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Delivering on Metagenomic promises: a paradigm shift in screening for novel enzymes

Metagenomics is the benchmark for exploring the diverse metabolic potential of microorganisms directly from any environment, and many biotechnologically relevant enzymes have already been discovered through it. Despite the availability of numerous screening assays suited for high- throughput functional-based screening, there are very few examples of metagenomically derived biosurfactants. In this presentation the most recent successes, including the discovery of a novel ornithine lipid (OL) from our laboratory, will be highlighted. Several aspects to the process of discovery of this OL very nicely demonstrates the specific obstacles which have led to the underrepresentation of biosurfactant discovery in metagenomic screening studies, and how these lessons can inform future screening strategies will be detailed. However, irrespective of the biocatalyst, a long time, usually in the order of years, is needed from the time of enzyme or biomolecule characterisation to the establishment of an industrial process. The technologies for functional metagenomic screening employed by both academic and industry platforms have only improved marginally over the last 15 years, and the same limitations still hamper our ability to adequately tap into novel functional space. To improve on the novelty hit rate, we have developed an innovative ultra-high throughput solution to overcome many of the limitations associated with classic functional metagenomics. This innovation has been demonstrated as a proof of concept study for β-xylosidases, but could also be developed for novel biosurfactants.