

*Horizon 2020 Work programme*

Food Security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy

*Call*

H2020-FNR-2020: Food and Natural Resources

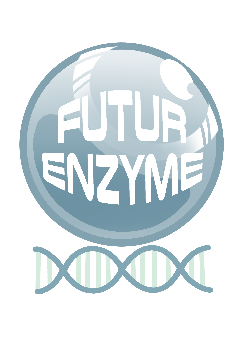
*Topic name*

FNR-16-2020: ENZYMES FOR MORE ENVIRONMENT-FRIENDLY CONSUMER PRODUCTS

*FuturEnzyme:*

Technologies of the Future for Low-Cost Enzymes for Environment-Friendly Products

Final ID: 101000327

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minutes  
of the 18-MONTH EXECUTIVE COMMITTEE MEETING

**Document information sheet**

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# 18-MONTH EXECUTIVE COMMITTEE MEETING

## 1. Introduction

As stated in the Consortium Agreement Section 6, “the Executive Committee is the supervisory body for the execution of the Project which shall report to and be accountable to the General Assembly and it shall pay special attention to the progress in deliverables and achieving Project milestones in a timely fashion”. This body is formed by the **Coordinator**, who chairs the meetings, and the **Work Package** (WP) **leaders** (**Table 1**). It will meet twice a year (one usually in the frame of the General Assembly annual meeting).

**Table 1.** Partners leaders for Work Packages conforming the Executive Committee.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **WP lead** | **Partner number** | **Affiliation** | **Name** | **e-mail** |
| 1, 9 | 1 | CSIC | Manuel Ferrer | mferrer@icp.csic.es |
| 2 | 2 | BSC | Víctor Guallar | victor.guallar@bsc.es |
| 3 | 3 | BANGOR | Peter Golyshin | p.golyshin@bangor.ac.uk |
| 4 | 4 | UHAM | Wolfgang R. Streit | wolfgang.streit@uni-hamburg.de |
| 5 | 9 | FHNW | Patrick Shahgaldian | patrick.shahgaldian@fhnw.ch |
| 6 | 16 | Eucodis | Jan Modregger | modregger@eucodis.com |
| 7 | 10 | CLIB | Markus Müller | mueller@clib-cluster.de |
| 8 | 8 | ITB | Ilaria Re | Ilaria.re@italbiotec.it |

The **tasks** of the Executive Committee are:

- prepare the meetings, propose decisions and prepare the agenda of the General Assembly;

- seek a consensus among the Parties;

- be responsible for the proper execution and implementation of the decisions of the General Assembly;

- monitor the effective and efficient implementation of the Project with special attention to the progress in deliverables and achieving Project milestones in a timely fashion;

- collect information at least every 6 months on the progress of the Project, examine that information to assess the compliance of the Project with the Consortium Plan and, if necessary, propose modifications of the Consortium Plan to the General Assembly;

- support the Coordinator in preparing meetings with the Funding Authority and in preparing related data and deliverables;

- prepare the content and timing of press releases and joint publications by the consortium or proposed by the Funding Authority in respect of the procedures of the Grant Agreement Article 29;

- in the case of abolished tasks as a result of a decision of the General Assembly, advise the General Assembly on ways to rearrange tasks and budgets of the Parties concerned.

The 18-month Executive Committee was agreed to take place online on **14th November 2021** using CSIC’s platform *Conecta*. The room specifically created for [FuturEnzyme](https://conectaha.csic.es/b/pat-1d3-guk-x6v) was used. The meeting was recorded and can be followed in this [link](https://balanbbb.corp.csic.es/playback/presentation/2.3/73c45220ca9d919ea5a88862837074915e4db82d-1668415836362?meetingId=73c45220ca9d919ea5a88862837074915e4db82d-1668415836362).

These minutes, after approval by the Executive Committee, will be shared to all the Consortium members, and will be made available at the intranet of the [Project’s website](http://www.futurenzyme.eu).

## 2. Participants

Besides the 8 Work Package leaders (including the Coordinator), who are the members of the Executive Committee, other Consortium members attended to the meeting (**Table 2**). Up to **26 participants** were connected:

**Table 2.** Full list of participants from the different partners.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Partner number** | **WP lead** | **Affiliation** | **Name** | **e-mail** |
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|  |  |  | Ali Foroutan | aliforoutan1048@gmail.com |
| 10 | 7 | CLIB | Markus Müller | mueller@clib-cluster.de |
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| 16 | 6 | Eucodis | Jan Modregger | modregger@eucodis.com |

## 3. The meeting

The participants were welcomed by the Coordinator, Manuel Ferrer (CSIC). He invited to those who have recently been incorporated to FuturEnzyme to be introduced. Markus Müller from CLIB introduced Behare Limani, who will assist in communication activities (replacing Annika Thamm). Then Laura Marturano from CNR introduced herself: she is in charge of the analysis of new microorganisms in search for hyaluronidases. After her, Patrick Shahgaldian from FHNW introduced Ali Foroutan, PhD student in charge of protein engineering, protein production, etc., and Guillaume Magnin, postdoc in charge of supramolecular engineering. At last, Sara Daniotti introduced Maria Elena Saija, in charge of communication activities, and Maria Ciotti, PhD student in charge of the Life Cycle Assessment (LCA).

### General comments and WP1\_ Management and Coordination

Ferrer began by highlighting the importance of this meeting because of the close first reporting period (November 2022, month 18), and because of the need to select enzyme candidates to go on with WPs 6 and 7. Then, he summarized WP1. At the end of his intervention, he remarked some points to focus on for the first reporting period:

* Clearly define the source of each enzyme (new bioresources -new samples, libraries, enrichments, isolates-, metagenomes, genomes, fosmid sequences, GPS coordinates, etc.).
* Compile information about the enzymes we retrieved (by in silico and functional approaches, and their sequences).
* Compile as much information as possible for all enzymes cloned/synthetized/characterized.
* Define the best candidates and how to proceed with engineering and their transfer to SMEs and industrial partners.
* WP leaders in charge of compiling their corresponding information.
* Each partner in charge of their own economic report in the EU portal.

He reminded some dates:

* 1 February 2023: First reporting period meeting in Brussels (with the Project Officer, Colombe Warin, and an expert to be defined).
* 3-6 July 2023: ESSIB in Hamburg (including a workshop within the project).
* 6-7 July 2023: FuturEnzyme’s 24-month General Assembly meeting in Hamburg.

Víctor Guallar wondered if the meeting in Brussels will be in person, at which Ferrer answered that yes, and it is mandatory for all WP leaders to attend.

### WP2\_Machine learning enzyme bioprospecting integrated into an industrial context

**Víctor Guallar** (BSC) took the lead to summarize WP2. Together with **Manuel Ferrer** and **Jennifer Chow** (UHAM), they put together the work done so far*.* Guallar stressed out the need for as many sequences and as much experimental data as possible to develop a machine learning procedure. Ferrer wondered if the SCOT (Stability COnsensus meTapredictor) data shown are from a single protein, and wanted to know if any mutant can be incorporated for the tool, or if it is needed to prepare different variants with different characteristics to nourish it. Guallar answered that any protein serves well. Ferrer commented that at the end of the project, we should have an online tool: how far are we from it and which kind of data do you need for instance for detergents? Guallar answered that this is still to be faced since for the first 2 years of the project their part is to focus on providing predictions. Then, with the sequences that the partners handle to BSC, the more the better, they will focus on preparing the mentioned tool. Ferrer said that partners implicated in WP4 are preparing an extensive table with all the datasets generated from all enzymes being characterised, a summary of which will be made available to BSC for its analysis.

Ferrer asked Chow: if we select different enzymes from different classes and we want to check similar sequences, can we send these sequences to UHAM to find them by their HMM model? Chow said that yes, more than welcome. We can also send the information from genomes, metagenomes, etc. from this project and previous ones. BSC can receive hits obtained by UHAM’s tool to make structure analysis. Ferrer clarified that for the first periodic report, we have to prepare 3 tables with all the sequences we are handling in the different aspects of the project: those from previous projects (already collected), the new bioresources generated for FuturEnzyme and those characterized. Besides, they have to prepare a short description of the method they use to generate and analyse the sequences.

**Action points**:

1. Generate a table with all sequences encoding enzymes identified by bioinformatics and computational methods.
2. Compile all experimental datasets generated until month 18 and share with BSC for their analysis and for generating predictive tools.

### WP3\_ Activity-based bioprospecting for enzymes

For WP3, **Peter Golyshin** (Bangor) presented the work done so far, supported by **Jennifer Chow**. At the end of his intervention, he announced that at the end of August 2022, the Thermophiles Conference will take place in Bangor, and we are all invited. He will keep us informed.

(This WP was postponed after WP4, since Bangor had IT issues).

**Action points**:

1. Compile all bioresources that have been used in the project (already available before FuturEnzyme started and newly generated) and generate a table that lists all of them, as well as highlighting the set of bioresources that were found positives.

### WP4\_ Small-scale enzyme production and characterisation

**Jennifer Chow**, **Manuel Ferrer**, **Jan Modregger** (Eucodis), **Patrick Shahgaldian** (FHNW) and **Peter Golsyhin** resumed the activities carried out in the frame of WP4. Chow wanted to know if Eucodis purifies the enzymes from the supernatant, at which Modregger answered that depends on the requirements, for instance, of the pure level demanded by the customer. Chow showed results of T7 RNAP amongst others, and Modregger offered to commercialize this type of enzymes.

In Shahgaldian’s intervention, Guallar wondered if it could be tried to introduce a dyad when designing artificial proteases, at which Shahgaldian answered that it would be interesting. Ferrer wanted to know how green the chemical synthesis of this scaffold can be, so we can report how this technology supports sustainability. Shahgaldian said that he will look into it. Guallar asked if proteases with cystein are not of interest for Henkel because of pH incompatibility, but serine proteins. Since there is no representation from Henkel (or other manufacturer), the question is pending to be answered (see Section 5).

Ferrer pointed out that UDUS should check their enzymes, demonstrated to be hits for detergents, also with textiles. This comment was made because CSIC has found that some lipases capable of degrading stains on fabrics also remove spinning oils from Schoeller fabrics. In the case of Bangor hits, Ferrer pointed out that they can check their lipases with the [NEFA kit](https://www.wako-chemicals.de/de/produkte/diagnostika/diagnostische-reagenzien/nefa-hr-2-assay) for the detergent application. Bangor’s PETases should also be tested for Schoeller textiles’ degradation. IST-ID results were explained but will be clarified by email/minutes since no IST-ID member could attend at this point of the meeting. At this point, Ferrer remarked the urge to fill the table circulated by UDUS (31.10.2022) for D4.6 in order to compile and have all the experimental information needed to make decision of which enzymes are the best candidates to focus on, and to be later transferred to WP5-WP7, and also to WP2 for implementing the predictive tool. Moreover, all partners involved need to ensure that the enzymes in this table are also included in the previously mentioned tables, the one listing all bioresources available for the project identified by functional (WP3) or in silico (WP2) screens, which also need to be completed asap. Shahgaldian wondered if immobilized/supramolecular engineered enzymes have to be included in the D4.6 table, at which Ferrer said that not in this case, as these ones will be integrated in WP5 work.

**Action points**:

1. All partners implicated in WP4 should compile all experimental datasets regarding all the enzymes being selected, expressed and characterised until month 18.
2. Suggest and provide information of the enzymes selected for characterization (at least 180 total).
3. Each partner should highlight the best candidates to focus on, that means, that should go to WP5-WP7, providing a brief description of the reasons.

WP5\_Enhancing enzymes through innovative engineering

The work comprised in this WP5 is briefed by **Patrick Shahgaldian**, and supported by **Manuel Ferrer**. Ferrer pointed out that we need to decide whether candidates for WP6 can be already transferred, although they are not yet subjected to supramolecular engineering, or if it is better to wait until this process has been performed on the hits. We also need to identify the whole consortium candidates to be transferred to WP6. Golyshin wanted to know how much enzyme is needed for the supramolecular engineering performed by FHNW/Inofea. Shahgaldian informed that around 50 mg is a good amount (they can start working with around 5 mg), but the more the better, and highly preferred His-tagged.

At this point, it is reminded that we need to have available the documentation demonstrating that the sampling is performed following good practices by Nagoya’s protocol.

**Action points**:

1. Transfer to Inofea and FHMW the enzyme materials needed to start.

### WP6\_Development and supply of best enzyme prototypes

WP6 status is summarised by **Jan Modregger** (Eucodis) and supported by **Manuel Ferrer**. He remarked the need to hurry up to accomplish in time Milestones 19 and 20, due for January and March 2023, since they still do not have available the candidates and even if they started now, they are short in time. To properly accomplish them, we might need a 2-month delay in the due date. Ferrer, commented that if we decide to postpone this due date, we have to ask for permission to the Project Officer, Colombe Warin (with a short report on why we need to postpone it), before the end of this month (November 2022). He remarked the need to decide:

* How do they receive lead candidates from WP4 and WP5 partners?
* What are the targets for each candidate handed over for strain and process development?
* Idea: Implementation of a “Lead Candidate Process” (possibly online?)

Ferrer commented on relevant questions to be soon answered:

* The cultivation conditions for the hyaluronidase-containing isolates needs optimization. May Bio\_Ch collaborate in the cultivation?
* Discuss the best way or strategy to visualize our enzymes to the public (other companies, etc.).

Modregger pointed out that they have at the project’s disposal the following alternative expression organisms: *Escherichia coli, Bacillus subtilis, Streptomyces lividans, Corynebacterium glutamicum, Pichia pastoris, Saccharomyces cerevisiae, Aspergillus oryzae;* and their fermentation and downstream processing capacity is: 1 L - 10 L – 50 L – 200 L – 1000 L. He commented the convenience of using secretion expression organisms since in this way purification steps are simplified to, for instance, precipitation techniques, instead of chromatography, a process much more time- and cost-consuming. So, it is highly relevant to “link” each enzyme to the expression system and production scale.

Ferrer also remarked that we will publicize the enzymes not relevant for the 3 sectors in the project by the website, social media, etc.

**Action points**:

1. All academic partners implicated in WP2-WP5 are urged to suggest the best enzymes/isolates to be proceeded in WP6. CSIC already suggested two, ID9 and Lip9.
2. Share with Eucodis and Bio\_Ch information about the selected candidates to proceed as soon as possible with production.

### WP7\_Formulation and manufacturing of consumer products

The ongoing of WP7 was resumed by **Markus Müller** (CLIB). He remarked the relevance of sending candidates to the manufacturers in early stages so they can get involved and give feedback in the testing not only at the end of the project.

Modregger commented that in Eucodis they set up their own internal “milestones” for the candidates, which can be of use also for our project. In this way, they have a proper optimization of an enzyme production from the beginning that can be followed by subsequent mutants, or slightly modified if needed.

**Action points**:

1. CLIB will organize a short meeting to define the enzyme candidates and discuss, on the basis of the information provided, the candidates to be prioritized, so proceed with scale up production and testing.

### WP8**\_**Communication, Dissemination and Exploitation

WP8 work and activities were shown by **Maria Elena Saija** (ITB). Ferrer commented that if any partner has more events they have participated on, they should share them to be added to this list. He also informed that the policy brief is being prepared by the Policy Working Group of the Cluster Enzymes for Greener Products. Moreover, the Project Officer suggested that we organize a policy meeting in Brussels around March 2023. Regarding the review about climate change and enzymes that we are preparing (to be sent to Oxford Open Climate Change), he reminded the partners involved to check it ([circulated](https://clibcluster.sharepoint.com/:f:/s/ExterngeteilteDokumente/EjnrkSsG3e1OgVMDVV7jJ48BdmVVdkoA1N6YrBLfof9tIA?e=HbMcb4) on 07/11/2022). Last, he mentioned we are preparing the project’s video. Ferrer reminded that the Deliverable 8.9\_*Report on public, intraconsortium, and interconsortia 18-months events* is led by UHAM, but since CSIC has more information about it, they will prepare it.

**Action points**:

1. To revise the events in which all partners participate, and send the information to the project manager.
2. To revise the draft review article that has been circulated.

With this, Manuel Ferrer thanks all the participants the assistance and the meeting is dismissed.

## 4. To dos

### Before 23 November 2022

* Fill in Table Bioresources generated for FuturEnzyme (new, in silico (within WP2) and functional (within WP3)).
* Fill in Table D4.6\_Annex 1 (enzymes including stability data).
* Decide whether candidates for WP6 can be already transferred, although they are not yet subjected to supramolecular engineering, or if it is better to wait until this process has been performed on the hits.
* Decide from Table D4.6\_Annex 1 (enzymes including stability data) the candidates to be selected as hits to be transferred to WP2, 5, and 6.
* Send participation in events (patricia.molina@icp.csic.es).
* Check and revise [climate change review](https://clibcluster.sharepoint.com/:f:/s/ExterngeteilteDokumente/EjnrkSsG3e1OgVMDVV7jJ48BdmVVdkoA1N6YrBLfof9tIA?e=HbMcb4).

### Before 31 December 2022

* For Open Science and FAIR principles, make sure raw data supporting publications are publicly available; if don’t, prepare the document and upload it to [FuturEnzyme’s Zenodo community](https://zenodo.org/communities/futurenzyme/?page=1&size=20). Anyone can add entries in this community, that the project manager allows before publication.
* Agree on a “Lead Candidate Process” (online?): How do Eucodis receive lead candidates from WP4 and WP5 partners? What are the targets for each candidate handed over for strain and process development?

### Before 16 January 2023

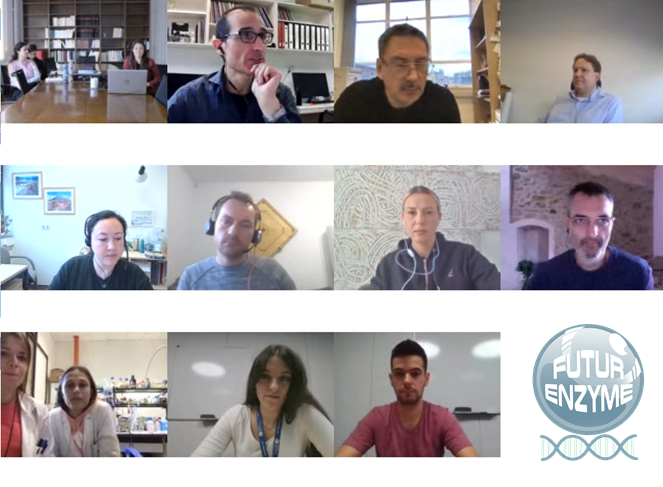
* Short description of the method used to generate and analyse the sequences.
* Financial report at the EU portal.
* WP leaders: gather and organize the information from all partners up to the first periodic report (November 2022).

## 5. Reminders and questions to partners

* In [FuturEnzyme](http://www.futurenzyme.eu)’s web intranet there are available all the templates needed for the project’s activities, the submitted deliverables and milestones, meeting’s presentations, brochures, identity guidelines and more useful information. It can also be used to store information and results.
* Send abstracts before submission.
* For **Henkel**: Guallar asked if proteases with cystein are not of interest for Henkel because of pH incompatibility, but serine proteins. Christian Degering answered by email (17.11.2022): “My understanding is that proteases are not in focus for the current activities in FuturEnzyme. However, to answer the question anyway: To our knowledge Cystein protease are nowadays not relevant for Laundry & HomeCare. Serin proteases are clearly in focus/commercialized. Nevertheless, if storage stability, performance spectrum in the application and producibility of the enzyme are good, I do not see a reason why Cystein proteases should be excluded in general. We would be open to discuss or test.
* For **IST-ID**: clarify WP4 results shown.
* For **Bio\_Ch**: The cultivation conditions for the hyaluronidase-containing isolates needs optimization. May Bio\_Ch collaborate in the cultivation?

## 6. Photo

Screenshot of the 18-month online Executive Committee meeting.



## 7. Agenda

10:00-10:05 Welcome to the 6-month Executive Committee meeting

Manuel Ferrer (CSIC): Project Coordinator and Chair of the 18-month Executive Committee meeting

Patricia Molina (CSIC): Project Manager

10:05-10:20 FuturEnzyme: general resume

Manuel Ferrer (CSIC): FuturEnzyme Project Coordinator and Chair of the 18-month Executive Committee meeting

Content: The coordinator will briefly summarize: a) a general vision of the project achievements; b) the outcomes of the dissemination and communication actions; c) the work done in relation to the “European Cluster Enzymes for Greener Products” with the other 3 funded projects; c) the outcomes from meetings with Project officers and Advisory Board members; and d) other actions.

10:20-10:40 CSIC as leader of WP1 and 9

Manuel Ferrer

Content: M. Ferrer will discuss about: a) the status of Milestones and Deliverables; b) budget issues; c) ethics and Nagoya protocol; and d) other actions.

10:40-11:00 BSC as leader of WP2

Víctor Guallar

Content: V. Guallar will discuss the status of the bioinformatics and computational effort for in silico enzyme discovery.

Note: we need to clarify the advances in predictive and web tools for enzyme search.

11:00-11:20 Bangor as leader of WP3

Peter Golyshin

Content: P. Golyshin will discuss the status of the functional screens and sequencing effort done by WP3 partners.

Note: we need to clarify whether new screens are needed or whether sequencing effort is needed.

11:20-11:40 UHAM as leader of WP4

Jennifer Chow

Content: J. Chow will discuss the status of the effort regarding expression and characterization of enzymes by WP4 partners.

Note: we need to clarify the candidates that have been selected for scale up production and pre-industrial validations. Each partner should select and discuss best candidates.

11:40-12:00 FHNW as leader of WP5

Patrick Shahgaldian

Content: P. Shahgaldian will discuss the status of the effort regarding the supramolecular engineering and enzyme activity metamorphosis.

Note: we need to clarify which enzyme has been selected as best targets to engineer; also, which enzymes have been selected for immobilization and the way to transfer them.

12:00-12:20 Eucodis as leader of WP6

Jan Modregger

Content: although too early to discuss about scale-up production, it will be nice to discuss about steps to proceed once a good enzyme candidate is identified.

Note: we need to clarify which enzyme will be transferred to BioChem\_Sol and Eucodis for scale-up fermentation; also we need to clarify which candidates seem to be promising but expression problems were found so that to find alternative expression systems.

12:20-12:40 CLIB as leader of WP7

Markus Müller

Content: discuss about Protocols of Industry Meetings, LCA aspects, Exploitation Plan and other actions.

12:40-13:00 ITB as leader of WP8

Ilaria Re/Sara Daniotti

Content: status of the dissemination and communication efforts and discussion about future actions, etc.

13:00-14:00 Conclusion, remarks, decisions to be taken, and future plans

Manuel Ferrer

Content: we will discuss about the best way to proceed to prepare the 18M report, and other actions.