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## In vitro engineering of gut microbiomes from wood-eating beetles for the valorization of lignocellulosic biomass to value-added biochemicals

*A Data Management Plan created using DMPonline.be*

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**Template:** FWO DMP (Flemish Standard DMP)

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### Project abstract:

Residual lignocellulosic biomass from agriculture and forestry as a resource for the production of biomaterials, biochemicals and bioenergy, will be an important driver for the biobased circular economy. To produce materials and chemicals from lignocellulosic biomass, sustainable, energy-friendly and resource efficient conversion routes are needed. Wood-eating beetles are natural biorefineries for lignocellulosic biomass driven by host-gut microbiome interactions and enable them to feed on nutrient-poor diets and digestion of recalcitrant molecules. Our aim is to engineer lignocellulolytic microbiomes from wood-eating beetles for biorefinement platforms to produce value-added biochemicals from residual biomass. Microbiome functioning and lignocellulose bioconversion will be studied in vivo in the digestive tract of wood-eating beetles with careful consideration of gut physiology and physiochemistry. Especially, lignin deconstruction is elucidated in-depth to map the formation of lignin derivatives to resolve inhibitory effects in anaerobic digesters and identify value-added aromatic biochemicals. Based on in vivo conditions, gut microbiome cultivation will be further optimized in microbioreactor arrays in vitro to finally be able to mimic lignocellulose bioconversion in a multistage bioreactor. The microbiome in the multistage bioreactor will be subsequently engineered for the production of value-added biochemicals such as carboxylates and lignin-derived aromatics.

**Last modified:** 05-02-2024

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## FWO DMP (Flemish Standard DMP)

### 1. Research Data Summary

List and describe all datasets or research materials that you plan to generate/collect or reuse during your research project. For each dataset or data type (observational, experimental etc.), provide a short name & description (sufficient for yourself to know what data it is about), indicate whether the data are newly generated/collected or reused, digital or physical, also indicate the type of the data (the kind of content), its technical format (file extension), and an estimate of the upper limit of the volume of the data.

				Only for digital data	Only for digital data	Only for digital data	Only for physical data
Dataset Name	Description	New or reused	Digital or Physical	Digital Data Type	Digital Data format	Digital data volume (MB/GB/TB)	Physical volume
		<i>Please choose from the following options:</i> <ul style="list-style-type: none"> <li>• Generate new data</li> <li>• Reuse existing data</li> </ul>	<i>Please choose from the following options:</i> <ul style="list-style-type: none"> <li>• Digital</li> <li>• Physical</li> </ul>	<i>Please choose from the following options:</i> <ul style="list-style-type: none"> <li>• Observational</li> <li>• Experimental</li> <li>• Compiled/aggregated data</li> <li>• Simulation data</li> <li>• Software</li> <li>• Other</li> <li>• NA</li> </ul>	<i>Please choose from the following options:</i> <ul style="list-style-type: none"> <li>• .por, .xml, .tab, .csv, .pdf, .txt, .rtf, .dwg, .gml, ...</li> <li>• NA</li> </ul>	<i>Please choose from the following options:</i> <ul style="list-style-type: none"> <li>• &lt;100MB</li> <li>• &lt;1GB</li> <li>• &lt;100GB</li> <li>• &lt;1TB</li> <li>• &lt;5TB</li> <li>• &lt;10TB</li> <li>• &lt;50TB</li> <li>• &gt;50TB</li> <li>• NA</li> </ul>	
Beetle microbiome composition + functionality	Sequencing (amplicon + metagenomics) + metaproteomic + microbiome growth data	New data	Digital	Experimental	.fasta/q, .txt, .xml, .csv	<5TB	
Microbiome metabolites	Chemical analysis data on metabolites produced	New data	Digital	Experimental	.txt, .xml, .csv	<1GB	
Metadata beetle physicochemical conditions	Measuring data on physicochemical properties in beetle gut	New data	Digital	Experimental	.txt, .xml, .csv	<1GB	
Metadata bioreactor conditions	Measuring + monitoring data on bioreactor properties	New data	Digital	Experimental	.txt, .xml, .csv	<1GB	

If you reuse existing data, please specify the source, preferably by using a persistent identifier (e.g. DOI, Handle, URL etc.) per dataset or data type:

**Are there any ethical issues concerning the creation and/or use of the data (e.g. experiments on humans or animals, dual use)? Describe these issues in the comment section. Please refer to specific datasets or data types when appropriate.**

- No

**Will you process personal data? If so, briefly describe the kind of personal data you will use in the comment section. Please refer to specific datasets or data types when appropriate.**

- No

**Does your work have potential for commercial valorization (e.g. tech transfer, for example spin-offs, commercial exploitation, ...)? If so, please comment per dataset or data type where appropriate.**

- No

**Do existing 3rd party agreements restrict exploitation or dissemination of the data you (re)use (e.g. Material/Data transfer agreements/ research collaboration agreements)? If so, please explain in the comment section to what data they relate and what restrictions are in place.**

- No

**Are there any other legal issues, such as intellectual property rights and ownership, to be managed related to the data you (re)use? If so, please explain in the comment section to what data they relate and which restrictions will be asserted.**

- No

## **2. Documentation and Metadata**

**Clearly describe what approach will be followed to capture the accompanying information necessary to keep data understandable and usable, for yourself and others, now and in the future (e.g., in terms of documentation levels and types required, procedures used, Electronic Lab Notebooks, README.txt files, Codebook.tsv etc. where this information is recorded).**

We have a lab guide with standardized protocols (on the shared J-drive) that are being done in the lab. For new experiments, new protocols will be set-up and shared. Performed lab work will be written down in an Electronic Lab Notebook (Benchling), and shared with the supervisor and lab technician. The results will be published and materials and methods will be described in detail so that the experiment can be repeated by an experienced researcher.

All generated data is stored on the KU Leuven server, which contains protected project directories to which only researchers involved have access. In addition, every researcher has a personal directory on the KU Leuven server for safe data storage and a OneDrive directory. Data is never stored on personal or work devices to prevent data loss upon technical failure

**Will a metadata standard be used to make it easier to find and reuse the data? If so, please specify (where appropriate per dataset or data type) which metadata standard will be used. If not, please specify (where appropriate per dataset or data type) which metadata will be created to make the data easier to find and reuse.**

- Yes

A metadata template will be available for storage of raw sequencing data on the shared K-drive.

### **3. Data storage & back-up during the research project**

#### **Where will the data be stored?**

Raw sequencing data will be stored on a dedicated large volume storage drive with restricted access for internal use (K-drive). Active research data will be kept on OneDrive and Benchling (electronic lab journal) with access permissions for PhD researcher(s) and promoter.

#### **How will the data be backed up?**

Standard back-up provided by KU Leuven ICTS.

**Is there currently sufficient storage & backup capacity during the project? If yes, specify concisely. If no or insufficient storage or backup capacities are available, then explain how this will be taken care of.**

- Yes

#### **How will you ensure that the data are securely stored and not accessed or modified by unauthorized persons?**

The data will be stored in the University's secure environment.

#### **What are the expected costs for data storage and backup during the research project? How will these costs be covered?**

Costs for data storage are covered by the research group.

### **4. Data preservation after the end of the research project**

**Which data will be retained for at least five years (or longer, in agreement with other retention policies that are applicable) after the end of the project? In case some data cannot be preserved, clearly state the reasons for this (e.g. legal or contractual restrictions, storage/budget issues, institutional policies...).**

All data will be preserved for 10 years according to KU Leuven RDM policy.

#### **Where will these data be archived (stored and curated for the long-term)?**

At the end of the project, data (raw and processed, incl. unpublished) annotated with metadata will be uploaded to the Research Data Repository (RDR) at KU Leuven. Data will be made open-access on the moment of publication.

**What are the expected costs for data preservation during the expected retention period? How will these costs be covered?**

Costs for data storage are covered by the research group.

## **5. Data sharing and reuse**

**Will the data (or part of the data) be made available for reuse after/during the project? In the comment section please explain per dataset or data type which data will be made available.**

- Yes, in an Open Access repository

Sequencing data from beetle gut microbiome.

**If access is restricted, please specify who will be able to access the data and under what conditions.**

Question not answered.

**Are there any factors that restrict or prevent the sharing of (some of) the data (e.g. as defined in an agreement with a 3rd party, legal restrictions)? Please explain in the comment section per dataset or data type where appropriate.**

- No

**Where will the data be made available? If already known, please provide a repository per dataset or data type.**

Data will be available at the KU Leuven Research Data Repository and on the publication that will come out of this project.

**When will the data be made available?**

Upon publication of the research results.

**Which data usage licenses are you going to provide? If none, please explain why.**

Data from the project that can be shared will be made available under a Creative Commons Attribution license (CC-BY 4.0), so that users have to give credit to the original data creators.

**Do you intend to add a PID/DOI/accession number to your dataset(s)? If already available, you have the option to provide it in the comment section.**

- Yes

All publications will receive a DOI.

**What are the expected costs for data sharing? How will these costs be covered?**

Sharing data via NCBI is free of charge. Data present in manuscripts will cost the open access publication costs.

**6. Responsibilities**

**Who will manage data documentation and metadata during the research project?**

Lilian Prinsen (PhD), Benjamin Horemans (promotor), Dries Grauwels (lab technician)

**Who will manage data storage and backup during the research project?**

Lilian Prinsen and ICT support

**Who will manage data preservation and sharing?**

Lilian Prinsen (PhD), Benjamin Horemans (promotor)

**Who will update and implement this DMP?**

Lilian Prinsen (PhD)