Supplementary information

Riboflavin–ultraviolet light A-crosslinked decellularized heart valve for improved biomechanical properties, stability, and biocompatibility

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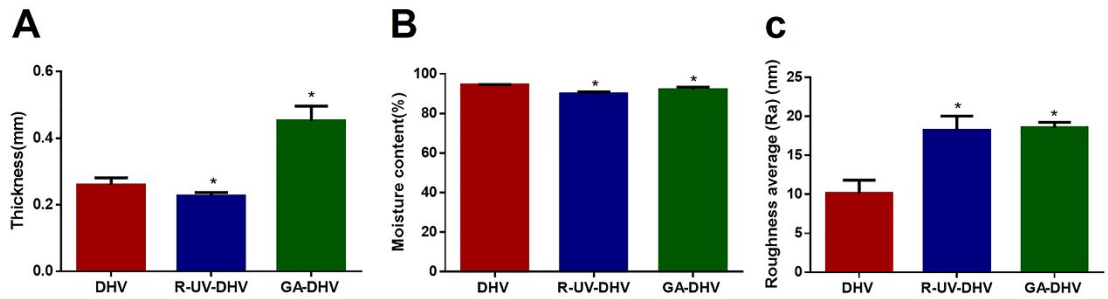
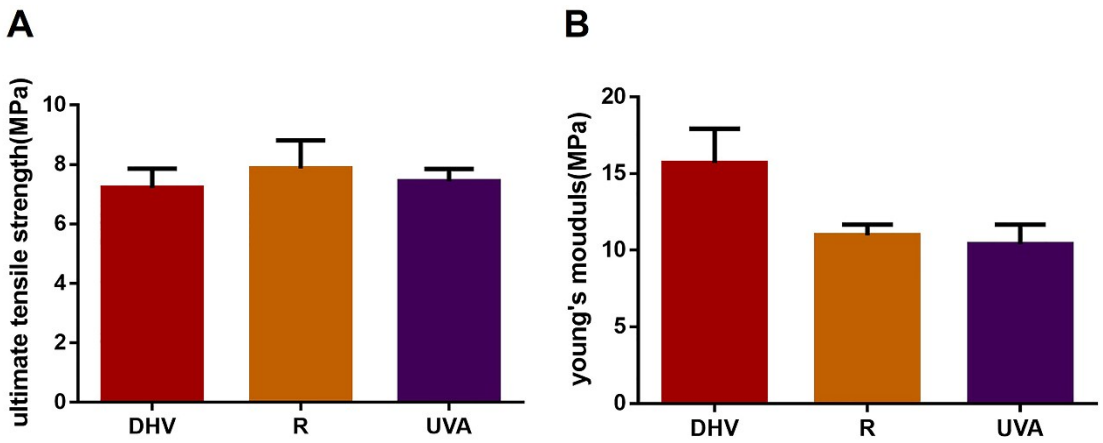
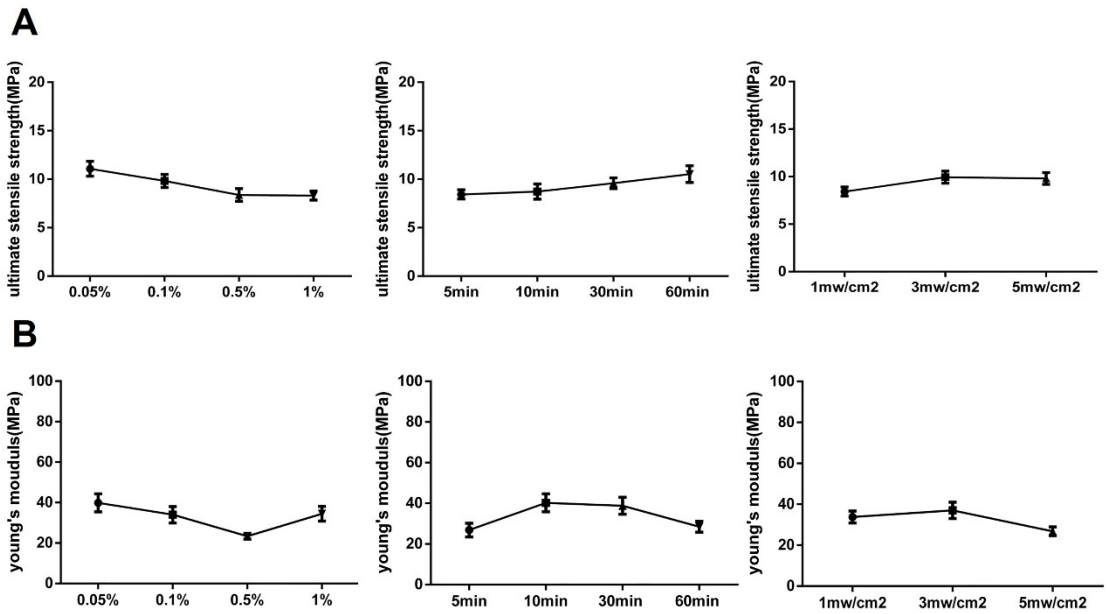


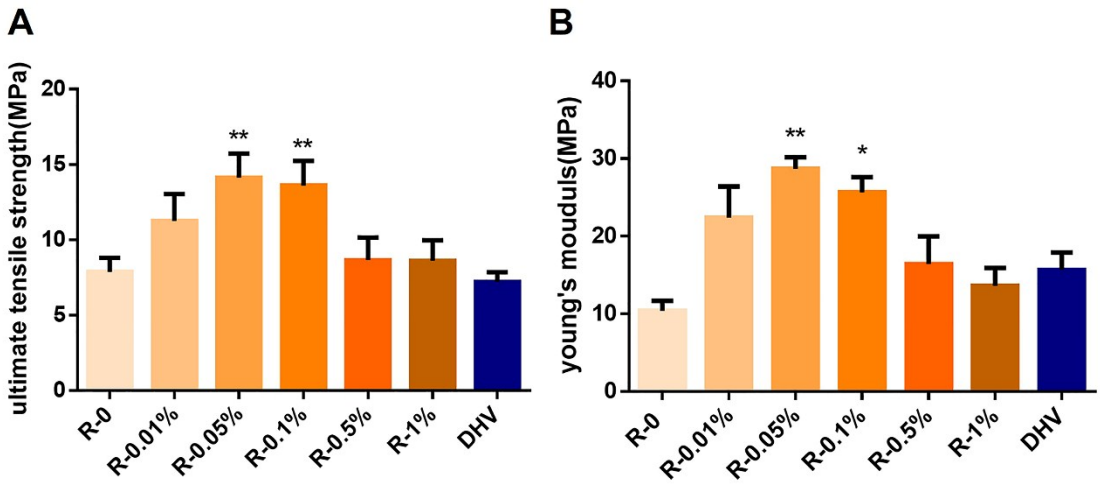
Supplementary Fig. 1. Thickness, moisture content and roughness average of the scaffolds. The thickness and moisture content of the leaflets significantly reduced after R–UVA crosslinking. The roughness average significantly improved after R–UVA crosslinking. (A) Thickness. (B) Moisture content. (C) Roughness average of various leaflets. *means a significant difference compared to the DHV, *$p<0.05$.



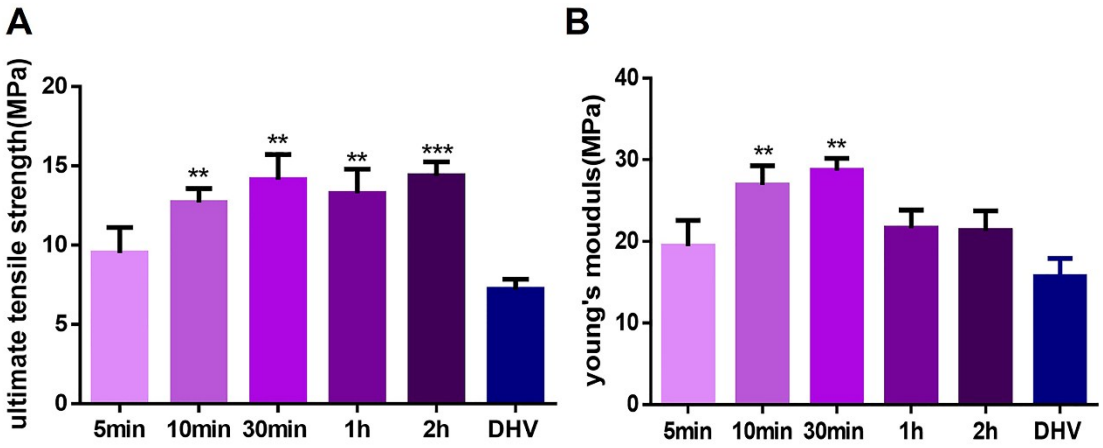
Supplementary Fig. 2. Biomechanical properties of the DHV treated with riboflavin(R) or UVA alone. Individual riboflavin or UVA treatment did not improve the DHV biomechanical properties. (A) Ultimate tensile strength. (B) Young's modulus of the DHV.



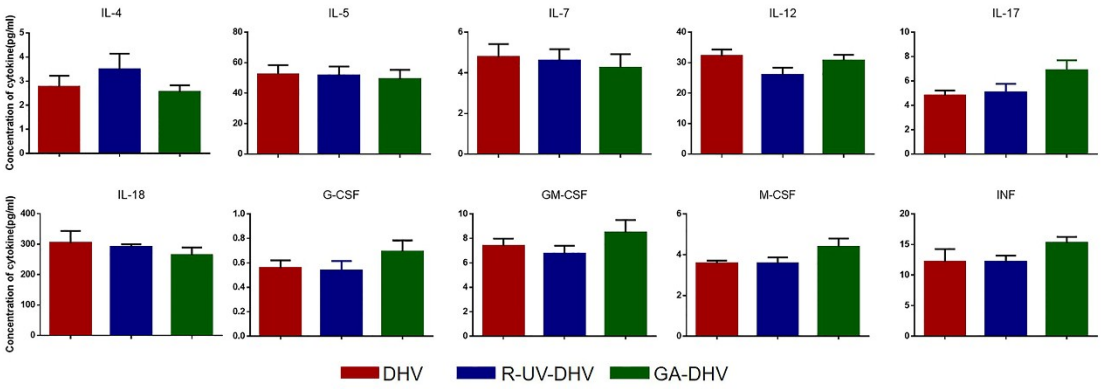
Supplementary Fig. 3. Exploration of experimental conditions via orthogonal experiment. The effects of riboflavin concentration, illumination time, and light intensity on the DHV biomechanical properties. (A) When the riboflavin concentration was 0.05%, the illumination time was 60 min, the light intensity was 3 mw/cm^2, and the ultimate tensile strength was the greatest. (B) When the riboflavin concentration was 0.05%, the illumination time was 10 min, the light intensity was 3 mw/cm^2, and the young's modulus was the greatest.



Supplementary Fig. 4. Effect of riboflavin concentration alone on DHV biomechanical properties. To further verify the orthogonal experimental results, we separately studied the effects of riboflavin concentration on the DHV biomechanical properties. The biomechanical properties of the valve did not increase with increasing riboflavin concentration, but rather had an optimal concentration. (A) When the riboflavin concentration was 0.05%, the ultimate tensile strength was the greatest. (B) When the riboflavin concentration was 0.05%, the young's modulus was the greatest. *means a significant difference compared to the DHV, **p≤0.01, ***p≤0.001.



Supplementary Fig. 5. Effect of illumination time alone on DHV biomechanical properties. To further verify the orthogonal experimental results, we separately studied the effects of illumination time on the DHV biomechanical properties. The DHV biomechanical properties did not increase with the extension of illumination time, but had an optimal time point. (A) When the illumination time was 30 min, the ultimate tensile strength was the greatest. (B) When the illumination time was 30 min, the young's modulus was the greatest. *means a significant difference compared to the DHV, **$p<0.01$, ***$p<0.001$. Combining the results obtained from the orthogonal experiments, supplementary Fig. 4, and the aforementioned, we concluded that when the riboflavin concentration is 0.05%, the illumination time is 30 min, and the light intensity is 3 mw/cm^2, the DHV biomechanical properties are optimal, which were also the experimental conditions for the subsequent studies.



Supplementary Fig. 6. Concentration of the other 10 cytokines presented on the explanted scaffolds, which were not significantly different among the three groups.

Supplementary Table 1. Orthogonal table

Exp. number	Riboflavin concentration (%)	Illumination time(min)	light intensity(mw/cm²)
1	0.05	5	1
2	0.05	10	3
3	0.05	30	6
4	0.05	60	1
5	0.1	5	3
6	0.1	10	1
7	0.1	30	1
8	0.1	60	6
9	0.5	5	6
10	0.5	10	1
11	0.5	30	1
12	0.5	60	3
13	1	5	1
14	1	10	6
15	1	30	3
16	1	60	1