Supplementary data 1. Flow rate derivation.

Normal cardiac output (CO) = (4-8) L/min

Average CO = 6 L/min

Distribution of CO to superior mesenteric artery (SMA) = 15% of CO

Distribution of CO to intestinal mucosa-submucosa = (50-90) % of CO (average = 70%)

Hence, estimate of blood flow (BF) to intestinal mucosa-submucosa = 6 L/min X 15% X 70%

Microfluidic/micro-human flow = 10^6

Therefore,

Blood flow to micro intestine mucosa-submucosa = 6 L/min X 15 X $70/10^6$

= 0.0063 L/min

= 0.63 µl/min

In post-prandial state, BF to intestine increases by ~50%.

Thus, BF to micro intestine mucosa-submucosa = 0.63 – 0.95 µl/min.

Supplementary Figure S1.

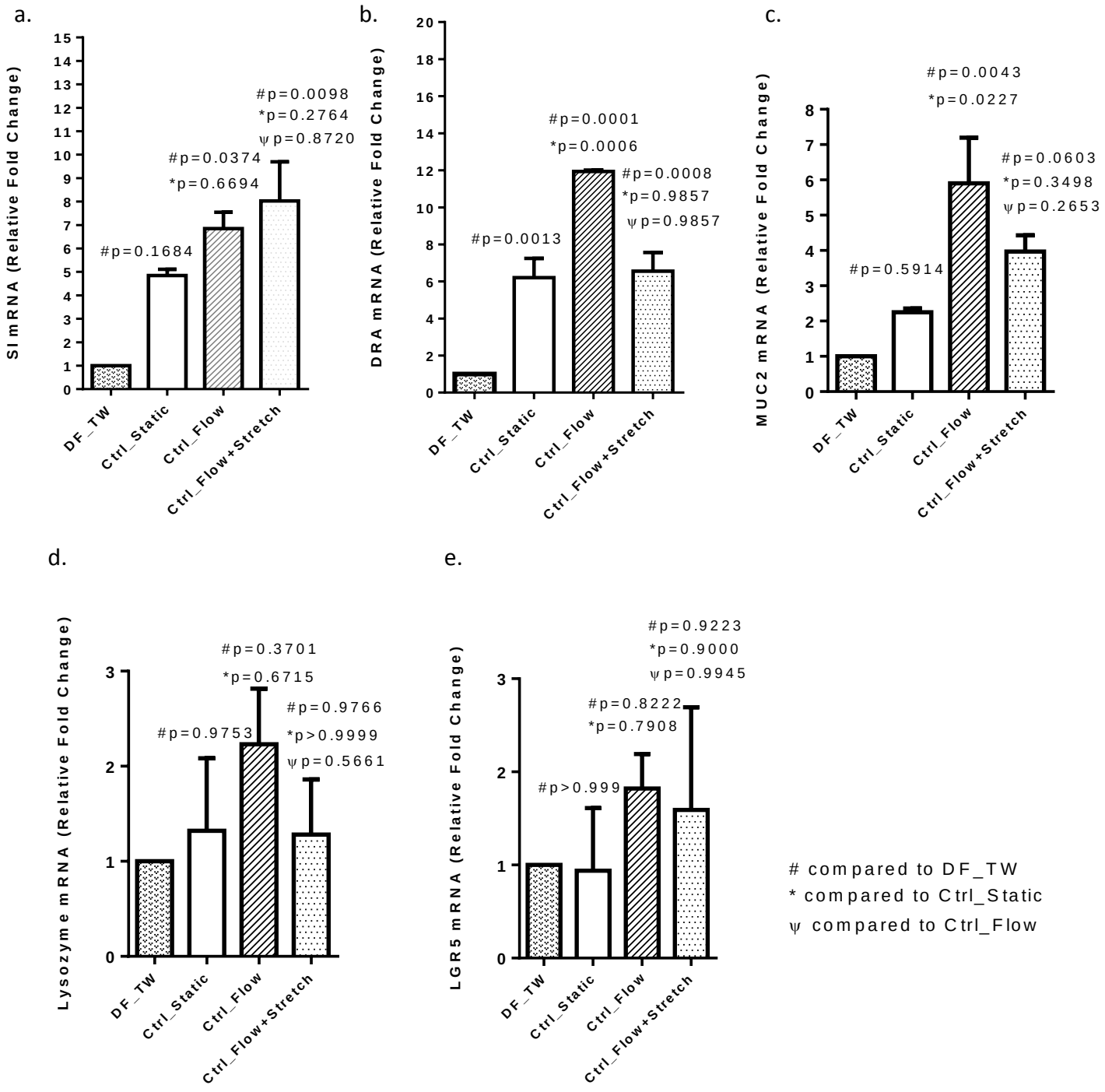

Figure S1. Enteroids grown on chip are differentiated. mRNAs for differentiation markers (a) SI, (b) DRA, (c) Muc2 and (d) lysozyme which is expressed at high levels in Paneth cells and (e)

stem cell marker LGR5, were normalized to that of differentiated enteroids grown on Transwell inserts. SI, DRA and Muc2 mRNAs were significantly increased compared to Transwell inserts, specifically so of the cells grown under flow condition. n=3 for all studies. Results are means ± SEM.