Waste stream valorisation: online training for the biotech industry

One of the emerging concepts behind sustainability is 'waste stream' valorisation. For any industry that produces a commodity from biomass, organic waste biomass is also produced. Landfill is one fate for such waste material, but landfill use is sub-optimal and unsustainable due to leeching of methane, a harmful greenhouse gas. Alternatively, in order to reduce our dependency on fossil oils and mitigate climate change, such organic waste can be valorised into products which otherwise would have been synthesized from fossil oil. Valorising organic waste streams thus provides opportunity for profit whilst promoting a green circular economy.

Take the food industry as an example. Food processing industries in Europe, result in large amounts of waste, estimated at 25 million tons per year (Federici *et al*, 2009) which number can only increase with time. Waste streams resulting from the food industry include potato peel, apple pomace, tomato leaves and bakery waste amongst others. These organic waste streams are typically rich in lipids, amino acids, carbohydrates and phosphates (Pleissner, D., *et al*, 2013). Carbohydrates, such as starch and amylose, typically enriched within bakery waste, have been shown to be perfect feedstocks for succinate production, a high value compound that was worth $400 million in 2014. Succinic acid is a building block for a plethora of other value-added metabolites used in many industries such as the pharmaceutical and food industry; it can be used in a range of products such as for surfactants, detergents, polymers and paints. The market value of succinic acid is expected to shoot up to over $1000 million by 2020 (Carlson, A., *et al*, 2016). The conversion technology employed here is fermentation, a biological conversion route. Succinic acid is not unique in being of high value. Polylactic acid, also produced by fermentation of organic waste streams, is 100% biodegradable and, as an example, can be used for applications associated with food packaging. Biodegradable plastics are huge business at the moment: bio-plastic production is on the increase with an expected global production capacity increase of 300% to 7.85 million tonnes, supported by current EU biopolicy legislation. Bioplastics have been designated a lead market by the European Commission, and its success will help drive the further evolution of a bioeconomy in Europe.

As we have seen, industrial biotechnology is a highly technical field, drawing on the results of many different research disciplines. For any industry involved with, or producing, organic waste specific techniques and knowledge of many conversion routes currently available can support future development. There has never been a better time to get involved and to fill the skills gap that currently exist in this rapidly expanding sector. A new and exciting online-training programme has been developed to address this skills shortage. Steered by industry, and facilitated by Aberystwyth University, a series of postgraduate distance-learning modules have been developed. These include Agricultural Feedstock Valorisation, Biorefining Technologies and Bioproduct Development. These modules provide an in-depth knowledge of the aims, objectives and

technologies used to valorise and convert waste streams to produce commercially viable end products from biorefining: learn how waste matter is being re-defined as a co-product. These modules can be taken as standalone modules or built up towards an MSc in Industrial Biotechnology, or the new MRes in Industrial Biotechnology (subject to approval).

References

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