

# Supplementary Materials

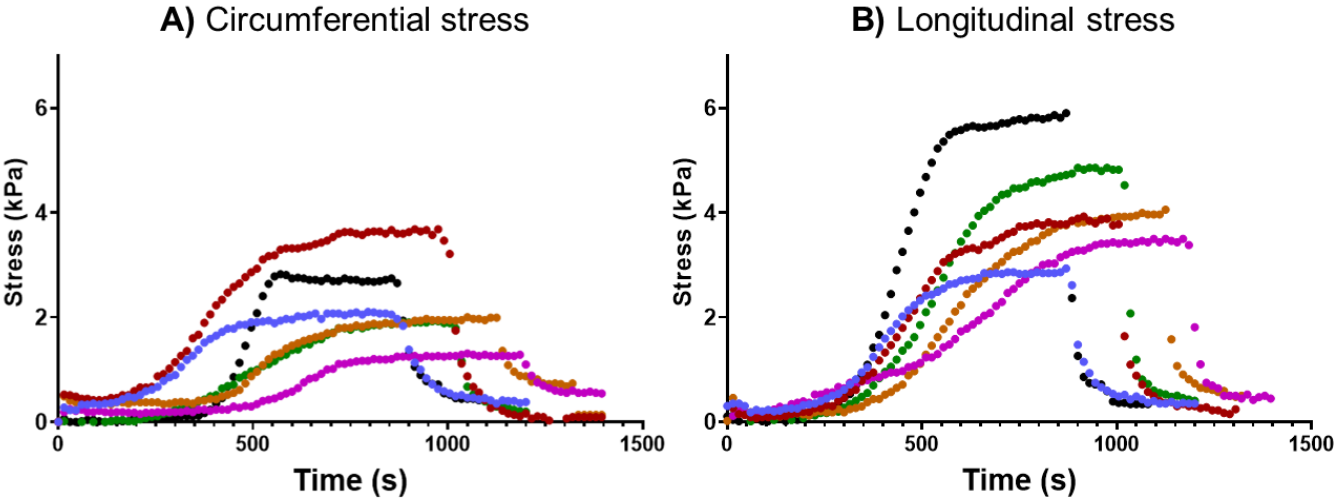


Figure S1: Individual plots of contractile stresses generated during the active tests with 0% initial passive stretch. A) Circumferential stress and B) Longitudinal stress. The stress presented is 1st-PK stress.

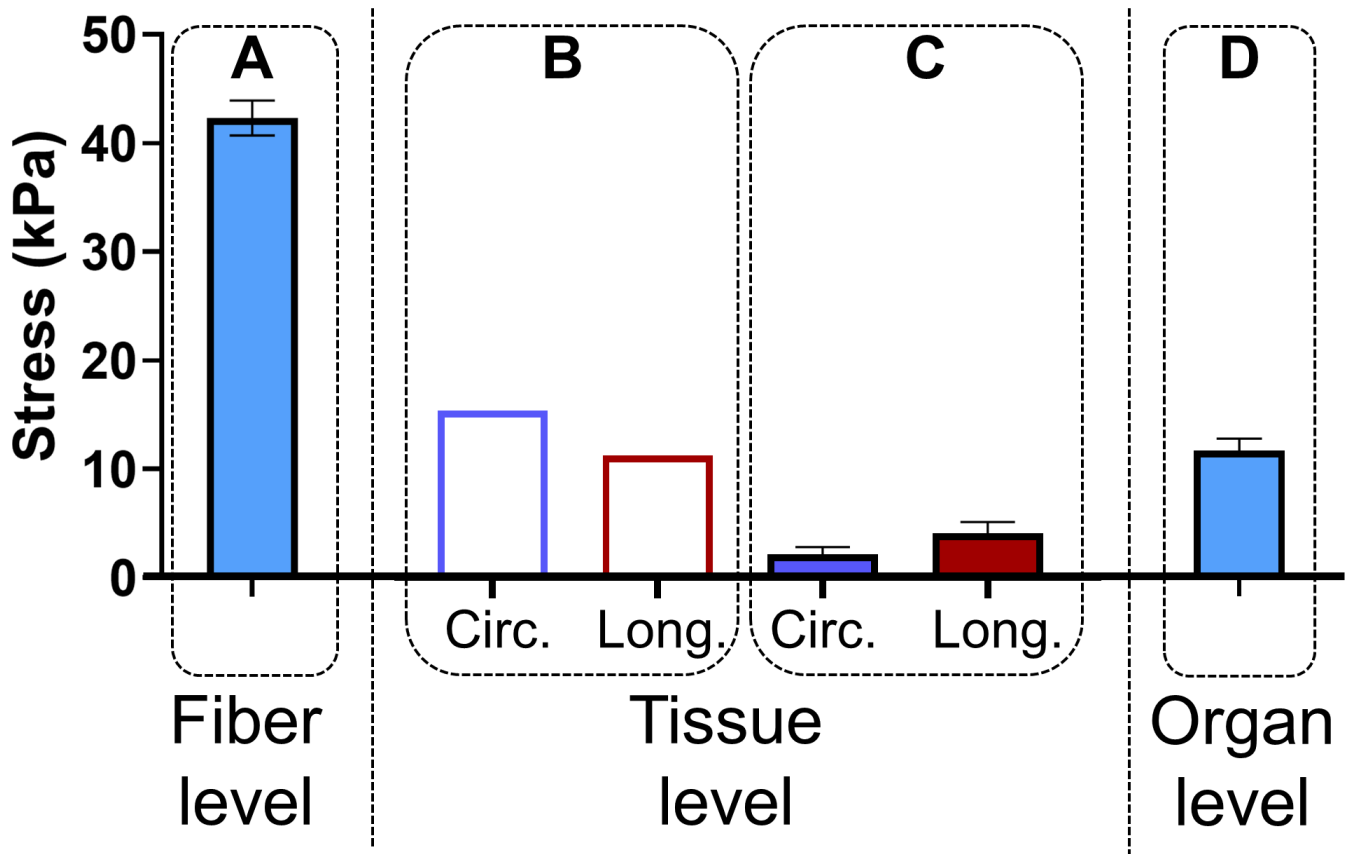
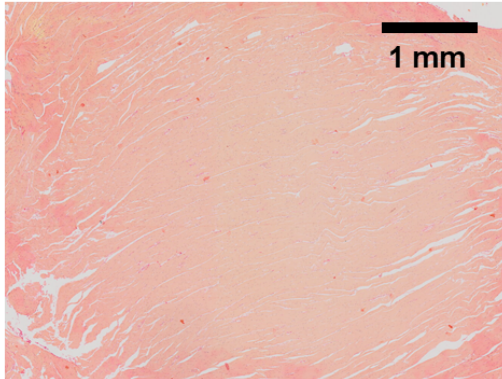
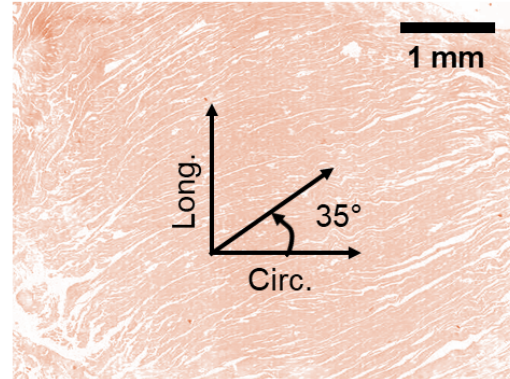


Figure S2: Stresses measured and predicted at the fiber-, tissue-, and organ-level. A) Measured fiber-level stress from the papillary muscle activation testing. B) Predicted tissue level stress based on composite modeling described in section 4.3. Measurable tissue-level contractile forces are reduced due to non-contractile components, transmural orientation variation, and transverse rotation of fibers. C) Measured tissue-level stress obtained from biaxial activation testing of the LVFW specimens. D) Estimated organ-level stress using RV pressure and Laplace equation (described in section 4.4).

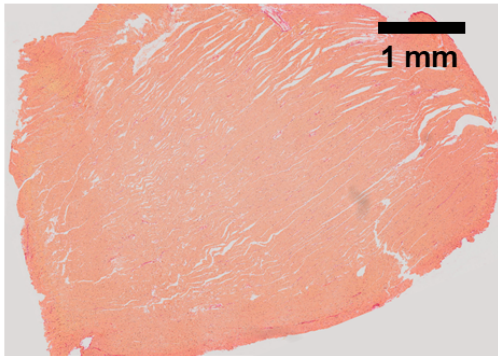
**A) Representative endocardium**



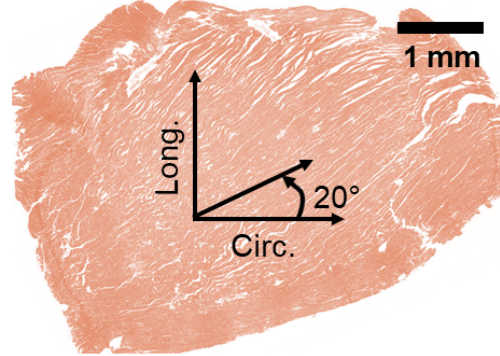
**B) Average angle of isolated myofibers**



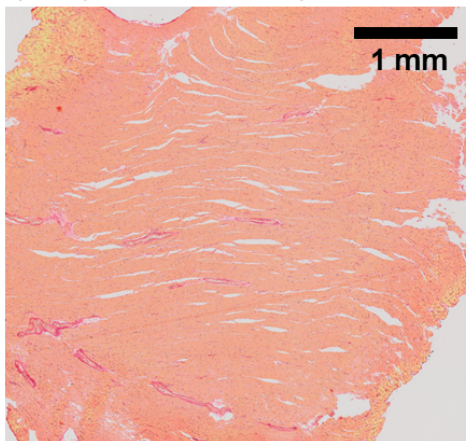
**C) Representative mid-myocardium**



**D) Average angle of isolated myofibers**



**E) Representative epicardium**



**F) Average angle of isolated myofibers**

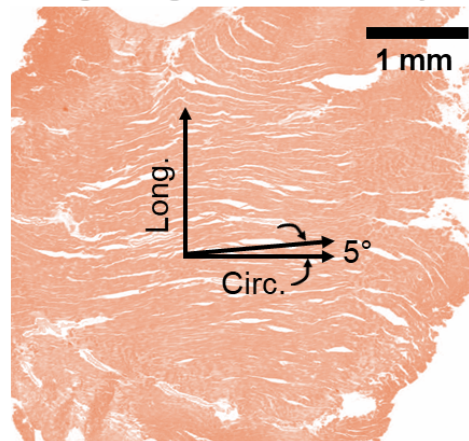


Figure S3: Representative histological images and the average fiber orientation from the section. A, C, and E and representative sections at the endocardium, mid-myocardium, and epicardium levels, respectively. The corresponding images were processed using ImageJ to isolate the myofibers and these images have been presented in B, D, and F, respectively. Myofiber orientation was obtained from an in-house image processing pipeline [19,21]. Scale bars indicate 1 mm.

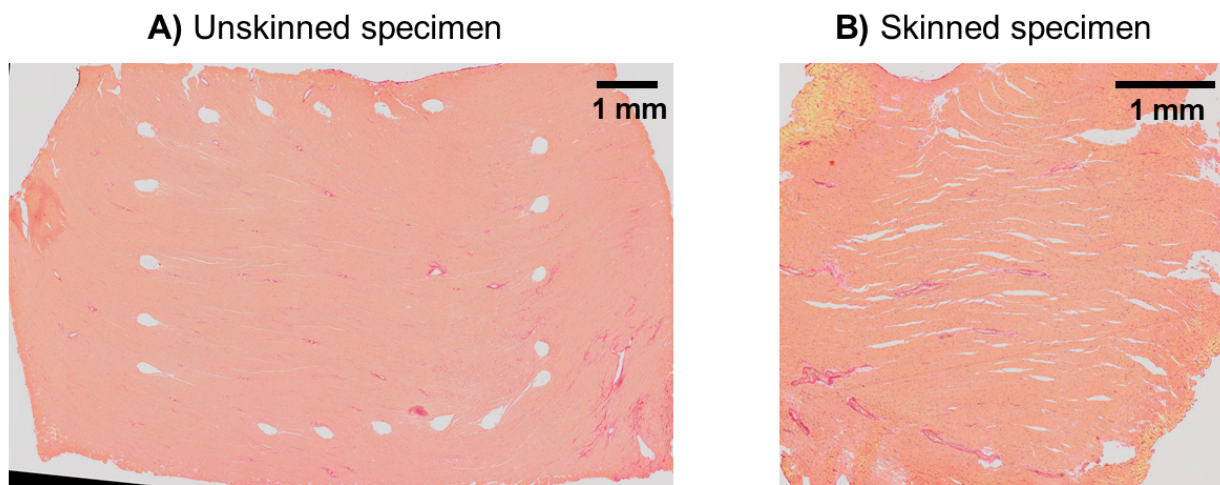


Figure S4: Representative histological images of A) unskinned specimen used only for passive testing taken from a prior study with mice of a similar cohort as the ones used in this study [2], and B) skinned specimens used for active testing. No significant damage was evident inside the region falling within the rakes lines. Based on preliminary analysis of the porosity in the histological images, the porosity was found to be 10.37%, 7.48% and 6.3% for the sections presented in Figs. S3 (A), (C), and (E), respectively. Analyzing the unskinned sample presented in (A) yielded a porosity value of 3.9%. Scale bars indicate 1 mm.