
Boosting the industrial biotechnology to boost the European Bioeconomy

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**Dr. Dr. h.c. Christian Patermann
Director ret., EU-Commission
Member of the 1st Bioeconomy Council, Germany**

How does the bioeconomy landscape look like?

- Biomass is the primary natural resource!
 - New knowledge from converging technologies is an additional one.
 - Biotechnologies, in particular industrial biotechnology are its principle technology drivers.
 - Biorefineries are their prime industrial production complexes.
 - Value chains represent the main nerve strains or „autostradas“ in this economy.
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Practical examples for innovative biobased products out of the C-toolbox of nature

- **Polyethylenfuran (PEF)** bottles by YXY-technology, replacing hitherto used PET bottles, 100% biobased, reaching the market until 2020.
 - spectacular competition Coca-Cola – Pepsi.
 - also ALPLA plant Alwin Lehner GmbH together with Avantium (NL), Coca-Cola and Danone are in the development team
- **RESULT:** improvements of quality, weight, catchment of CO₂ etc.
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Practical examples for innovative biobased products out of the C-toolbox of nature

- **Succinic Acid:** basis for the multitude of bioplastics, plastizisers, biosolvents, polyethene
 - Competition who builds the first and largest demonstration facilities (DSM, Roquette, BASF, Lanxess (Sarnia location in CA and others)).
 - Opening of the first commercial production plant of 10,000 tons/ y by BASF and Puray in Montmelo, Spain in January 2014.
 - commercial start of a plant of 30,000 tons/ y by BioAmber and Mitsui in Sarnia, CA; in August 2015.
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Practical examples for innovative biobased products out of the C-toolbox of nature

- **Biobased pthalat-free plastizisers** for plastics, construction, automotive industries by Evonik.
 - **Essential amino acids** as feed additives (methionine, lysine) by Evonik.
 - New fibres („**Cellulocis chemicals**“) for cloth industries, adhesives and other purposes.
 - **Levulinic Acid** on the basis of by-products of sugar production, mainly developed in Italy (Bio-ON and Eridania Sadam) and Austria (Univ. of Vienna).
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Practical examples for innovative biobased products out of the C-toolbox of nature

- **Biobased BDO (1,4-Butandiol und Butandien)** for automotive and chip industries (BASF, Genomatika).
 - **Biokerosine** (biobased marine diesel and aviation gas) **and Biorubber (Russian dandelion)**, other option: Usage of Guayule by Versalis, subsidiary of Eni, Italy. Strong emerging competition with Asian producers.
 - **Biopolymers and Biomonomers** as basic chemicals.
 - **Lauric acid** as replacement for fossile polyamides. Evonik, demo plant in Slovakia.
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Practical examples for innovative biobased products out of the C-toolbox of nature

Bran, new fibres, lignin, even glycerine as feedstock

- Innovative resins
 - Plastizisers
 - Biosurfactants
 - Sponges
 - New cosmetics
 - De-icing materials for aviation
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Practical examples for innovative biobased products out of the C-toolbox of nature

- **Arkema**, subsidiary of Total, F, started usage of castor oil for the replacement of fossile polyamides for the production of several consumer goods, like skying boots, sun glasses, electronics etc.
- **Fischer Bio-PA Plugs**: first 100% biobased Fischer-plug (Universal UX) on the market made out of biobased polyamides out of castor oil, as well as first biobased mortar.
- **Essential amino acids** as feed additives (methionine, lysine) -> Evonik

Practical examples for innovative biobased products out of the C-toolbox of nature

- First **biobased closures for gabled roof packaging by TetraPak** made out of sugar cane residues.
- **Food and ketchup producer Heinz:** residues of tomato skin as basis for biological plastics for wiring brackets and storage bin in cars.
- New biobased cable protection tubes with higher bending cycle and temperature resistance and other environmental advantages in particular for applications in the industrial robotic industry (developped by Reiku in Germany), made from castor oil.

What can be concluded from these recent industrial developments inside and outside Europe ?

- There is a growing number of biobased production lines for intermediates and platform molecules, all focused around the renewable “C” !
 - There is a shift from science and research activities on the content of biological resources to optimization of industrialized processes.
 - There is a shift from the cell factory to the real factory with the necessary growing attention on economics. This requires stronger attention on elements of the backend of value chains like norms, standards, marketing and consumer acceptance.
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**All these activities require
industrial biotechnology**

What can be concluded from these recent industrial developments inside and outside Europe ?

- In addition CO₂ turns out more and more to become a potential resource as well as waste and proteins become important objects of the bioeconomy.
 - The frontiers among chemical products, biofuels, proteins for food purposes start to become „swimming“!
This might reach a new dimension by a stronger use of big data in the future.
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Changes and lessons learnt in the last ten years

- Biomass is the primary natural resource of the bioeconomy, be it a carrier for energy, or a modular part for chemicals, biochemicals, proteins or nutrients, etc..
- Recently, CO₂ is added to the portfolio of primary natural resources of the bioeconomy.
- Biorefineries will be the central production facilities of the bioeconomy. Their primary but not exhaustive feedstock will be biological waste resources and biomass: both of renewable nature.

Changes and lessons learnt in the last ten years

- Recycability and/ or multiple reuse of biomass in diverse forms including cascades, will be the prime elements along new value chains like „from fork to farm“ oder „farm to fork“, „gate to plate“ etc. .
- Such old optimization on new value will represent the ‚nerve strains‘ of this new concept of economy.
- Biotechnologies, in particular industrial biotechnology and focused new knowledge stemming from converted technologies, like nano-, info- or cognitive sciences will be the technology drivers of this new form of economy.

Changes and lessons learnt in the last ten years

- There are new trends emerging we must take into account: big data, aspects on healths (“one health”)
- Closeness not only to the concept of sustainability but also the relationship to the content of the circular economy are becoming more and more important strategic elements in the discussions of the bioeconomy to be a factor for the future.
- In parallel to the growing maturity of the bioeconomy economics will play a growing role, in particular when biorefining will be successfully implemented, based on a stronger diversity and flexibility within the choices for feedstock, ranging from lignocellulosic glycerine over black liquor to bran.

**Industrial biotechnology will be
indispensable to achieve these goals!**

**Thank you very much
for your attention !**
