Supporting Information

1. Morphology of electrospun cellulose acetate nanofiber membranes

Electrospun cellulose acetate nanofiber membranes used in this work were composed of flat fibers and the average diameter of nanofibers was about 390 nm as shown in Figure S1.

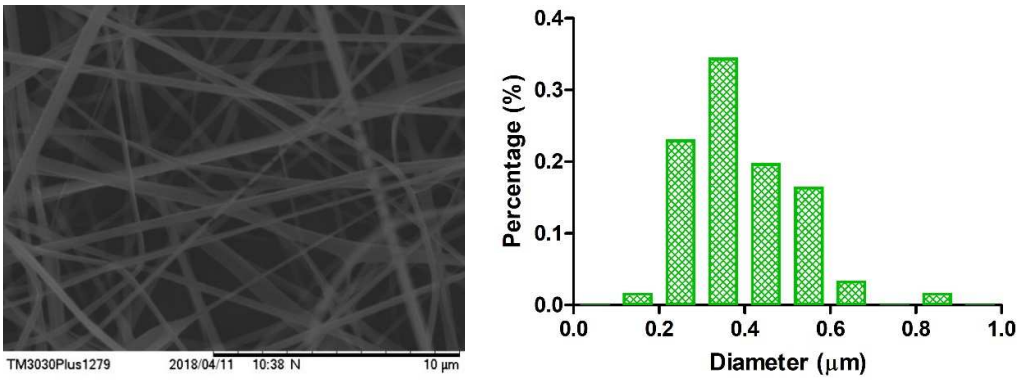
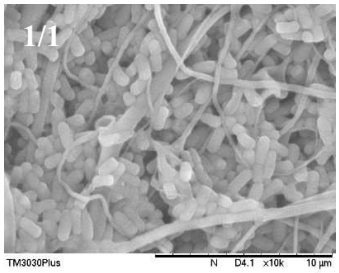
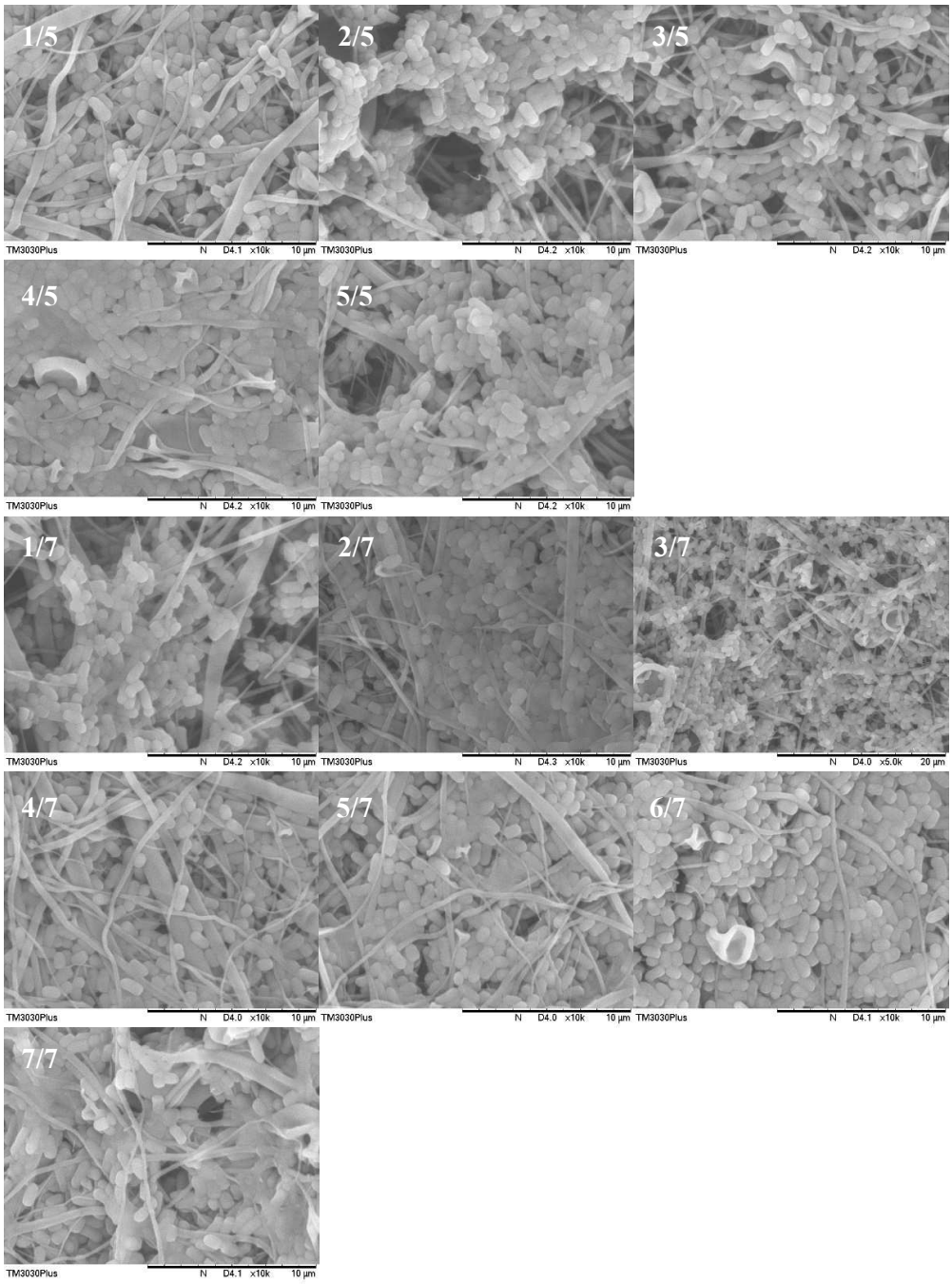


Figure S1. SEM images and distribution of fiber size of electrospun cellulose acetate nanofiber membrane.

2. Morphology of biofilms

Except for 3 pieces of nanofiber membranes, the morphology of biofilms with 1, 5, 7, and 9 pieces of nanofiber membranes in one broth were represented, separately in Figure S3.




1/5
TM3030Plus N D4.1 x10k 10 µm
2/5
TM3030Plus N D4.2 x10k 10 µm
3/5
TM3030Plus N D4.2 x10k 10 µm
4/5
TM3030Plus N D4.2 x10k 10 µm
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TM3030Plus N D4.2 x10k 10 µm
1/7
TM3030Plus N D4.2 x10k 10 µm
2/7
TM3030Plus N D4.3 x10k 10 µm
3/7
TM3030Plus N D4.0 x5.0k 20 µm
4/7
TM3030Plus N D4.0 x10k 10 µm
5/7
TM3030Plus N D4.0 x10k 10 µm
6/7
TM3030Plus N D4.1 x10k 10 µm
7/7
TM3030Plus N D4.1 x10k 10 µm

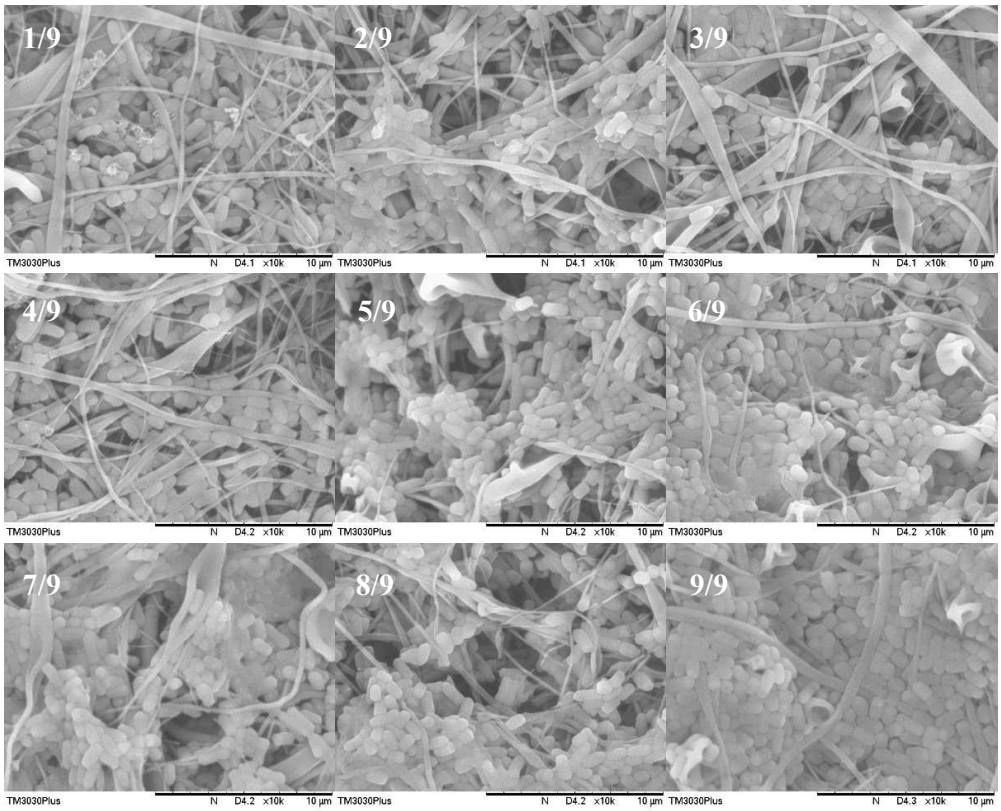

Figure S2. SEM images of the *L. plantarum* biofilm on 1, 5, 7, and 9 pieces of cellulose acetate nanofiber membrane from the top down, separately. The inoculation concentration of bacteria was 1%, and the culture time was 18 h.

3. Usability of Culture Broth

After *L. plantarum* biofilm formation on cellulose acetate nanofiber membranes, the left culture broth was adjusted for next biofilm culture process. The pH of this broth was adjusted to 6.5～7.0 with sterile ammonia. Glucose was added as the carbon source with concentration of 3%. Then cellulose acetate nanofiber membranes were dipped into this adjusted broth for the next biofilm formation. The culture condition is as same as mentioned in the last Experimental Section. After *L. plantarum* biofilm formation on cellulose acetate nanofiber membranes, the left culture broth was composed of metabolites and planktonic bacteria which was released from biofilms. This kind of broth can be adjusted and used as a new culture

broth for the next culture processes. As shown in Figure S2, the adjusted broth presented excellent reusability in the following culture processes. Viable cells in biofilms were ~ 12 log CFU/g in the first four cycles. After 7 cycles, viable cells in biofilms were still higher than ~10 log CFU/g. The reducing of viable cells is attributed to the limited nutrition. In the adjusted broth, only glucose as a carbon source was added. Nitrogen source and additional nutrients weren't supplied at the same time. Therefore, biofilm formation was inhibited and viable cells in the formed biofilms gradually reduced. There are reasons for believing that the broth can be reused in the following biofilm cultures if the nitrogen source and other nutrients are suitably supplied into the broth. Recycle of broth replacing freshly prepared inoculum can decrease the culture cost and show the potential to save resources.

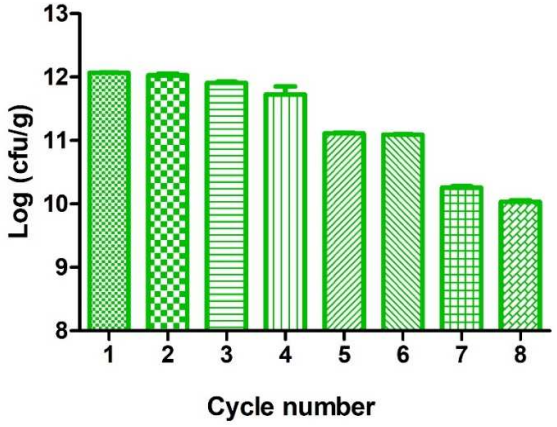

Figure S3. Effect of cycle number of culture broth, which was left after *L. plantarum* biofilm formation on cellulose acetate nanofiber membrane, on viable cells existing in biofilms in the next biofilm formation process.