



InBiRa



Fraunhofer-Institut für Grenzflächen-
und Bioverfahrenstechnik IGB

Dr.-Ing. Susanne Zibek

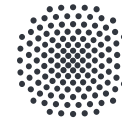
The insect biorefinery - from the utilization of organic residues and waste to the manufacture of products for fuels, lubricants, cosmetics, cleaning agents, plastics and plant fertilizers

1st online event "Sharing knowledge about...": Insect Biorefineries and AI Tools, November 20th 2023

Consortium and Budget

Project partner

- PreZero Stiftung & Co KG
- Hermetia Baruth GmbH
- Institute for Sanitary Engineering, Water Quality and Solid Waste Management ISWA
- Institute of Interfacial Process Engineering and Plasma Technology (IGVP)
- Fraunhofer Institute for Interfacial Engineering and Biotechnology IGB, coordination
- Ifeu – Institut für Energie- und Umweltforschung Heidelberg gGmbH



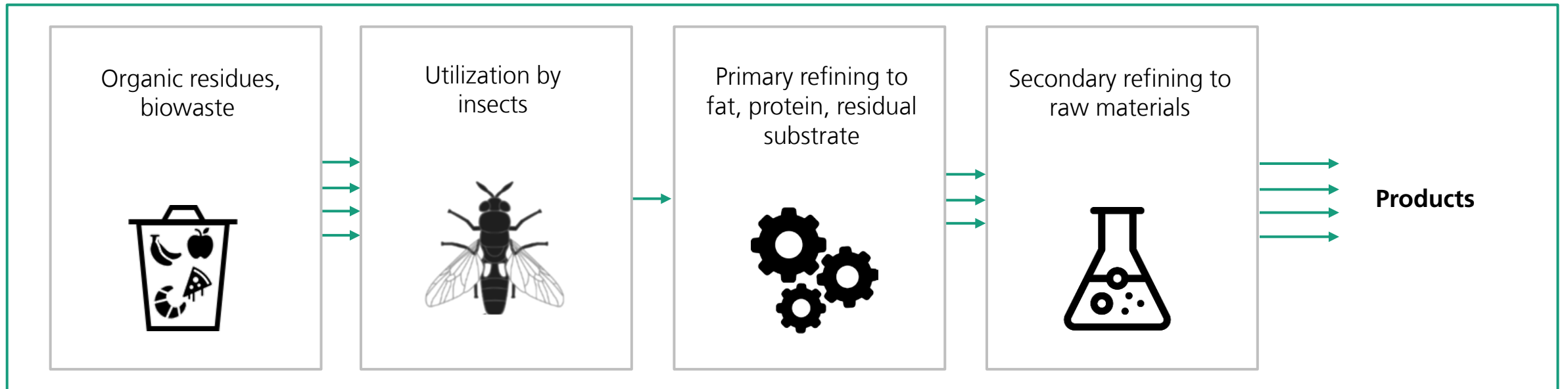
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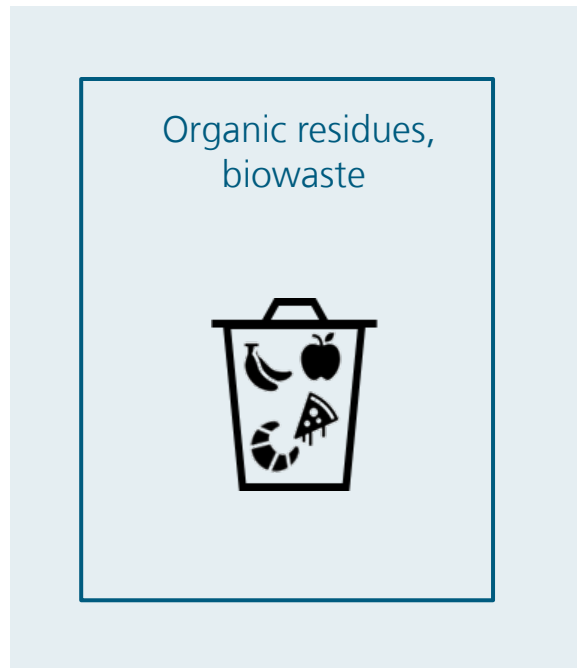
Project volume
~ 3,8 Mio €

Conversion of organic waste into valuable products

Our biorefinery for the utilization of waste substrates



We use the black soldier fly consuming organic residues



- Project: From the young larvae to the mast larvae



New feed mixtures and their use

Cooperation

„ PreZero collects more than 10 million tons of recyclables and gives them a new life“

- **Returns from the retail trade**

- Bakery products
- Fruits
- Vegetables
- Dairy products
- Without meat vs. with meat

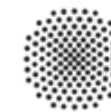
- **Residual materials from the catering industry**

- Canteen

- **Residual materials from the organic waste garbage can**

- Deliver returns from super markets
- Produce feed mixtures and characterize them with regard to nutrients, comminution, homogenization and service life
- Use the new feed mixtures and produce fattening larvae. Among other things, growth and intake rate are characterized

pre
zero



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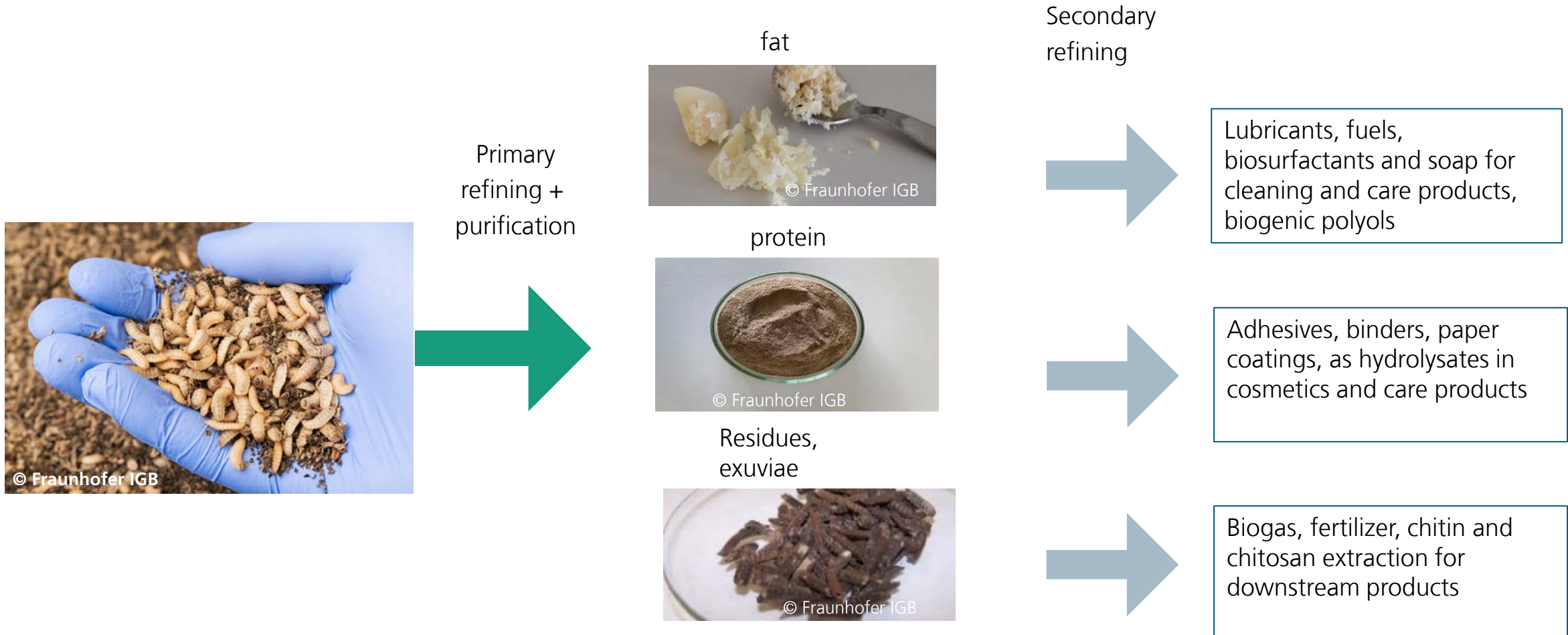
Institut für Siedlungswasserbau, Wassergüte- und Abfallwirtschaft



Hermetia
Baruth GmbH

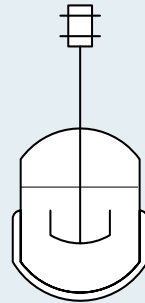
Primary and secondary refining

Separation into valuable material flows and chemical/enzymatic conversion to products

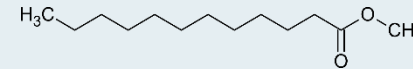


The fats can be used to produce fuels and lubricants or biosurfactants

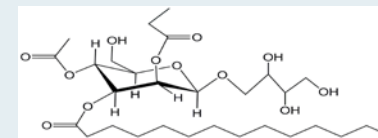
Fat



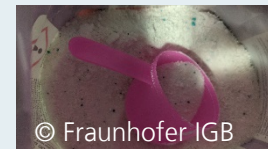
Fatty esters



- Insect fat is rich in medium-chain fatty acids (~45% lauric acid with C12 chain length), which is also found in tropical coconut fat and palm kernel oil



biosurfactants (z.B. APG) fat alcohols



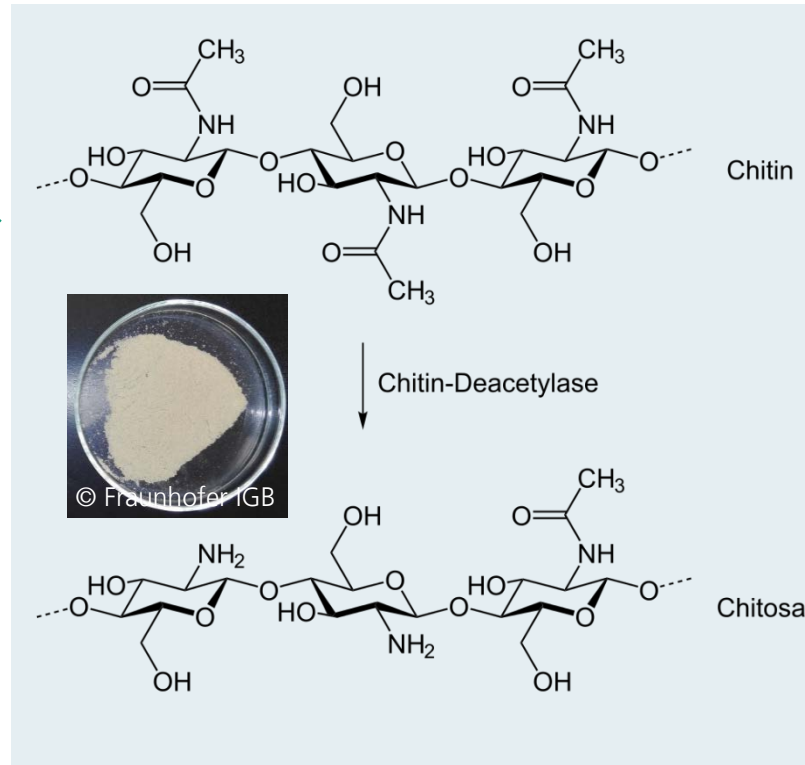
Alexander Beck, Fabian Haitz, Saskia Grunwald, Laura Preuss, Steffen Rupp, Susanne Zibek* "Influence of microorganism and plant oils on the structure of mannosylerythritol lipid (MEL) biosurfactants revealed by a novel thin layer chromatography mass spectrometry method" (DOI: 10.1007/s10295-019-02194-2)

Chitosan can be extracted from insect skins

Exuviae from larvae



Exuviae from pupae



Coating in the food or textile industry



- Insect skins contain minerals such as calcium, magnesium and up to 40 % chitin
- Chitin is the second most common natural polymer on earth

Hahn T, Roth A, Ji R, Schmitt E, Zibek S. Chitosan production with larval exoskeletons derived from the insect protein production. J Biotechnol. 2020 Feb 20;310:62-67. doi: 10.1016/j.jbiotec.2019.12.015. Epub 2019 Dec 23. PMID: 31877336.

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Baden-Württemberg

MINISTERIUM FÜR UMWELT, KLIMA UND ENERGIEWIRTSCHAFT

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Project time: Oktober 2021 – Oktober 2024



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