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Advances in Design and Use of Microbial Production Systems: A Workshop for the BWC Community

Examples in Action

- Industrial use of bio-based production systems: drivers and challenges – Detlef Männig, Evonik Industries
- Alfred Szwarc, Brazilian Sugarcane Industry Association (UNICA)
- Muhammad Farish Kamaludin, Malaysian Biotechnology Corporation

Strategies for Reducing Design and Development Barriers

- Developing an integrated design tool: recent progress and remaining challenges – Markus Herrgard, Technical University of Denmark
- Streamlining laboratory workflows and data analysis in the development of production platforms – Sean Ward, Synthace Ltd.
- Platforms for engineering microorganisms – Jason Kelly, Ginkgo BioWorks

What are the Implications for the BWC?

- Piers Millett, Biosecure Ltd
- Discussion

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Landscape

- Significant interest in the bioeconomy and in moving to bio-based processes

- Number of factors driving:
  - Resource availability (biomass)
  - Environmental considerations
  - Financial incentives and investment

- To be produced on industrial scale – need profitability, consistency, reliability

- Biological industry is not monolithic:
  - Can be hard to precisely define, hard to generalize
  - Balance of drivers and challenges in different sectors – specialty products with smaller production scales and higher profit margins vs. large scale bulk chemicals where price is very sensitive (ex. biofuels)
  - Specific sectors vulnerable to different external factors (ex., falling oil prices)

- Global nature of industry
  - International partnerships

Design tools

- Multiple tools for different purposes and stages (DNA, pathways, organism…)
- Narrow the space – helping to avoid going down paths that won't work
- Need to validate with experimental testing

Rapid Implementation

- Automation
- Increasing experimental capacity
- Reducing variability

Specialty companies

- Develop the organisms (ex., Ginkgo BioWorks) for partner companies such as chemical manufacturers

Effects on the tacit knowledge to design and carry out experiments?

Messages

- Tool development, automation, experimental design – cross sector; continued drive forward
- Lower cost, faster, increasing capacity
- Development at laboratory scale is different than industrial scale manufacturing
  - Hard to use biology effectively in manufacturing context (cost effectives, robustness)
- What directions technological advances move may vary
  - Complex resource investments for “foundries” (centralized) versus automation technology (benchtop size, drop in equipment cost)
- Progress in multiple areas but not at visionary stage of entering the desired end product and having systems map out exactly what to do and have it work

Engagement

- Need to find ways to engage science and industry - where fields headed, how to promote responsible conduct, advantages and disadvantages of governance strategies, how they relate to BWC

- Various models could be considered – stand-alone meetings, discussions at scientific conferences, temporary working groups…

- Not a single umbrella for the biology/biotechnology industry
  - Role of individual champions

- Role of concrete data and examples