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Andrea studied a BSc in Nanotechnology and Molecular Engineering at the University of the Americas Puebla (UDLAP) in her home-country, Mexico. She participated in two research projects at the University of British Columbia (Canada). The first involved investigating the conditions for organized DNA deposition in gold electrodes, and the second involved studying the effect of different oxygen profiles on breast cancer cells in microfluidic devices. Before joining the BCFN she completed an internship at King Abdullah University of Science and Technology (Saudi Arabia) in the Integrated Nanotechnology Lab, characterising MEMS for marine life tagging. Her interests include microfluidic devices, nanomaterials for biomedical applications and bio-inspired materials.

"Fabricating Light Responsive Hydrogels for Bio-hybrid Robotics"

The areas of Soft Robotics and Tissue Engineering have conveyed to explore beyond traditional materials and their currently limited range of mechanical properties. Within this new realm of Engineered Living Materials (ELM), bacterial or mammalian cells have been incorporated as force-transducing elements.

We have engineered hydrogels to become cell-laden light-responsive soft robots. Our proposed fabrication comprises a photo-responsive hydrogel with actuation strain comparable to that in human tissue for 4D scaffolds. The material comprises a photo-responsive chrysophenine doped polyurethane, which is later surface modified to increase cellular adhesion. The photo-active chrysophenine has a characteristic absorbance band from 460 to 490 nm (blue light), which triggers a trans-cis transition that disrupts the π stacked network while being safe for cellular growth. This, in turn, shifts the local dielectric constant, displacing water from the polymer network, which gives rise to macroscopic actuation up to 17% strain.

We are optimising the application of this novel material to create actuatable scaffolds, which would become a 4D culture substrate for tissue engineering where parameters of mechano-transduction from the polymer to muscular tissue could be explored.