Contact printing of arrayed microstructures

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Survey of the variables for contact printing of polystyrene.

The spin speeds for creating the printing film were varied between 600 - 2000 rpm in 100-to-200 rpm increments. The micropallet sizes tested varied between 50 - 170 μm. The gaps between the micropallets were varied over the range of 20 - 100 μm. After contact printing and baking, 100 micropallets were randomly chosen on each array and were scored by visual assessment to calculate the percentage of the micropallet array that possessed an appropriate coating. In these experiments, the percentage of micropallets that were individually coated with a homogeneous layer of polystyrene was 100% at the micropallet dimensions tested when the spin speed used to create the polystyrene print layer was in the range of 600 - 1300 rpm. At higher spin speeds the print layer was so thin that it quickly dried ($t < 5$ s) to a highly viscous or solid film after spinning. This resulted in reduced efficiency of transfer of the polystyrene to individual micropallets as evidenced by either a complete lack of transfer or many polystyrene fibrils forming between micropallets. Success of contact printing was reduced to less than 50% of arrays (number of arrays = 20) at 1400 - 1500 rpm, less than 30% of arrays ($n = 20$) at 1700 rpm and 0% at spin speeds >1700 rpm.

Contact printing of extracellular matrix materials

To evaluate whether the PAA sacrificial-layer, contact-printing method could improve the coating of ECM materials such as collagen, arrays were contact printed with collagen under sterile conditions. After printing and air drying, the individual micropallets were seen to be evenly coated with the collagen. No overflow and no collagen fibrils spanning micropallets were seen (Fig. S3A).

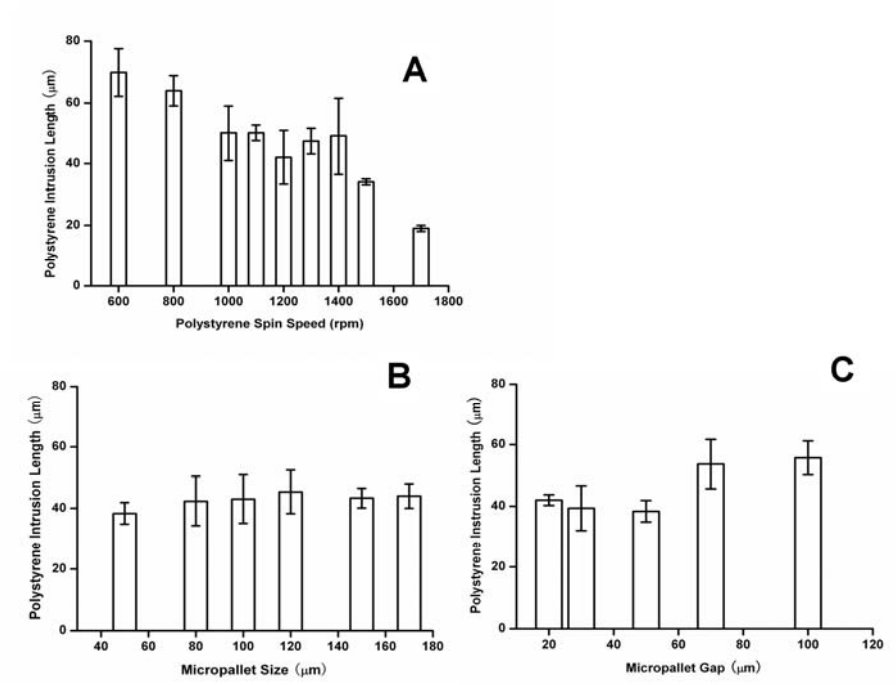

Fig. S1 (A) Plot of polystyrene intrusion length *vs*. polystyrene film spin speed. (B) Plot of polystyrene intrusion length *vs*. micropallet dimension. (C) Plot of polystyrene intrusion length *vs.* gap between the micropallets.

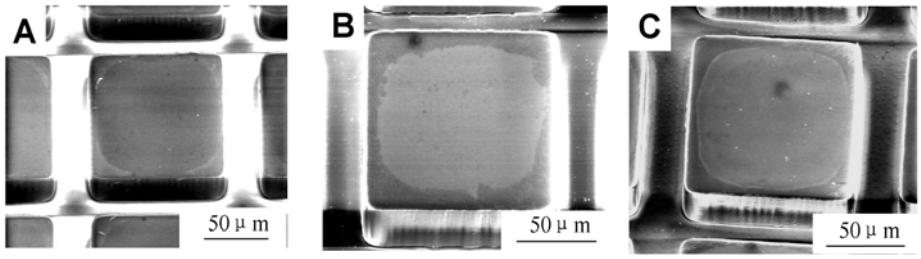

Fig. S2 ESEM images of SU-8 micropallets contact printed with: (A) collagen, (B & C) a 0.1% solution of gelatin after a single stamping (B) and after 4 stampings (C).

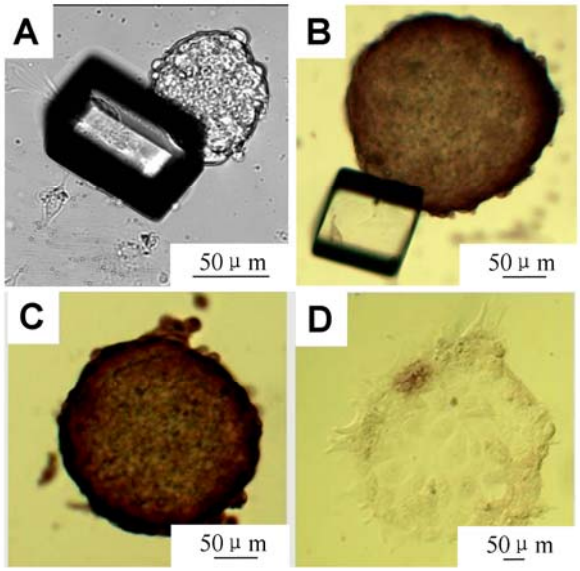

Fig. S3 (A) A released and collected gelatin-coated micropallet with an attached ES cell colony. (B) Alkaline phosphatase staining of an ES cell colony 72 hr after release and collection from the array. (C & D) Positive (C) and negative (D) controls of alkaline phosphatase stained ES cell colonies.