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Physical and Mechanical Properties of Lymphocyte Adhesive Biopolymer Multilayer Films

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Lymphocyte adhesive biopolymer polyelectrolyte multilayer (PEM) films were fabricated using the layer-by-layer technique. Substrates were coated with a cell adhesive layer composed of both polyelectrolyte hyaluronic acid (HA) and chitosan (CHI). PEM assembly conditions such as pH and ionic strength can be tuned to enhance cell adhesion to the resulting PEM. The biopolymer PEMs were constructed under pH 3 and 5 conditions, and in the absence and presence of 100mM NaCl. Lymphocytes bind most efficiently to HA/CHI multilayers constructed under pH 3 conditions and with salt. Interestingly the moduli for all films were in the range of soft biological tissues, such as fat and muscle. Biopolymer films constructed in the presence of salt have the lowest modulus from the films studied. Along with nano-indentation measurements, other physical properties of the films that were analyzed included thickness, roughness, contact angle, and surface morphology. These cell-PEM systems have great potential in immune system engineering applications.