



<b>General information</b>	
PPP number	<b>AF-15269</b>
Title	<b>Sustainable Future Proteins</b> Focus on nutritional and health-promoting quality
Theme	<b>Healthy and Safe</b>
Implementing institution(s)	<b>WFBR; UU-UIPS</b>
Project leader research (name + e-mail address)	<b>Prof. dr. Harry J. Wichers</b> <a href="mailto:harry.wichers@wur.nl">harry.wichers@wur.nl</a>
Coordinator (on behalf of private parties)	<b>Dr. Jeroen BergenHenegouwen</b> <a href="mailto:jeroen.vanbergen@danone.com">jeroen.vanbergen@danone.com</a>
Address project website	<a href="https://topsectoragrifood.nl/project/future-proteins/">https://topsectoragrifood.nl/project/future-proteins/</a> <a href="https://sharepoint.wur.nl/sites/futureproteins/SitePages/Home.aspx">https://sharepoint.wur.nl/sites/futureproteins/SitePages/Home.aspx</a>
Start date	<b>1 April 2016</b>
End date	<b>31 July 2020</b>

<b>Approval by the coordinator of the consortium</b>	
The annual report must be discussed with the coordinator of the consortium. The "TKI's" appreciate additional comments concerning the annual report.	
Assessment of the report by the coordinator on behalf of the consortium:	<input checked="" type="checkbox"/> Approved <input type="checkbox"/> Not approved
Additional comments concerning the annual report:	

<b>Summary of the project</b>	
Problem definition	Due to (globally) increasing demands for protein for inclusion into the human diet, alternative sources for such proteins, from maximally sustainable sources, need to be identified. This project aims at studying nutritional properties of proteins from sustainable sources.
Project goals	Development of a toolbox to assess the digestibility of proteins, to evaluate how well a given (mixture of) protein(s) is able to meet human amino acid requirements, and which spectrum of biologically active peptides is formed during digestion, with an emphasis on effects on gastro-intestinal health.

<b>Results</b>	
Planned results 2019	<p>WP1 Protein digestion: Digestions were planned to be completed in 2019</p> <p>WP2 Bioactivity of peptides: Models systems were planned to be set-up, digesta were planned to be tested</p> <p>WP3: Intervention trial Intervention trial with selected food-grade test samples was planned to be completed</p> <p>Overall: integration of data was planned</p>

Achieved results 2019	<p><b>WP1:</b> All in vitro-digestions that were planned were completed in 2019, both for INFOGEST-protocol and for SHIME-system. SHIME-samples were sent for microbiota-analysis.</p> <p><b>WP2:</b> Gut-on-a-Chip system operational, samples are being tested. Endotoxin contaminations Peptidomics for digesta was completed. Bio-informatics approach to identify ACE-inhibiting activity started up</p> <p><b>WP3:</b> Human trial completed, all samples analysed (serum, urine, faeces, microbiota). Significant differences between kinetics of amino acid-uptake for various proteins. Inter-individual variation dependent of protein sample.</p>
Planned results 2020	<p>Experimental work brought to minimum, only to fill possible gaps that emerge from data interpretation. Focus on interpretation and integration of results.</p>

<p><b>Deliverables/products in 2019</b> (provide the titles and /or a brief description of the products/deliverables or a link to a website.</p>
<p><u>Scientific articles:</u> Paulus G.M. Jochems, Jeroen van Bergenhenegouwen, Anne Metje van Genderen, Sophie T. Eis, Livia Wilod Versprille, Harry Wichers, Prescilla V. Jeurink, Johan Garssen, and Rosalinde Masereeuw (2019) Development and validation of bioengineered intestinal tubules for translational research aimed at safety and efficacy testing of drugs and nutrients. Toxicol. in Vitro <u>60</u>: 1-11, published online May 6 2019, <a href="https://doi.org/10.1016/j.tiv.2019.04.019">doi.org/10.1016/j.tiv.2019.04.019</a></p> <p>Jitske Jansen, Katja Jansen, Ellen Neven, Ruben Poesen, Amr Othman, Alain van Mil, Joost Sluijter, Javier Sastre Torano, Esther A. Zaal, Celia R. Berkers, Diederik Esser, Harry J. Wichers, Karin van Ede, Majorie van Duursen, Stéphane Burtey, Marianne C. Verhaar, Björn Meijers, Rosalinde Masereeuw (2019) Metabolite-sensing and signaling in kidney proximal tubules stimulates microbiome-derived organic anion secretion. Proc. Natl. Acad. Sci. USA, <u>116</u>(32): 16105-16110. Published August 6, 2019; <a href="https://doi.org/10.1073/pnas.1821809116">doi: 10.1073/pnas.1821809116</a></p>
<p><u>External reports:</u></p>
<p><u>Articles in professional journals/magazines:</u></p> <p>Discovery Magazine April 2019: 'Raising the steaks. There are 7.5 billion of us and counting. What's for dinner?'</p> <p>Baking Europe Winter 2019: Protein foods for the elderly</p>
<p><u>(Poster) presentations at workshops, seminars, or symposia.</u></p> <p><b>Presentation</b> P.G.M. Jochems. Pre-clinical protein screening in bioengineered intestinal tubules. Nutrients, Barcelona, Spain, September 2019.</p> <p><b>Poster</b> P.G.M. Jochems. Developing a novel 3-dimensional small intestinal-like chip for xenobiotic screening. (ISSX), Portland, Oregon, USA. July 28 - Aug. 1, 2019</p> <p><b>Poster abstract</b> van de Berg-Somhorst, B. P. M., Bastiaan-Net, S., Evers, D., El Bachrioui, K., Ariens, R. M. C. &amp; Wichers, H. J. Antihypertensive Activity Of Food Protein Hydrolysates From Sustainable Sources. 6th International Conference on Food Digestion, Granada, Spain, 2-4 April 2019</p> <p><b>Poster</b> Ariens, R. M. C., El Bachrioui, K., van de Berg-Somhorst, B. P. M., Bastiaan-Net, S. &amp; Wichers, H. J. Effect Of Ultra-Filtration After In Vitro Digestion Of Sustainable Food Proteins On SCFA Production By Microbiota Fermentation. 6th International Conference on Food Digestion, Granada, Spain, 2-4 April 2019</p> <p><b>Poster</b> Ariens, R. M. C., El Bachrioui, K., van de Berg-Somhorst, B. P. M., Bastiaan-Net, S. &amp; Wichers, H. J. Effect Of Ultra-Filtration After In Vitro Digestion Of Sustainable Food Proteins On SCFA Production By Microbiota Fermentation. 21th Gut day symposium, Amsterdam, the Netherlands, 5 December 2019</p>
<p><u>TV/ radio / social media / newspaper:</u></p>

Remaining deliverables (techniques, devices, methods, etc.):

Paper: with respect to the protein screening

Paper: ToxA reparation effect

Paper: In vitro meets clinical

Total: PhD thesis

<https://topsectoragrifood.nl/project/future-proteins/>

<https://www.wur.nl/nl/project/Eiwitten-van-de-toekomst-nutritionele-kwaliteit-en-bio-functionele-activiteit-na-vertering.htm>