Biochemical approaches to developing spent media from industrial bioprocesses for new protein production in E. coli fermentation systems.

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What if we could take waste byproducts from industrial processes and generate new value in secondary processes with that waste? Of the thousands of tonnes of hazardous chemical waste generated from the biopharmaceutical manufacture of protein-based drugs each year, spent cell culture media from bioprocessing represents one potential area for exploitation using applied biochemical approaches. Studies have shown that levels of up to 60% spent media added to cell culture systems helped to increase protein production by mammalian and insect cells. In this poster presentation we describe (i) the proof of principle experiments to determine viability of E.coli cultures using harvested spent media from CHO cell culture (ii) the expression analysis of a novel fusion protein by the cultures and (iii) the empirical approaches taken to optimise the culture conditions in comparison to rich bacterial media and nutrient limiting minimal media controls respectively. Our data shows that expression of a fluorescent mCherry fusion to a novel affinity construct of commercial value is maintained by the bacterial cultures in 100% spent medium from mammalian cell culture. The careful empirical optimisation of biochemical parameters in the expression culture system are presented to show how a spent medium from bioprocess can generate proteins of value in newly designed processes, including the titration of low cost additives such as glucose and glycerol, as well as gradients of temperature and expression time. A key aim of the circular bioeconomy is to maximise the utility of resources by ensuring waste can be used to generate new value and this study confirms the potential for the reuse of spent media from bioprocess as a food source for microbial expression cultures.

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