Supporting Information

Characteristics of membranes

Table S1 summarizes the results. The total intrusion volume, total pore area and porosity of PU nanofiber membrane were 254.85 %. 333.55 % and 13.85 % higher than that of the dialysis membrane respectively. However, as shown in Supporting Information Figure S1, the dialysis membrane has a highly wettable surface condition. These results indicate that even though the PU nanofiber membrane has better structural properties for diffusion, the PU nanofiber membrane's hydrophobicity obstructs a crosslinking of alginate. Relatively, more hydrophilic dialysis membrane could make more easily crosslinking than PU nanofiber membrane.

Table S1. Characteristics of membrane.

	PU nanofiber membrane	Dialysis membrane
Total intrusion volume (mL/g)	5.25	2.06
Total pore area (m^2/g)	161.07	48.29
Porosity (%)	80.96	71.11
Contact angle (°)	126.6	20.4

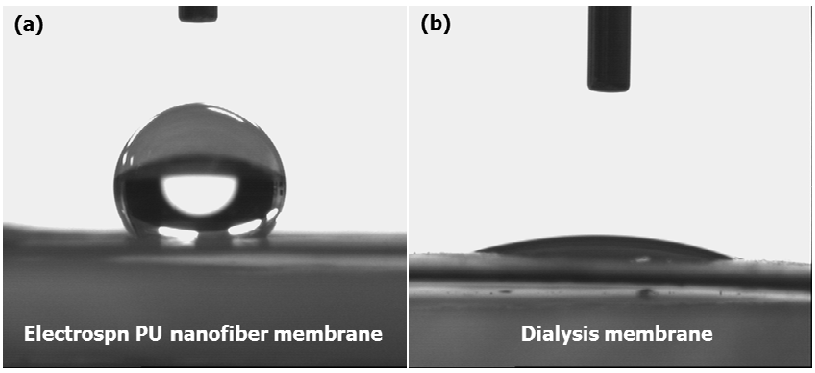

Figure S1. Contact angle measurement for wettablity test.

Comparison of diameter size of spheroid and viability

To support the advantages of the cell encapsulation technology, we examined the size mono-disperse spheroid to the concave mold size and viability of aggregated spheroid to the size of mold. In 700 µm concave mold, the viability is inferior to 300 and 500 µm mold, and this seem to be from the central necrosis of cells due to the lower nutrient and oxygen delivery.

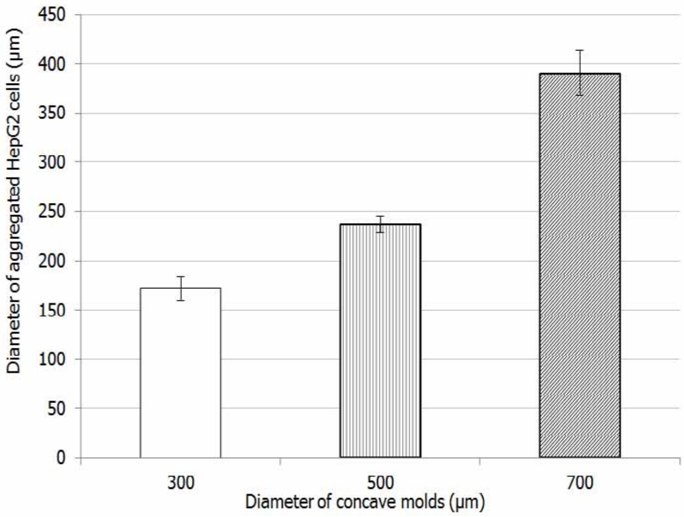

Figure S2. Diameter of spheroid to the size of concave mold (n = 50).

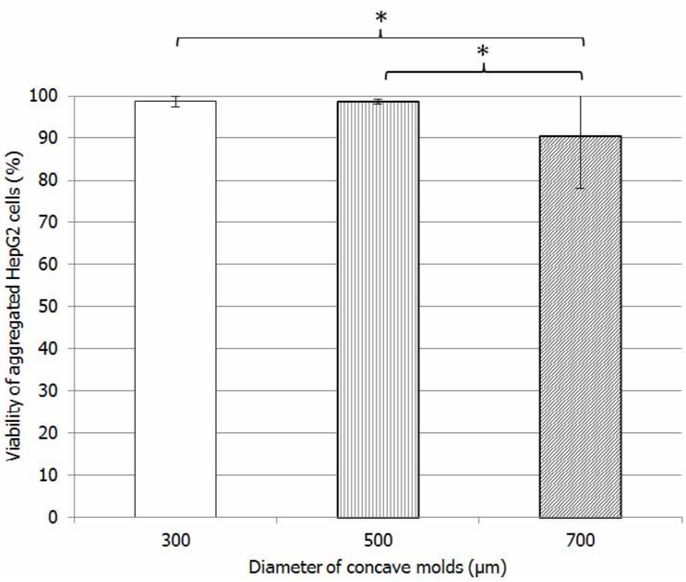

Figure S3. Viability of aggregated cells at 3 days after seeding (*p<0.05).

Transport capabilities of the membranes

We quantified the transport properties of 3 membranes. We prepared a PDMS mold-based osmotic pump system with an alginate solution (1, 2, or 3% (w/w)). As illustrated in the Figure S4, testing was performed by filling the polyethylene (PE, Natsume Seisakusho Co., Ltd) tube and the chamber for water reservoir with deionized water. Alginate reservoir was filled with the alginate solution (1, 2, or 3% (w/w)) and the osmotic pump was dipped into the alginate solution to immerse the membrane. The start time was noted and the position of the deionized water level in the PE tube was marked. Six hours later, the level of the deionized water had shifted, and the distance to the starting level was measured. A volume of deionized water had permeated into the alginate solution through the membrane within the period of time, and the degree of permeability could be indirectly calculated for each type of membrane tested. Movies of the process are provided as the Supporting Information.

Movie clips (transport capability of the dialysis membrane.wmv (size: 268 KB) and transport capability of the PU membrane.wmv (size: 1.91 MB).

The transport of water in osmotic pump system was recorded. To compare the different trasport capability of membrane was observed with a water transporting.

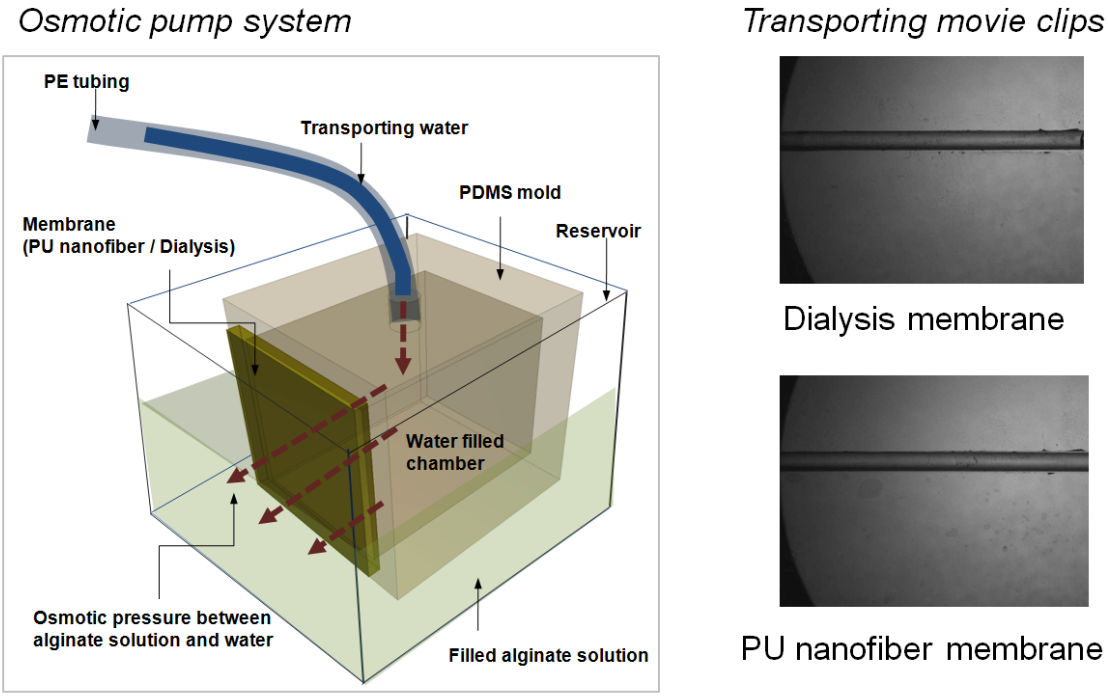

Figure S4. The schematic diagram of transport properties through the two different membranes (dialysis and PU nanofiber membrane) using an osmotic pump with movie clips.

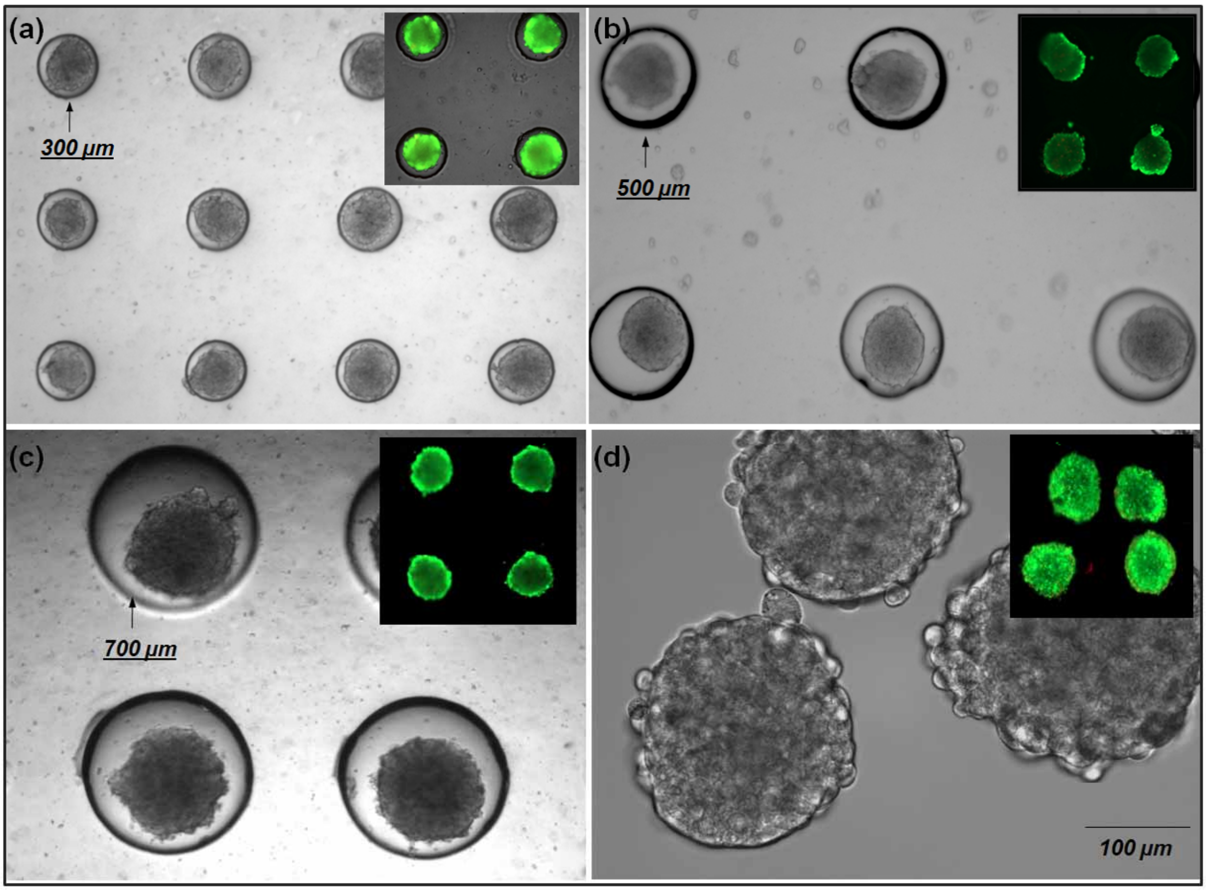

Figure S5. The size of the concave mold enabled control over the size of the HepG2 spheroids.