Session 8	Microbial protein transition players
Pitch Title	Renewable methanol in biotechnology: the paraformaldehyde approach
Company	FeedstocksUnited
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Abstract:

Green methanol as feedstock in biotech operations at large scales world-wide receives in-depth attention for the production of Single Cell Protein (SCP) and circular chemicals. Several decades ago, cheap fossil methanol was seen as an attractive feedstock. Now, renewable rather than fossil methanol is in focus since its utilization does not depend on fossil resources and importantly it does not compete with food sources.

Despite decade-long efforts, the biotech approaches have not been successful in generating economic large-scale productions on the basis of methanol. This impressive negative track record is to be attributed to the relatively reduced nature of methanol, which implies excessive oxygen demands during fermentations. For instance, the oxygen demand in the production of SCP on methanol is more than twice the amount required for sugar-based processes.

Hence, for large-scale methanol fermentations, it is very important to minimize oxygen budgets in order to arrive at economically viable production processes.

FSU has considered this key-issue of oxygen requirements in the water-based methanol fermentations. It is concentrating on reducing the oxygen footprint by employing the less-reduced C1-compounds paraformaldehyde or trioxane, which can be obtained chemically from methanol.

Paraformaldehyde is a formaldehyde polymer. It does not dissolve in water, but at ambient temperatures it will release formaldehyde as depending on both pH and temperature. Three methylotrophic microbes have been tested for their ability to grow at the expense of formaldehyde as chemically released from paraformaldehyde. The oxygen budget of formaldehyde fermentations is clearly lower than in the methanol-based fermentations. Results will be presented demonstrating the advantages of the paraformaldehyde approach. Both *Acidomonas methanolica* MB 58 and *Pichia pastoris* CBS 704 were cultivated in sealed 500-ml serum bottles in either the presence or absence of paraformaldehyde at various initial amounts. Determinations were done of formaldehyde, pH and OD over time. Results have previously been presented at the Symposium on Biomaterials, Fuels and Chemicals, Alexandria, VA 2024.

Subsequently, *Methylophilus methylotrophus* DSM 5691 was cultivated in a 1-l stirred-tank reactor under defined and controlled conditions both on methanol and paraformaldehyde. Various parameters were recorded over time demonstrating the ability of the organism to grow in the presence of paraformaldehyde.
In conclusion, paraformaldehyde seems to be a highly suitable feedstock in producing both SCP and many circular chemicals on the basis of renewable methanol.