these datasets are available at the moment; further details will be included once these detailed protocols are defined and therefore, the DMP will be updated accordingly. Also, additional datasets might be identified during the course of the project and would therefore be included in an updated version.

*Table 1: Data which will be used or collected by the INTAQT project*

N°	Dataset provisional name	Data description	Source	Nature	Size	Planned analysis	End-users
1	WP1_1.1_FiBL	Husbandry systems and practices	Multi-actor groups	Word, Excel, csv and/or SPSS file format	Not known. Task in progress	Ranked list of husbandry systems and practices	INTAQT partners
2	WP1_1.2_QUB and ACTA	Expectations regarding quality issues and analytical and scoring methods	Online survey: QUB; Face to face interview, consumers focus groups, Multi-actor groups: ACTA. Another dataset should be added	Word, Excel, csv and/or SPSS file format	Not known. Task in progress	Ranked list of quality traits and methods	INTAQT partners
3	WP2_2.1_INRAE	Infrared spectra, and various traits for milk, cattle & poultry	Large scale screening of a great number of cattle and	Excel, csv and/or SPSS file format	Not known. Task in progress	Databases and statistical analysis of the spectra and the related farms	INTAQT partners

		carcasses and characteristics of associated farms.	chicken carcasses			and products, ready for submission to WP4 and WP5.	
4	WP2_2.2_FIBL	Infrared spectra, various traits for milk, cattle & poultry carcasses and husbandry practices of farmers	Screening of the core product sample library	Excel, csv and/or SPSS file format	Not known. Task in progress	Databases of the spectra and the related farms and products, ready for submission to WP3, WP4 and WP5.	INTAQT partners
5	WP2_2.3_UNIP D	Various quality traits for milk, cattle & poultry carcasses and innovative husbandry practices of farmers	Screening of core product sample library related to innovative husbandry practices	Excel, csv and/or SPSS file format	Not known. Task in progress	Databases of husbandry practices and related products, ready for submission to WP3 and WP5.	INTAQT partners
6	WP3_3.1_BfR	Product safety data	Measurements of organic pollutants, antimicrobial residues, plant toxins and mycotoxins as well as microbial contamination of the samples collected in WP2	Excel, csv and/or SPSS file format	Not known. Task in progress	Statistical analysis of the relationships with farm characteristics; to be forwarded to WP5.	INTAQT partners
7	WP3_3.2_UGENT	Nutritional value data	Measurements of composition of the samples collected in WP2 (lactose (for milk), proteins, fats, microelements and vitamins)	Excel, csv and/or SPSS file format	Not known. Task in progress	Statistical analysis of the relationships with farm characteristics; to be forwarded to WP5.	INTAQT partners
8	WP3_3.3_UNIBO	Sensory quality profile	Measurements of technological and sensory attributes of the samples collected in WP2 (texture, tenderness, aroma, taste, overall liking, flavour, colour, technical properties)	Excel, csv and/or SPSS file format	Not known. Task in progress	Statistical analysis of the relationships with farm characteristics; to be forwarded to WP5.	INTAQT partners

9	WP4_4.1_UEX	Collection of rapid infrared spectral and Omics data	Farming system authentication using rapid infrared and Omics techniques	Excel, csv and/or SPSS file format	Not known. Task in progress	Infrared and Omics data and statistical analysis of these data	INTAQT partners
10	WP4_4.2_TEAGASC	Data analysis	Animal breed/strain authentication using DNA information	Excel, csv and/or SPSS file format	Not known. Task in progress	Database and analysis of genotypes with associated breed names (and strains) as well as SNP effects	INTAQT partners
11	WP4_4.3_UNIPD	Collection of rapid infrared spectral and Omics data	Quality assessment using rapid infrared spectral and Omics techniques	Excel, csv and/or SPSS file format	Not known. Task in progress	Infrared and Omics data	INTAQT partners
12	WP5_5.1_INRAE	List of trait definitions and methods to measure them	Trait ontology	Word format	Not known. Task in progress	Definition of traits and of standardised methods	INTAQT partners
13	WP5_5.2_UGENT	Outputs of models	Modelling the relationships between animal husbandry and intrinsic product quality traits	Word, excel, csv and/or SPSS file format	Not known. Task in progress	Databases and reports describing relationships between intrinsic product quality traits (safety, nutritional value and sensory features) and husbandry systems.	Producers, actors, advisers, policy makers, scientists
14	WP5_5.3_INRAE	Outputs of models	Integration of the different intrinsic quality components into multi-criteria scoring tools	Word, excel, csv and/or SPSS file format	Not known. Task in progress	Databases, reports and a web application for quality scoring.	Producers, actors, advisers, policy makers, scientists
15	WP5_5.4_FiBL	Meta-analysis	Evaluation of synergies and antagonisms between intrinsic product quality and farming systems sustainability	Word, excel, csv and/or SPSS file format	Not known. Task in progress	Databases, reports and model-matrices.	Producers, actors, advisers, policy makers, scientists

### 3.2. Intellectual Property Rights and confidentiality

The INTAQT project will produce the datasets issued from the INTAQT consortium or will use data from INTAQT partners as follow:

**Table 2: Owners and rights on data and other information used or created during the project**

N°	Dataset provisional name	Data manager	Name of the current contact	Ethical/IPR issues	Use of third-party data	Restrictions on data sharing after publication
1	WP1_1.1_FiBL	FiBL	Rennie Eppenstein	Multi-actor groups	Yes	No
2	WP1_1.2_QUB and ACTA	QUB and ACTA	Christelle Couzy or Cécile Laithier for multi-actor groups, face to face interviews, consumers focus groups; Nigel Scollan for online survey	Multi-actor groups	Yes	No
3	WP2_2.1_INRAE	INRAE	Jean-Francois Hocquette	Sampling from commercial farms	Yes	No
4	WP2_2.2_FiBL	FiBL	Florian Leiber	Sampling from commercial farms	Yes	No
5	WP2_2.3_UNIPD	UNIPD	Enrico Sturaro	Sampling from commercial farms	Yes	No
6	WP3_3.1_BfR	BfR	Fenja Klevenhusen	Analysis of animal products	No	No
7	WP3_3.2_UGENT	UGENT	Stefaan De Smet	Analysis of animal products	No	No
8	WP3_3.3_UNIBO	UNIBO	Massimiliano Petracci	Analysis of animal products	Yes	No
9	WP4_4.1_UEX	UEX	Mario Estévez	Analysis of animal products	No	No
10	WP4_4.2_TEAGASC	TEAGASC	Donagh Berry	Analysis of animal products	Yes	No
11	WP4_4.3_UNIPD	UNIPD	Massimo De Marchi	Analysis of animal products	No	No
12	WP5_5.1_INRAE	INRAE	Jean-Francois Hocquette	Scientists	No	No
13	WP5_5.2_UGENT	UGENT	Stefaan De Smet	Modelling	No	No
14	WP5_5.3_INRAE	INRAE	Marie-Pierre Ellies-Oury	Modelling	Yes	No
15	WP5_5.4_FiBL	FiBL	Florian Leiber	Modelling	No	No



## 4. Rules implemented by INTAQT to comply with the Open Research Data policy in the context of EU-funded projects

### 4.1. Data security and ethics

All data used in this project will be managed with the secure storage rules of the responsible partner identified above (Data manager): all data will be included in a backup plan (local and remote backups on servers secured by access rights). The project partners will comply with GDPR as for the secure storage and protection of personal data (see D8.2 "POPD - Requirement No. 2").

The INTAQT partners will follow the Ethics requirements governing the collection, storage and security of personal data for complying with GDPR, and for the datasets concerned. For example, the animal experiments in Partner research facilities will follow the European Convention of the Protection of Vertebrate Animals used for Experimental and Scientific Purposes, directive 2010/63/EU and the 3R principles (Replacement, Reduction and Refinement) which were developed over 50 years ago providing a framework for performing more humane animal research. The INTAQT project will also comply with the Nagoya protocol (which is an international agreement which aims at sharing the benefits arising from the utilization of genetic resources in a fair and equitable way).

### 4.2. Following the FAIR guidelines: Making data findable

The INTAQT project will follow as much as possible the FAIR data principle, making data Findable, Accessible, Interoperable and Re-usable. To achieve this goal, it has been agreed within the consortium that the datasets that will be shared in open access will be associated with a version number and keywords. Principles to make data findable according to the FAIR principles are summarised in Table 3.

To exchange data within a given WP and between WPs (inputs/outputs), all partners will use the same standards. To achieve these goals, INRAE has developed the Animal Trait Ontology of Livestock (ATOL) (<http://www.atol-ontology.com/atol/>) that is under strengthening by INTAQT partners. The ATOL is an ontology of characteristics defining phenotypes of livestock in their environment. The EOL (Environment Ontology for Livestock) ontology describes environmental conditions of livestock farms.

For animal products, a database will be developed using PHP/HTML, and will be stored using mysql as previously done for similar databases (Chriki et al., 2013. Ital J Anim Sci vol.12:e41). For chemical contaminants, INTAQT will use the international CAS Registry Number, also referred to as CASRN or CAS Number, a unique numerical identifier assigned by the Chemical Abstracts Service (CAS) to every chemical substance described in the open scientific literature. For microbial contaminants, a normal nomenclature of organisms will be provided by the Linnaeus classification system and ontology.

In addition, files in csv format will be used and follow shared templates. The csv syntax is a widely used, easy to generate (e.g. using a spreadsheet) and to reuse text format. It is also an accepted format to publish datasets with DOI and data papers.

Data will then be made accessible by using as much as possible public repositories (e.g. the Animal Quantitative Trait Loci Database <https://www.animalgenome.org/cgi-bin/QTLdb/>, or the Data INRAE portal for phenotypic data <https://data.inra.fr/dataverse/root>). Regarding the data stored in Data INRAE, the cost for curation of data loaded on this open access platform will be covered by INRAE (outside of the project). It will be the same for other partners involved in WP5. There are no duration limits planned for this kind of academic platforms. For the INTAQT open access reference table, each partner will use its internal processes to ensure quality of the data generated within the project before their integration. After the end of INTAQT, INRAE, who will host this open access reference table, will be in charge of the quality control, curation and preservation of newly integrated data.

Project partners will preserve raw data and will be strongly encouraged to attribute DOI (Digital Object Identifier) to specific datasets for increased visibility. To make data findable, datasets will be deposited in a repository such as the INRAE data repository (<https://data.inrae.fr/dataverse/survey-text>) which allows identification of data sets with DOI. Indeed, INRAE has a specific service in order to attribute DOI to datasets

generated by INRAE (<https://www6.inrae.fr/datapartage/Gener/Demander-un-DOI>). All acquired data will be stored securely and curated by the academic partners' institutes, e.g. Data INRAE for INRAE (<https://data.inra.fr/dataverse/root>). Final results will be stored in partners' results repositories but also in publicly available standard data repositories (Zenodo, HAL, etc.) for at least ten years following the end of the project. In addition, partners will be encouraged to publish research data as supporting material with their publications to facilitate preservation of data for future re-use by other projects or research initiatives, through data paper journals (e.g. Data in Brief) providing open-access publication of datasets with DOI. Regarding the quality reference information, all relevant data will be made accessible via the INTAQT open access reference table. Regarding the multi-criteria scoring tools for quality assessment, all relevant information and models will be made available in the INTAQT user-friendly web application. <https://www6.inrae.fr/datapartage/Gener/Demander-un-DOI>). All acquired data will be stored securely and curated by the academic partners' institutes, e.g. Data INRAE for INRAE (<https://data.inra.fr/dataverse/root>).

**Table 3: Principles to make data findable according to the FAIR principles**

N°	Dataset provisional name	Metadata provided	Foreseen Repository providing DOI	Naming conventions used
1	WP1_1.1_FiBL	Description of the survey instrument and related response options, data collection procedure and procedures used to manage the data	Not known yet	Not known yet
2	WP1_1.2_QUB and ACTA	Description of the survey instrument, interviews and related response options, data collection procedure and procedures used to manage the data	Not known yet	Not known yet
3	WP2_2.1_INRAE	Explanation of the different variables (column headings, standard used, experimental conditions ...).	Data INRAE <a href="https://data.inrae.fr/dataverse/survey-text">https://data.inrae.fr/dataverse/survey-text</a> + potentially other repositories	ATOL, AHOL and EOL standards whenever possible
4	WP2_2.2_FiBL	Explanation of the different variables (column headings, standard used, experimental conditions ...).	Data INRAE <a href="https://data.inrae.fr/dataverse/survey-text">https://data.inrae.fr/dataverse/survey-text</a> + potentially other repositories	ATOL, AHOL and EOL standards whenever possible
5	WP2_2.3_UNIPD	Explanation of the different variables (column headings, standard used, experimental conditions ...).	Data INRAE <a href="https://data.inrae.fr/dataverse/survey-text">https://data.inrae.fr/dataverse/survey-text</a> + potentially other repositories	ATOL, AHOL and EOL standards whenever possible
6	WP3_3.1_BfR	Explanation of the different variables (column headings, standard used, experimental conditions ...).	Data INRAE <a href="https://data.inrae.fr/dataverse/survey-text">https://data.inrae.fr/dataverse/survey-text</a> + potentially other repositories	ATOL, AHOL and EOL standards whenever possible
7	WP3_3.2_UGENT	Explanation of the different variables (column headings, standard used, experimental conditions ...).	Data INRAE <a href="https://data.inrae.fr/dataverse/survey-text">https://data.inrae.fr/dataverse/survey-text</a> + potentially other repositories	ATOL, AHOL and EOL standards whenever possible
8	WP3_3.3_UNIBO	Explanation of the different variables (column headings, standard used, experimental conditions ...).	Data INRAE <a href="https://data.inrae.fr/dataverse/survey-text">https://data.inrae.fr/dataverse/survey-text</a> + potentially other repositories	ATOL, AHOL and EOL standards whenever possible

9	WP4_4.1_UEX	Explanation of the different variables (column headings, standard used, experimental conditions ...).	Data INRAE <a href="https://data.inrae.fr/dataverse/survey-text">https://data.inrae.fr/dataverse/survey-text</a> + potentially other repositories	ATOL, AHOL and EOL standards whenever possible
10	WP4_4.2_TEAGASC	Explanation of the different variables (column headings, standard used, experimental conditions ...).	Data INRAE <a href="https://data.inrae.fr/dataverse/survey-text">https://data.inrae.fr/dataverse/survey-text</a> + potentially other repositories	ATOL, AHOL and EOL standards whenever possible
11	WP4_4.3_UNIPD	Explanation of the different variables (column headings, standard used, experimental conditions ...).	Data INRAE <a href="https://data.inrae.fr/dataverse/survey-text">https://data.inrae.fr/dataverse/survey-text</a> + potentially other repositories	ATOL, AHOL and EOL standards whenever possible
12	WP5_5.1_INRAE	Description of the ontology	Livestock ontologies	ATOL, AHOL and EOL standards whenever possible
13	WP5_5.2_UGENT	Explanation on how the collected variables are analysed (statistics and modelling from raw and transformed variables)	Not known yet	Modelling
14	WP5_5.3_INRAE	Explanation on how the collected variables are analysed (statistics and modelling from raw and transformed variable)	Not known yet	Modelling
15	WP5_5.4_FIBL	Explanation on how the collected variables are analysed (statistics and modelling from raw and transformed variable)	Not known yet	Modelling

For the partners not having an internal repository for Data open access and preservation, they will be strongly encouraged to deposit their data in publicly available standard data repositories (e.g. Zenodo, HAL, etc.) for at least ten years following the end of the project.

### ***4.3. Following the FAIR guidelines: Making data openly accessible, interoperable and reusable***

The INTAQT partners will be strongly encouraged to make their data publicly accessible unless impossible for legal constraints. The INTAQT Guidelines to make data publicly accessible are summarised in Table 4.

To increase reusability, the consortium will standardise file names and will notably use existing standards and ontologies to name and describe variables. For farm characterisation, as previously done in a project for animal welfare assessment (<https://welfurfarm.com/>), we will develop a website (linked to the project's general website) based on a mysql database, which will gather all the information collected on farms. Each farm will be evaluated on major principles of sustainability, each one being based on different criterions, representing each a dozen of measures.

Interoperability and reusability involve continued adoption and development of ontological approaches, and support of research data management standards. To achieve these goals, INRAE has developed the Animal Trait Ontology of Livestock (ATOL) (<http://www.atol-ontology.com/atol/>) described above that is under strengthening by INTAQT partners. More specifically, EOL describes the feeding modalities, the environment, the structure of livestock farms and rearing systems. The use of interoperable standards is also a key issue to make data reusable. To achieve this goal, a group of academics from different countries have developed AgroPortal (<http://agroportal.lirmm.fr/>), which is a vocabulary and ontology repository for agronomy, food, plant sciences and biodiversity. This is a common platform to receive and host ontologies from varied areas

related to agriculture, align them and enable their use by informatics tools (Jonquet et al., 2018 Comput. Electron. Agr. 144:126–143. <https://doi.org/10.1016/j.compag.2017.10.012>).

**Table 4: Guidelines to make data publicly accessible**

N°	Dataset provisional name	Open access	Closed data	Means of dissemination and maximum delay before access
1	WP1_1.1_FiBL	Analysed results shared and openly available after discussions with consortium partners	All data containing sensitive personal data (GDPR)	Publications, conferences, events, data access after scientific publications
2	WP1_1.2_QUB and ACTA	Analysed results shared and openly available after discussions with consortium partners	All data containing sensitive personal data (GDPR)	Publications, conferences, events, data access after scientific publications
3	WP2_2.1_INRAE	Research and experimental data	All data containing sensitive personal data (GDPR)	Publications, conferences, events, data access after scientific publications
4	WP2_2.2_FiBL	Research and experimental data	All data containing sensitive personal data (GDPR)	Publications, conferences, events, data access after scientific publications
5	WP2_2.3_UNIPD	Research and experimental data	All data containing sensitive personal data (GDPR)	Publications, conferences, events, data access after scientific publications
6	WP3_3.1_BfR	Research and experimental data	All data containing sensitive personal data (GDPR)	Publications, conferences, events, data access after scientific publications
7	WP3_3.2_UGENT	Research and experimental data	All data containing sensitive personal data (GDPR)	Publications, conferences, events, data access after scientific publications
8	WP3_3.3_UNIBO	Research and experimental data	All data containing sensitive personal data (GDPR)	Publications, conferences, events, data access after scientific publications
9	WP4_4.1_UEX	Research and experimental data	All data containing sensitive personal data (GDPR)	Publications, conferences, events, data access after scientific publications
10	WP4_4.2_TEAGASC	Research and experimental data	All data containing sensitive personal data (GDPR)	Publications, conferences, events, data access after scientific publications
11	WP4_4.3_UNIPD	Research and experimental data	All data containing sensitive personal data (GDPR)	Publications, conferences, events, data access after scientific publications
12	WP5_5.1_INRAE	Research and experimental data	All data containing sensitive personal data (GDPR)	Publications, conferences, events, data access after scientific publications
13	WP5_5.2_UGENT	Analysed results openly available after discussions with consortium	All data containing sensitive personal data (GDPR)	Publications, conferences, events, data access after scientific publications

14	WP5_5.3_INRAE	Analysed results openly available after discussions with consortium	All data containing sensitive personal data (GDPR)	Publications, conferences, events, data access after scientific publications
15	WP5_5.4_FiBL	Analysed results openly available after discussions with consortium	All data containing sensitive personal data (GDPR)	Publications, conferences, events, data access after scientific publications

The data in open access will be interoperable by using at maximum the ATOL, EOL and AHOL ontologies whenever possible. Consumer research standards will be acknowledged, and the metabolomics metadata standard Metabolomics Standard Initiative (MSI) will be followed. For modelling approaches, all parameters will follow the SOP (Standard Operating Procedure) of related guidelines in the field of animal science. Whenever possible, to allow inter-disciplinary interoperability and reusability, metadata will use a formal, accessible, shared, and broadly applicable language for knowledge representation, (meta)data will use vocabularies that follow FAIR principles, compliant with available (open) software applications. (Meta)Data will include qualified references to other (meta)data. All parameters used will be in English language, and all units will follow international standard unit.

## 5. Conclusions

The Data Management Plan (DMP) of the 'INTAQT agenda is in accordance with EU Regulation and policies of research organisations which are partners of the project. Consequently, INTAQT partners will rely on this DMP to follow the open access rules for research data. Partners will follow this detailed DMP for making INTAQT data Findable, Accessible, Interoperable and Reusable (according to the FAIR principles) following guidelines published by Wilkinson et al. (2016) The FAIR Guiding Principles for scientific data management and stewardship. *Scientific Data*. 15;3:160018. doi:10.1038/sdata.2016.18.

New data will be made available in a FAIR and Open manner, complying with EC Open Data policies and policies of research organisations, which are partners of the project, such as INRAE which is promoting open access of research data. Indeed, the Data INRAE portal offers new services to facilitate the management, sharing and research of scientific data (<https://data.inra.fr/dataverse/root>).

The INTAQT data management policy will include agreements regarding types of data, standards and formats, quality control measures, inclusion and exclusion criteria, curation and preservation procedures, data sharing and data exploitation. This first version of the DMP will be updated regularly. This DMP will be a "living" document outlining how the research data collected (including curation of other data) or generated (including computationally) will be handled during and after the project.

## 6. References

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