

A Nanoscale Shape-Discovery Framework Supporting Systematic Investigations of Shape-Dependent Biological Effects and Immunomodulation

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Since it is now possible to make, in a controlled fashion, an almost unlimited variety of nanostructure shapes, it is of increasing interest to understand the forms of biological control that nanoscale shape allows. However, a priori rational investigation of such a vast universe of shapes appears to present intractable fundamental and practical challenges. This has limited the useful systematic investigation of their biological interactions and the development of innovative nanoscale shape-dependent therapies. Here, we introduce a concept of biologically relevant inductive nanoscale shape discovery and evaluation that is ideally suited to, and will ultimately become, a vehicle for machine learning discovery. Combining the reproducibility and tunability of microfluidic flow nanochemistry syntheses, quantitative computational shape analysis, and iterative feedback from biological responses in vitro and in vivo, we show that these challenges can be mastered, allowing shape biology to be explored within accepted scientific and biomedical research paradigms. Early applications identify significant forms of shape-induced biological and adjuvant-like immunological control.

REFERENCES

Zhang W, Lopez H, Boselli L, Bigini P, Perez-Potti A...16 more, *ACS Nano* 2022, 16, 1, 1547–1559

FIGURES