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Editorial: Women in Biomaterials Science 2022

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Editorial on the Research Topic
Women in Biomaterials Science 2022

We are excited to present the inaugural Research Topic "Women in Biomaterials Science." This Research Topic aims to highlight the excellent work performed by female-identifying scientists in the field of biomaterials and to encourage more women to pursue careers in the field. Each paper in the Research Topic has a female corresponding author, two of the lead authors are women and a total of seventeen female scientists are represented as co-authors for all manuscripts. The topics covered in this Research Topic are diverse - from electrospun and 3D printed materials, to micro- and nanoparticles and from drug delivery devices and cell scaffolds to biomaterials for agricultural applications (Figure 1).

A paper from the laboratory of Dr. Candice Majewski from the Department of Mechanical Engineering at The University of Sheffield in Sheffield, United Kingdom, focused on developing antibacterial surfaces to control the spread of infectious disease (Wingham et al.). Specifically, the authors used a Laser Sintering Additive Manufacturing process to produce antimicrobial microcomposites by incorporating silver phosphate glass additives in parts made of polyamide 12, a common additive manufacturing polymer used in polymer powder bed fusion processes. The antimicrobial efficacy was tuned by controlling dissolution rates and silver content, and the microcomposites showed efficacy, both antifouling and bactericidal, against Gram-positive and Gram-negative bacteria (Wingham et al.).

Several other manuscripts in this Research Topic covered the development of various biomaterial systems for drug delivery applications (Chandrasiri et al.; Hernandez et al.; Dharmesh et al.). In a paper from the laboratory of Dr. Silviya P. Zustiak from the Department of Biomedical Engineering at Saint Louis University in Saint Louis, MO, the team developed nanocomposite hydrogel microspheres for sustained release of small molecules (Dharmesh et al.). Specifically, the authors used a simple and scalable aqueous phase separation method to fabricate injectable polyethylene glycol microspheres impregnated with nanosilicates. Nanosilicate concentration was varied to control the release of multiple small molecules, such as doxorubicin, acridine orange and brilliant blue, over days and weeks, while minimizing burst release (Dharmesh et al.). In another article in this Research Topic, Dr. Kim A Woodrow and her team from the Department of Bioengineering at the University of Washington in Seattle, WA, used electrospinning to produce drug-eluting fibrous biomaterials (Hernandez et al.). In particular, the

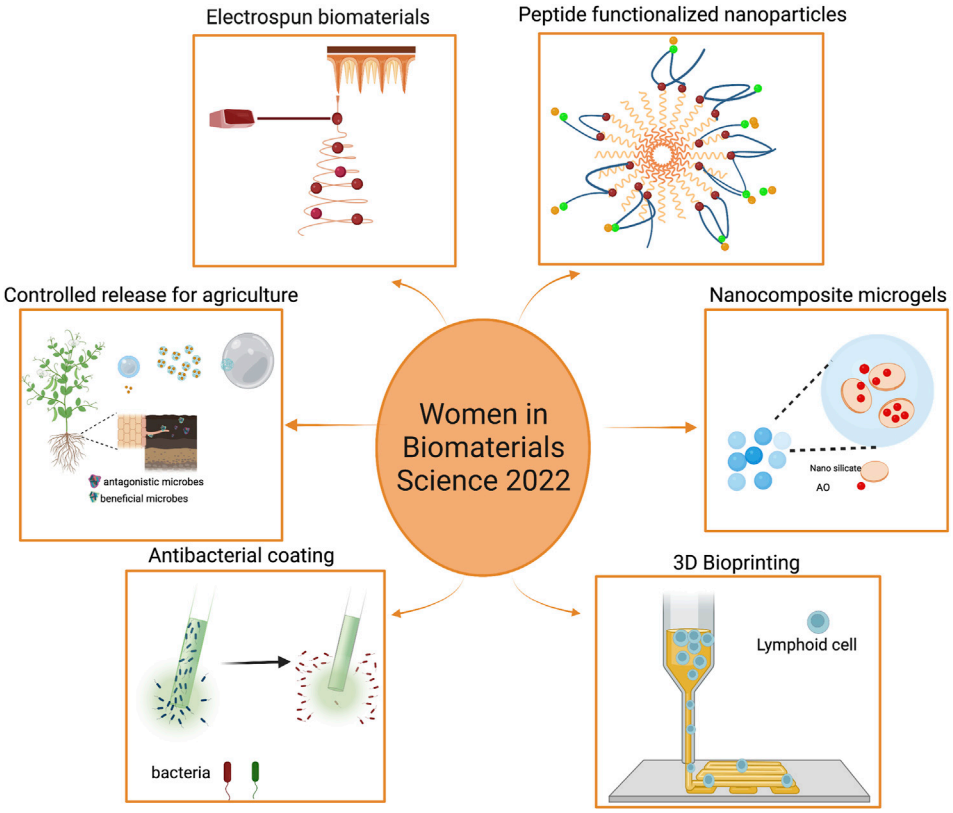

FIGURE 1
Schematic representation of the biomaterials science topics covered in the Research Topic of Women in Biomaterials Science 2022.

authors optimized a scalable, high-productivity free-surface electrospinning process to produce materials of uniform area density (<10% coefficient of variance) and high drug loading, and showed the simultaneous release of multiple drugs (Hernandez et al.). Finally, in a paper from the laboratory of Danielle S. W. Benoit from the Department of Biomedical Engineering at the University of Rochester in Rochester, NY, the authors describe peptide functionalization of polymeric nanoparticles, again focusing on system reproducibility and tunability for efficient drug delivery (Chandrasiri et al.). Specifically, the authors showed undesired intra- and intermolecular crosslinking for multi-amine peptides, where primary amines are commonly used for peptide conjugation, or carbodiimide coupling reagents. In contrast, peptide-polymer conjugates with reproducible dispersity and molecular weight were achieved by using selectively protected peptides as well as using anhydride ring-opening nucleophilic addition elimination for cyclic anhydride-containing polymers (Chandrasiri et al.).

A bioink for the 3D bioprinting of lymphoid cells is described in collaborative work by Dr. Cristina Scielzo from the Division of Experimental Oncology at IRCCS Ospedale San Raffaele in Milano, Italy and Dr. Silvia Fare from the Department of Chemistry, Materials and Chemical Engineering at Politecnico di Milano in Milano, Italy (Ribezzi et al.). The authors used different blend formulations of alginate, gelatin, and methylcellulose and demonstrated good shape fidelity and printing accuracy. The bioink was laden with lymphoid cells isolated from patients with Chronic Lymphocytic Leukemia and cultured for up to 3 weeks upon 3D bioprinting, showing good scaffold stability and mechanical properties similar to those of lymphoid tissues (Ribezzi et al.).

Lastly, a review paper from the laboratory of Dr. Jessica O. winter from the Department of Chemical and Biomolecular Engineering at The Ohio State University in Columbus, OH, explores the idea of translating knowledge from the biomedical controlled release field, such as release devices, ‘smart’ release designs for on-demand release in response to environmental cues, or theranostic systems that combine sensing and release for real-time monitoring of interventions, to agriculture applications, such as soil ecology, microbiology, horticulture, and crop sciences (Lee et al.). The goal of such controlled release systems would be to address the global challenge of sustainable food production. Examples include improving targeting of agrochemicals such as nutrients and pesticides to reduce waste and cost while enabling environmental sustainability (Lee et al.).

The papers in this Research Topic represent a small portion of the female investigators working in the biomaterials field. However, they are a good illustration of the diversity of ideas and approaches, the breadth and depth of the work, and the objective to address global challenges such as food insecurity, infectious disease and cancer.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

The author(s) S.P.Z, M.L.O and C.S. declared that they were an editorial board member of Frontiers, at the time of submission. This had no impact on the peer review process and the final decision.

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