

S1. Manufacturing the TPU Model

Figure S1 shows the structure of the in-vitro intestine model. Based on this information, the 3D printer produced the physical model with the TPU materials.

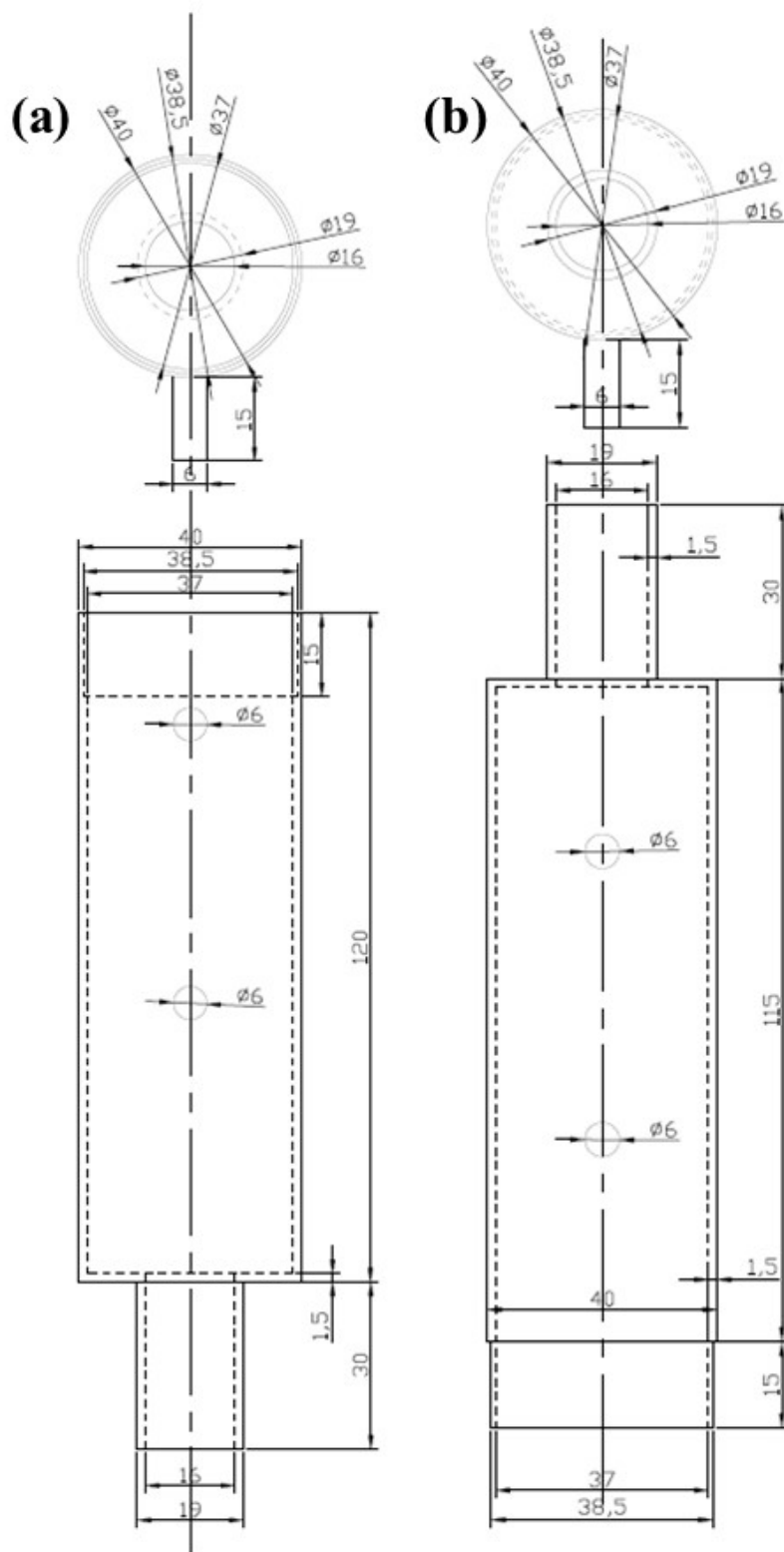


Figure S1. The structure of the system of the in vitro intestine model (all units in mm).

S2. Flow Visualization Tests

The operating procedure of the four actuators is shown in Table S1.

Table S1. The operating procedure of the actuators with duration in seconds.

Syringes 1 and 3		Syringes 2 and 4	
Backward	2	Forward	2
Forward	2	Backward	2

S3. Tensile Tester

The Shimadzu EZ-L tensile tester is shown in Figure S2. To study the mechanical features of the TPU intestine model, nine samples from different locations of the model were measured, as shown in Figure S2.

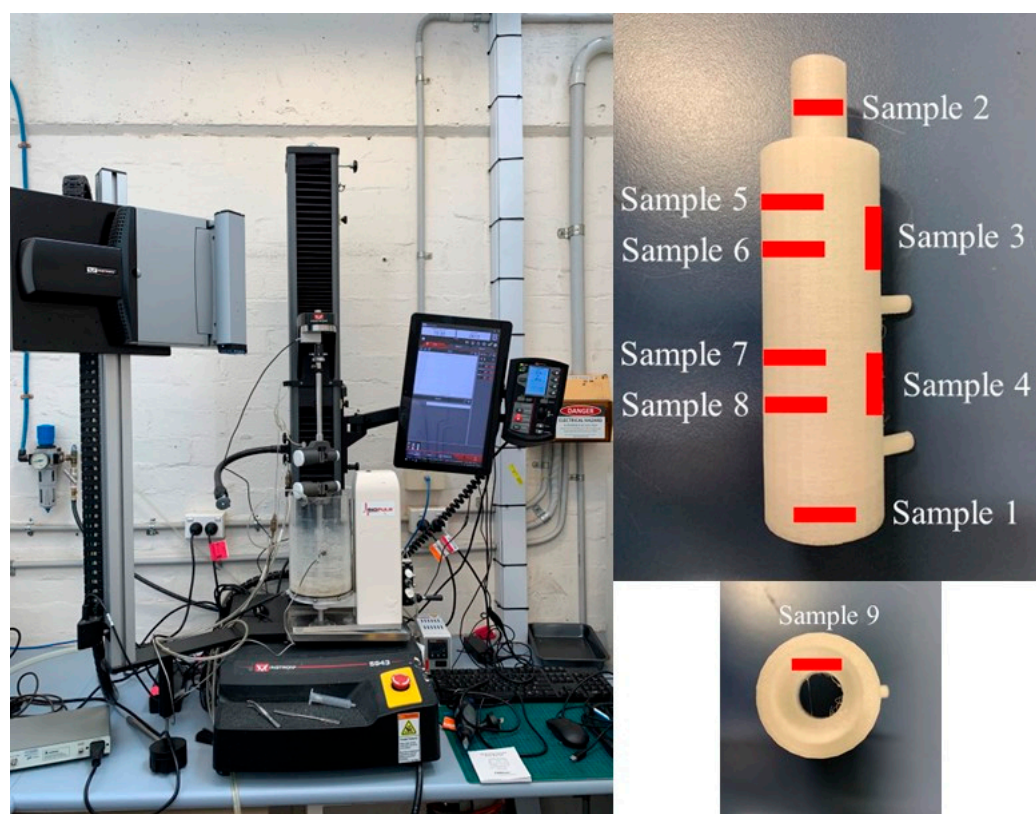


Figure S2. Mechanical property tests of the TPU intestine model material using a tensile tester.

The values of Young's modulus for different parts of the TPU intestine model are summarized in Table S2. The tensile tester stretches the sample during the measuring process. Therefore, a value for the Young's modulus is obtained at each location, and multiple samples are measured to study the mechanical properties of the TPU intestine material.

Table S2. Young's modulus of different parts of the TPU model.

Samples	Young's Modulus (kPa)
1	22,117
2	18,668
3	15,231
4	17,184
5	14,636
6	16,466
7	16,889
8	15,542
9	12,905