Low Volume, High Throughput Polymer Syntheses for Accelerating Discovery of Novel Biomaterials

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Synthetic biomaterials hold tremendous promise for diverse applications across many areas of healthcare. This is largely due to the diverse array of chemical tools that are now available to researchers, allowing for unprecedented levels of control over the properties and structure of synthesised biomaterials. However, the development pipeline of most biomaterials has largely been limited by the throughput at which novel materials can be synthesised, characterised and then finally evaluated for their suitability in a given application. Furthermore, the scale at which biomaterials are manufactured is not always conducive to the integration of expensive biologically derived therapeutics (e.g. enzymes, growth factors etc.). In order to expedite the discovery of new materials to be applied in biology, my work focuses on developing polymer synthesis and characterisation platforms that are versatile in both chemical functionality and synthetic scale (micro/milligram quantities). This approach can then be harnessed for the high throughput discovery and optimisation of novel polymer therapeutics (e.g. as inhibitors of infectious disease). Alternatively, we are also exploiting the versatility of this chemistry to enhance the function and potency of biologics to produce hybrid nanomaterials that can be used to artificially modulate cells (artificial organelles[1]), deliver encapsulated cargo intracellularly (antigen delivery to activate immune cells[2]), or mimic out-of-equilibrium cell feedback processes (synthetic protocells[3])

References:

[1] Kim, H.; Yeow, J et al. *Advanced Science* **2022**, *9*, 2200239.
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