

## **Macroemulsions for triple action on obese subjects: bacteria inhibition, barrier thickening and inflammation reduction**

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Organ-on-chip platforms have the possibility of mimicking physiological features able to almost completely reproduce the *in-vivo* organ functionalities. In particular, gut-on-chip permits to study intestinal inflammation, absorption and host-bacteria interaction. Regarding intestine, it is widely known that gut flora imbalance can lead to obesity. In details, obese subjects have a higher ratio between *Firmicutes* and *Bacteroidetes* species with respect to healthy subjects. Among *Firmicutes*, a keystone bacteria is *Ruminococcus Bromii*, which is highly specialized in degrading starch. Moreover, obese subjects have inflamed intestine and altered satiety. Oils are known as regulators of satiety and they are able to encapsulate and deliver powerful anti-inflammatory agents, such as curcumin. To demonstrate oil action we developed a two-channel gut-on-chip made of PDMS in which the channels are separated by a polycarbonate membrane. In such a platform we were able to reproduce a mucus layer and to thicken the intestinal barrier by adding oil macroemulsions, which were able to form an oil film on the cell layer. On the other hand, we were able to produce starch emulsions that, while being eaten from bacteria, create an oil film around them, inhibiting their activity, being most of their enzymes hydrophilic. We used *Lactobacillus Rhamnosus* as a control bacteria because it does not degrade starch. We found out that starch emulsion was able to entrap and reduce *R. Bromii* growth while not affecting *L. Rhamnosus*. Furthermore, we cultured *R. Bromii*, which is strictly anaerobic, inside the device for 5 days, assessing both cells and bacteria vitality. The final aim is that, while bacteria eat the starch emulsion, the released oil will inhibit them and will stick on the epithelium due to hydrophobic forces, diminishing the passage of molecules and thickening the barrier. Moreover, loading curcumin in the oil core will also reduce intestinal inflammation.