Abstract Submitted
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Capillary flow driven gradient generation in fluid stripes for biomaterial and biomedical applications MATTHEW HANCOCK, Brigham & Women's Hospital, JIANKANG HE, FRANCESCO PIRAINO, GULDEN CAMCIUNAL, ALI KHADEMHOSSEINI, Brigham & Women's Hospital — A simple and inexpensive bench-top method is presented employing passive mechanisms to generate centimeters-long gradients of molecules and particles in under a second with only a coated glass slide and a micropipette. By patterning hydrophilic regions on a substrate, a stripe of prepolymer solution is held in place on a glass slide by a hydrophobic boundary. Adding a droplet to one end of this "pre-wet" stripe causes a rapid capillary flow that spreads the droplet along the stripe to generate a gradient in the relative concentrations of the droplet and pre-wet solutions. Experiments and theoretical models characterize the flows and gradient profiles and their dependence on the fluid volumes, properties, and stripe geometry. A bench-top rapid prototyping method allows the user to design and fabricate the coated slides using only tape and hydrophobic spray. Gradient biomaterials are produced by crosslinking gradients of prepolymer solutions. Applications include producing a soluble drug gradient over cells in shear-protected microwells, generating a concentration gradient of cells encapsulated in three dimensions within a homogeneous biopolymer, and synthesizing a biomaterial with encapsulated cells exhibiting a gradient in cell spreading.

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