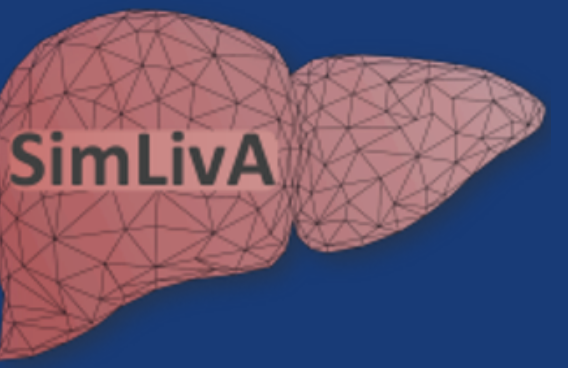
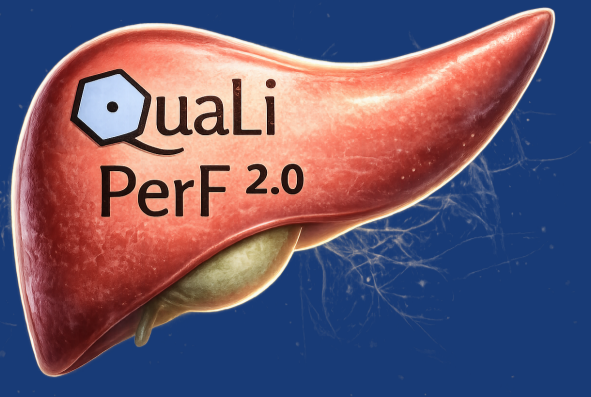


Towards a Systems-Level Framework of Liver Adaptation: Integrating Spatial Perfusion Redistribution and Ischemic Burden



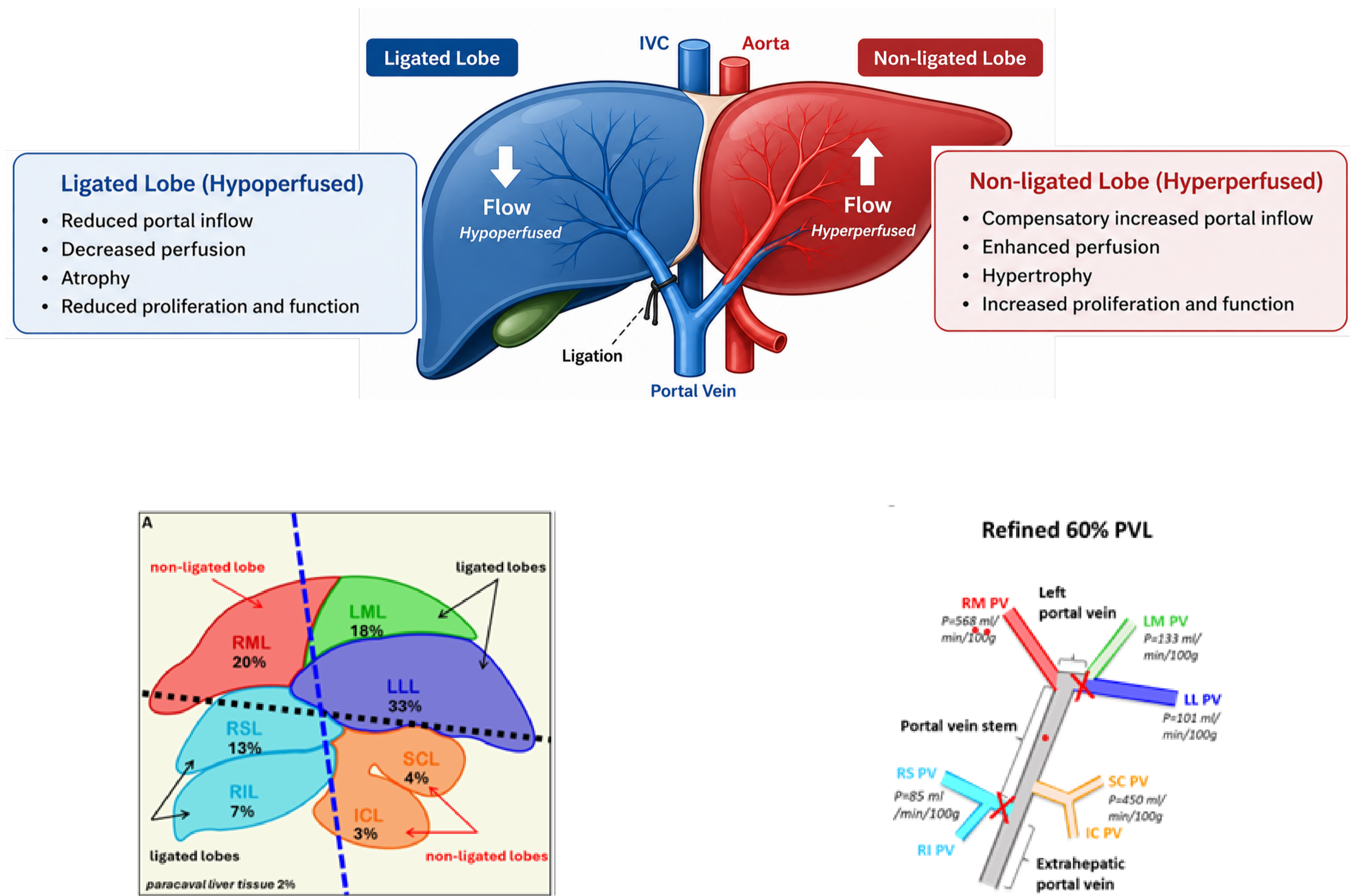
Albadry, M.^{1,2}, König, M.^{3,4}, Li, F.¹, Herrmann, K-H.⁵, Zhao, W-T.⁵, Wei, W.^{1,6}, Kosacka, J.^{1,7}, Pei, X.¹, Xu, F.^{1,8,9}, Hassan, M. I. A.¹, Kiehntopf, M.¹⁰, Lupp, A.¹¹, Böttcher, M.¹², Neuman, J.¹², Höpfl, S.¹³, Radde, N.^{13,14}, Dirsch, O.¹⁵, Settmacher, U.^{1,6}, Reichenbach, J. R.⁵, Tautenhahn, H-M.^{1,16}, Dahmen, U.¹

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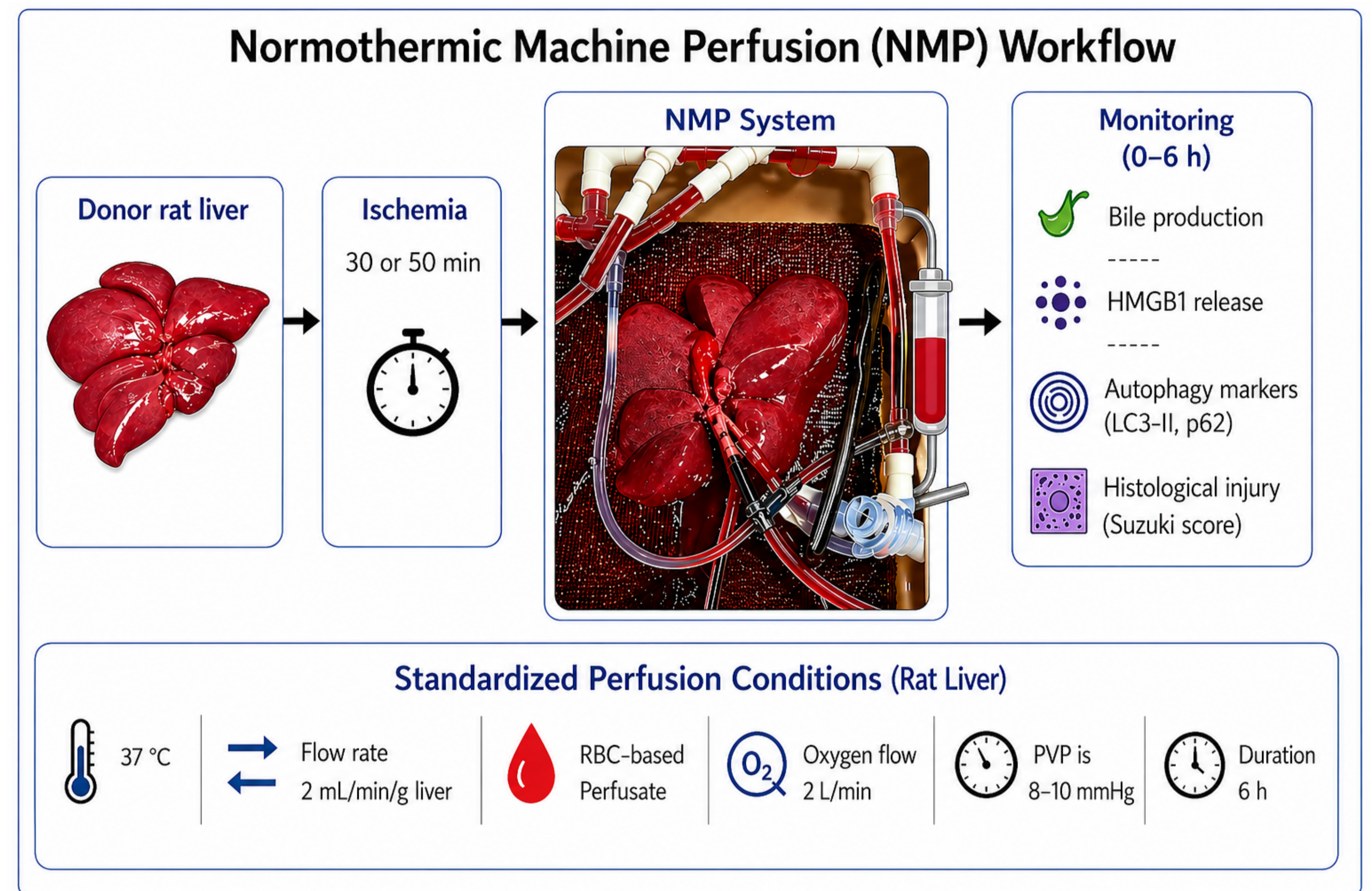
Liver Adaptation - Spatial Perfusion Redistribution (Selective Major Portal Vein Ligation)

Portal Vein Ligation = Intrahepatic Redistribution of Blood Flow

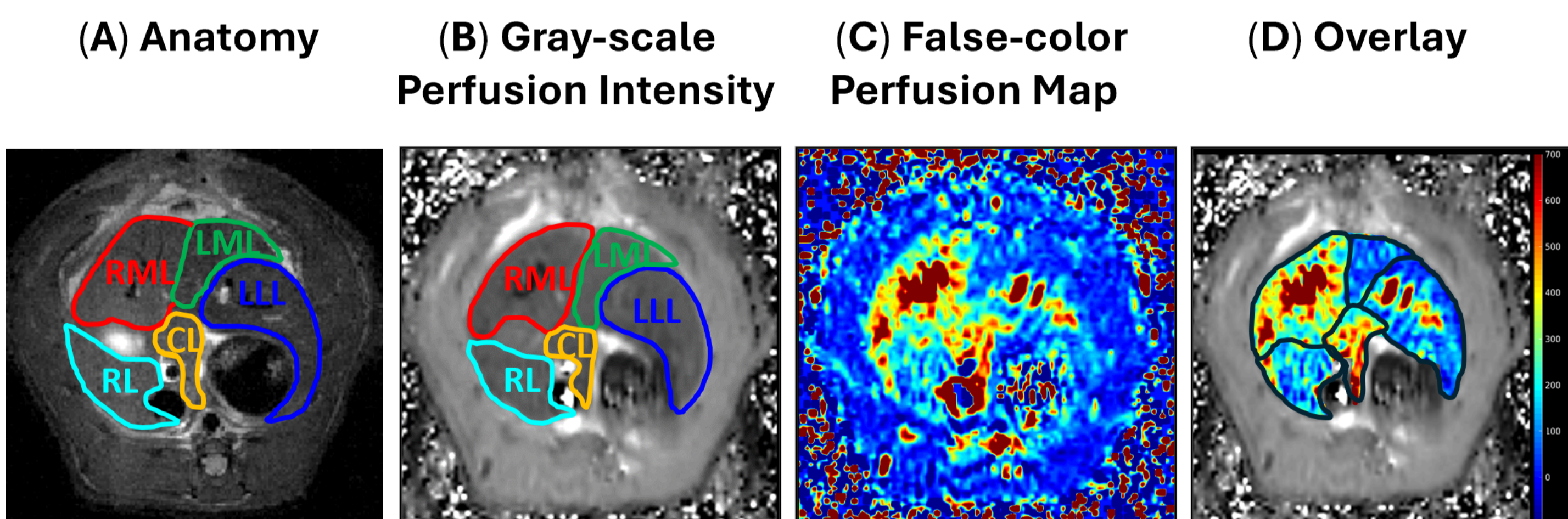


(A) Visualization of hepatic lobar anatomy (B) Portal vein tree and ligation site

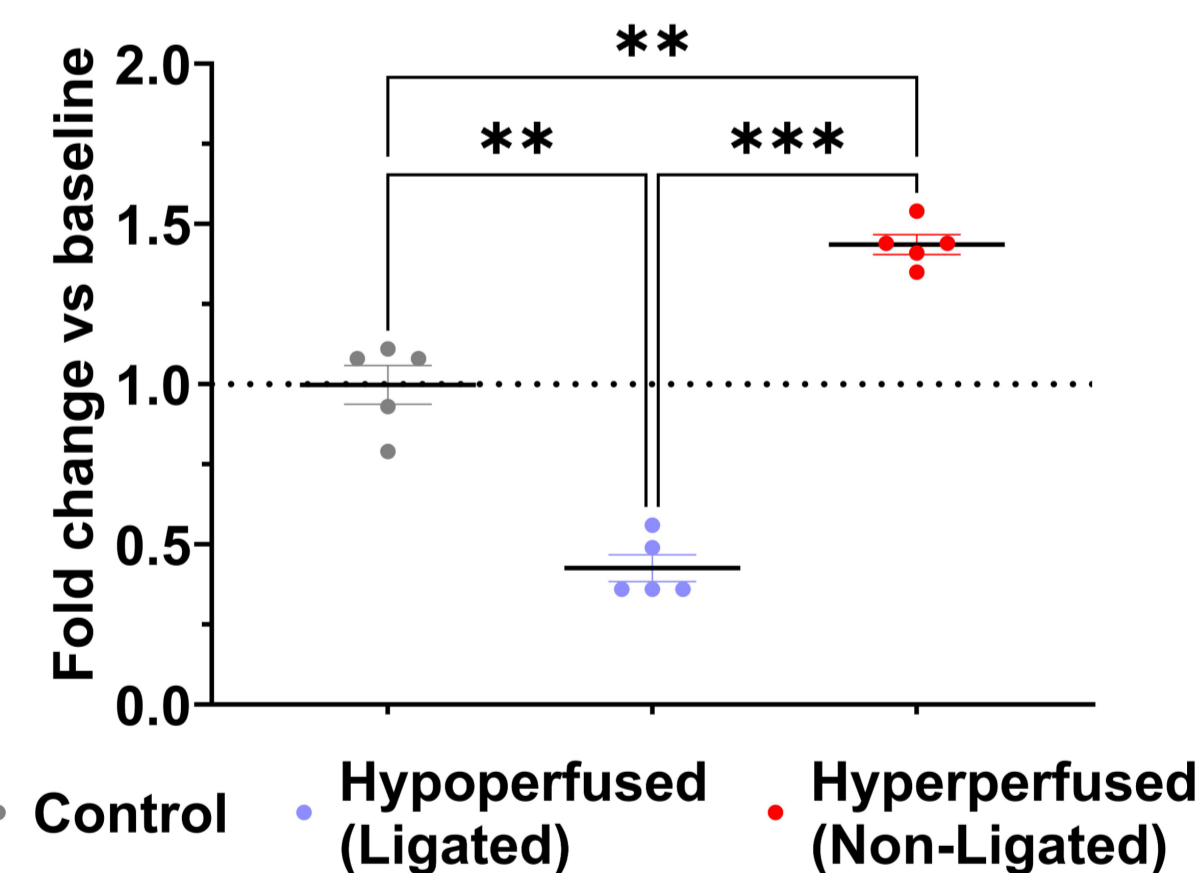
Liver Adaptation - Ischemic Burden (Normothermic Machine Perfusion)



Results



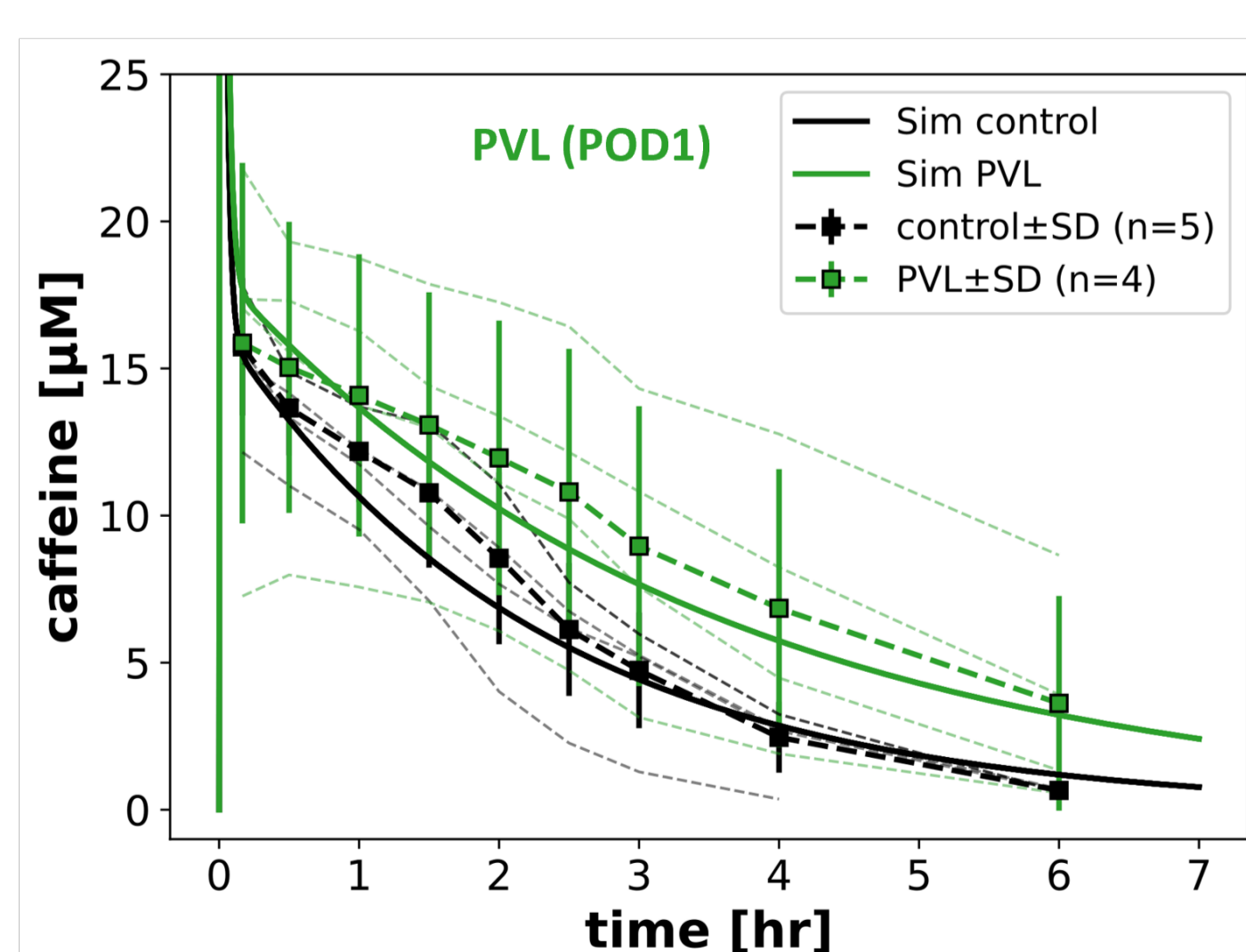
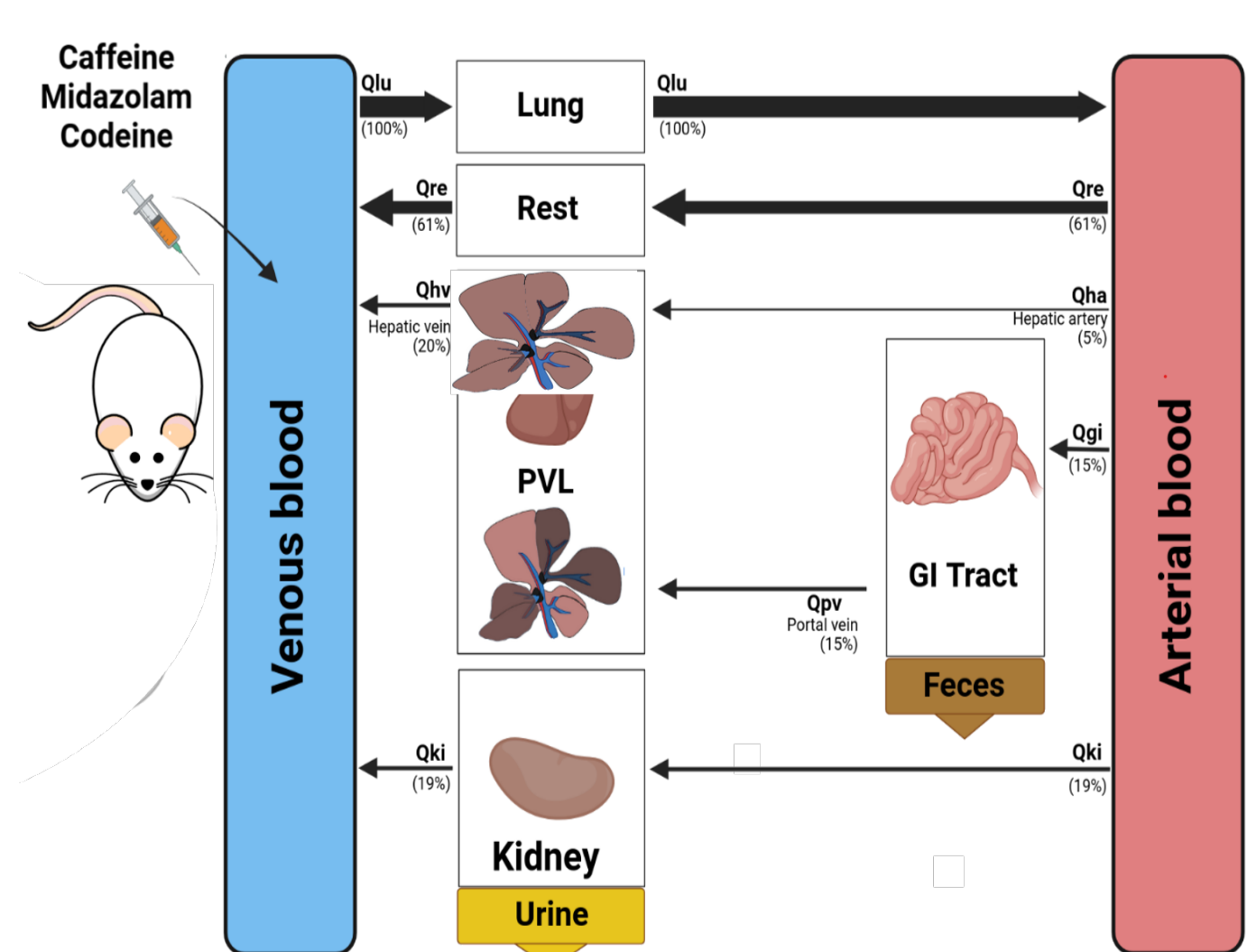
Fold change in hepatic perfusion after 60% PVL



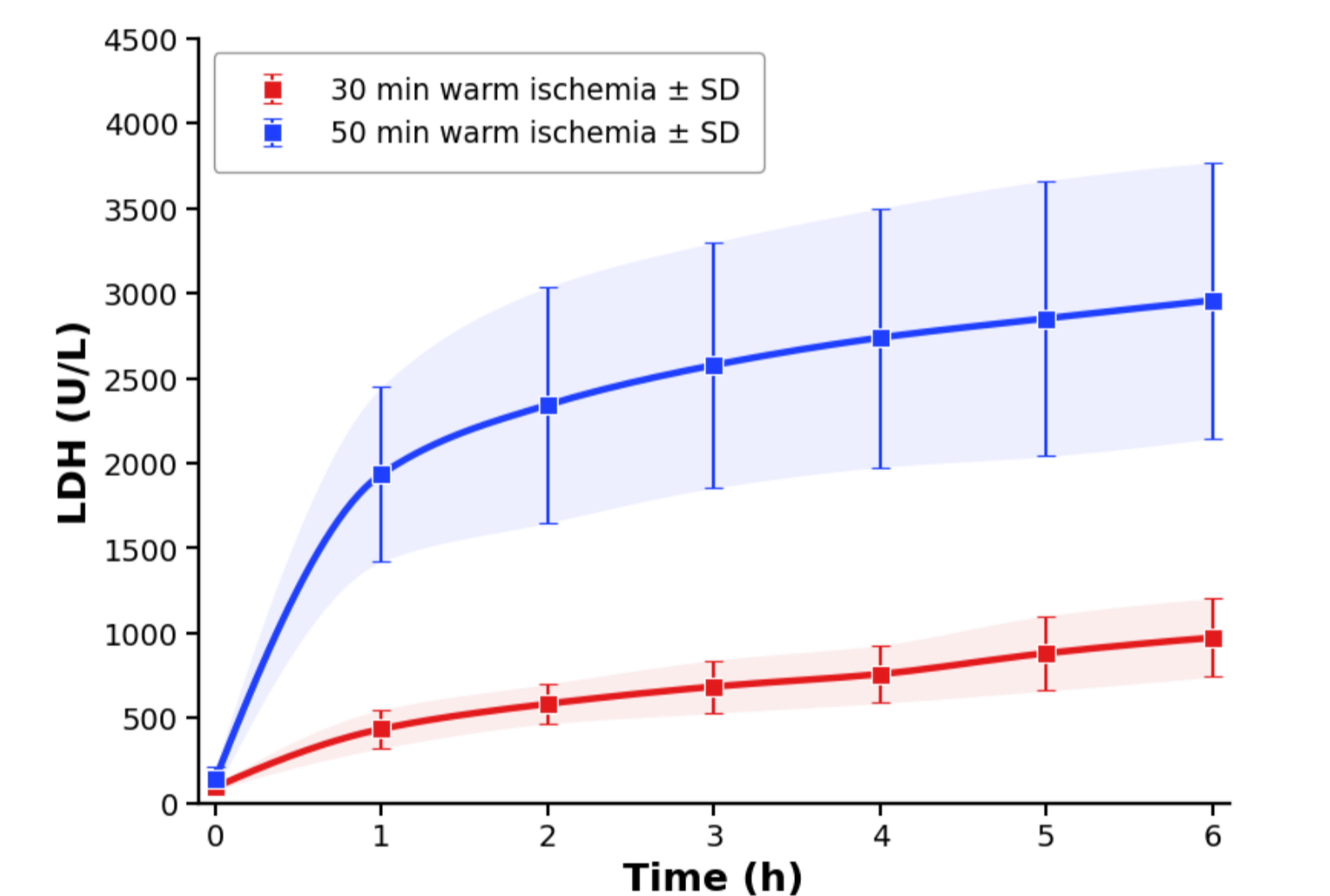
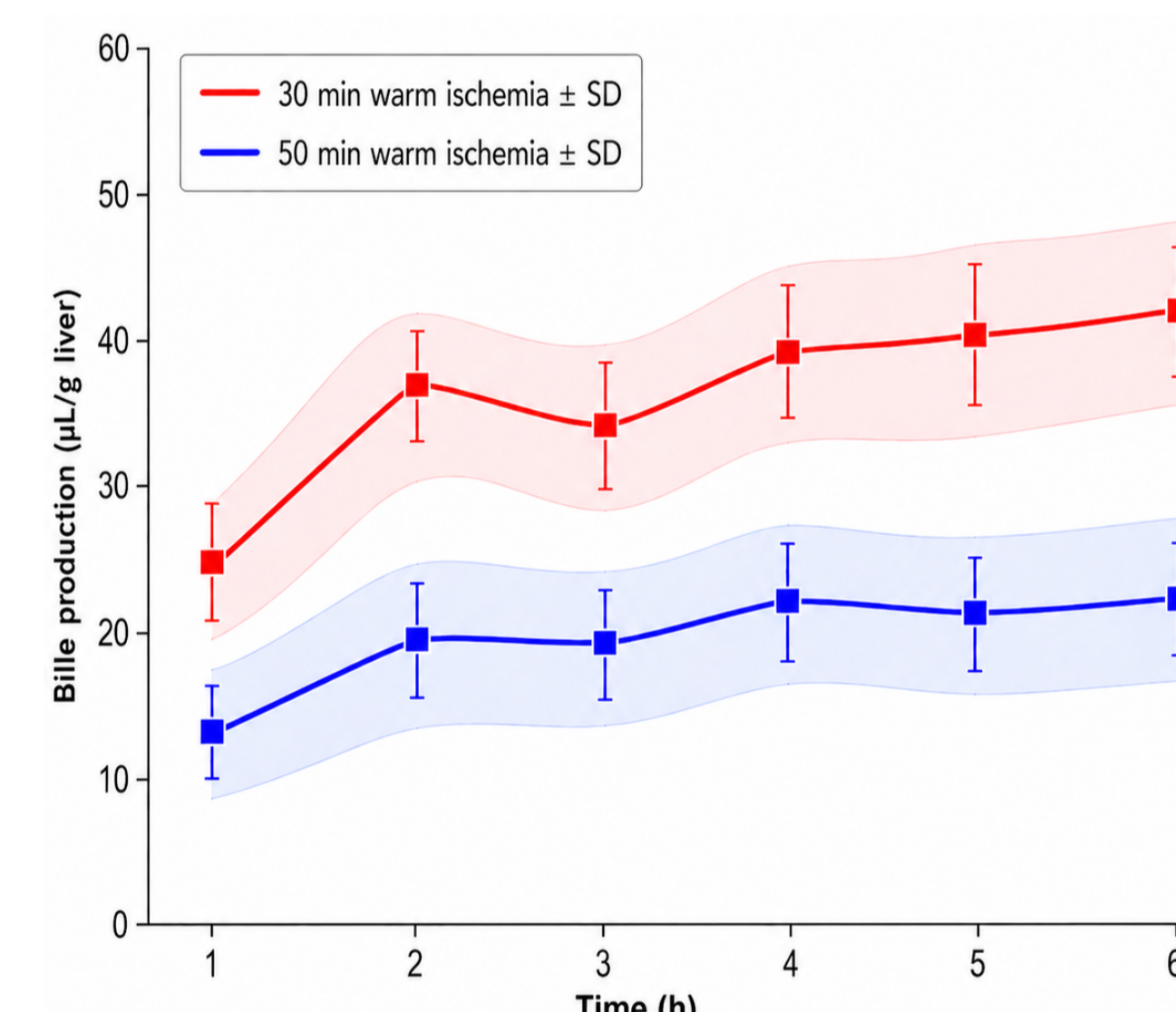
I. Visualization of hyper- and hypoperfusion using Multimodal MR-Imaging.

II. Quantification of hyper- and hypoperfusion using MRI-imaging

III. Comparison between simulation and drug elimination



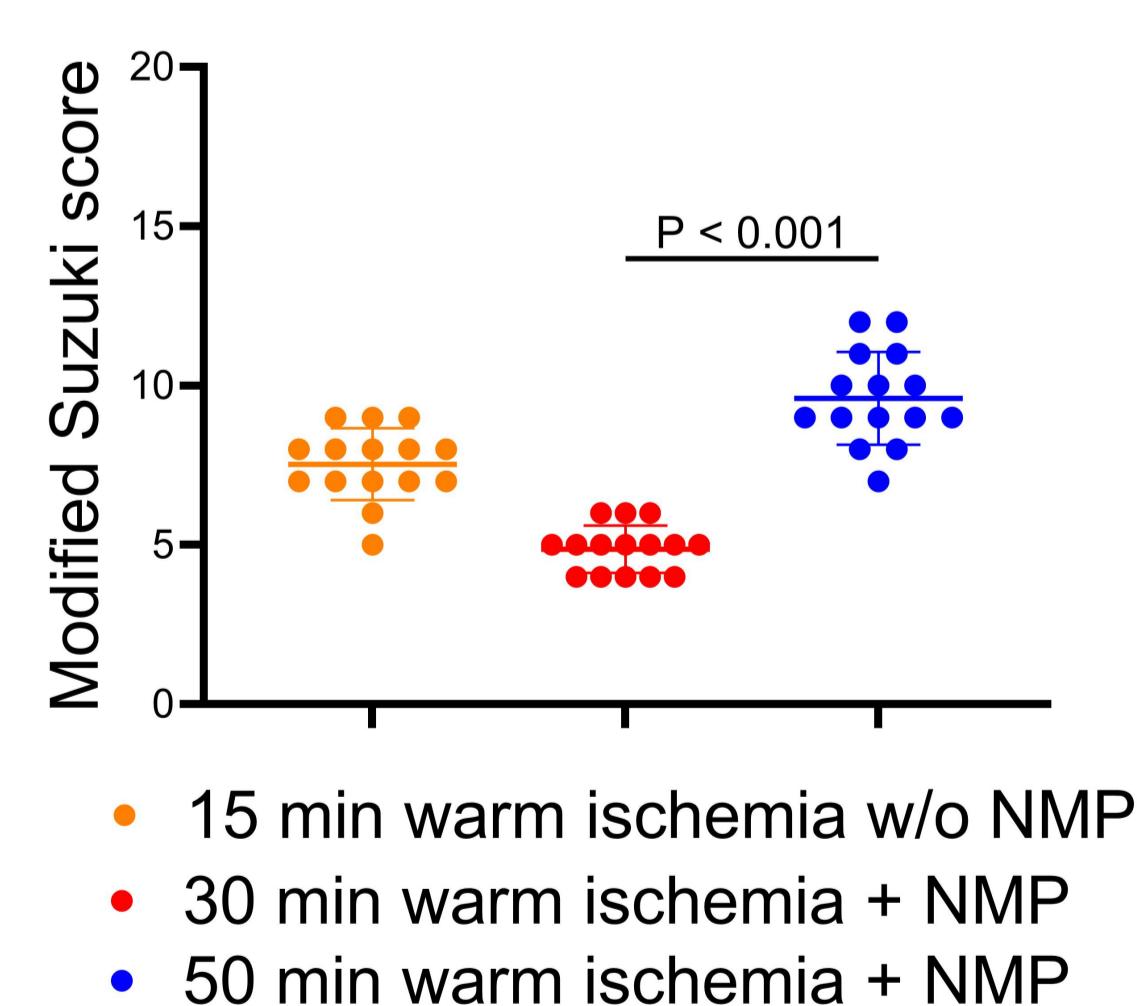
Results



Bile production is negatively correlated with ischemic burden, indicating progressive hepatocellular dysfunction

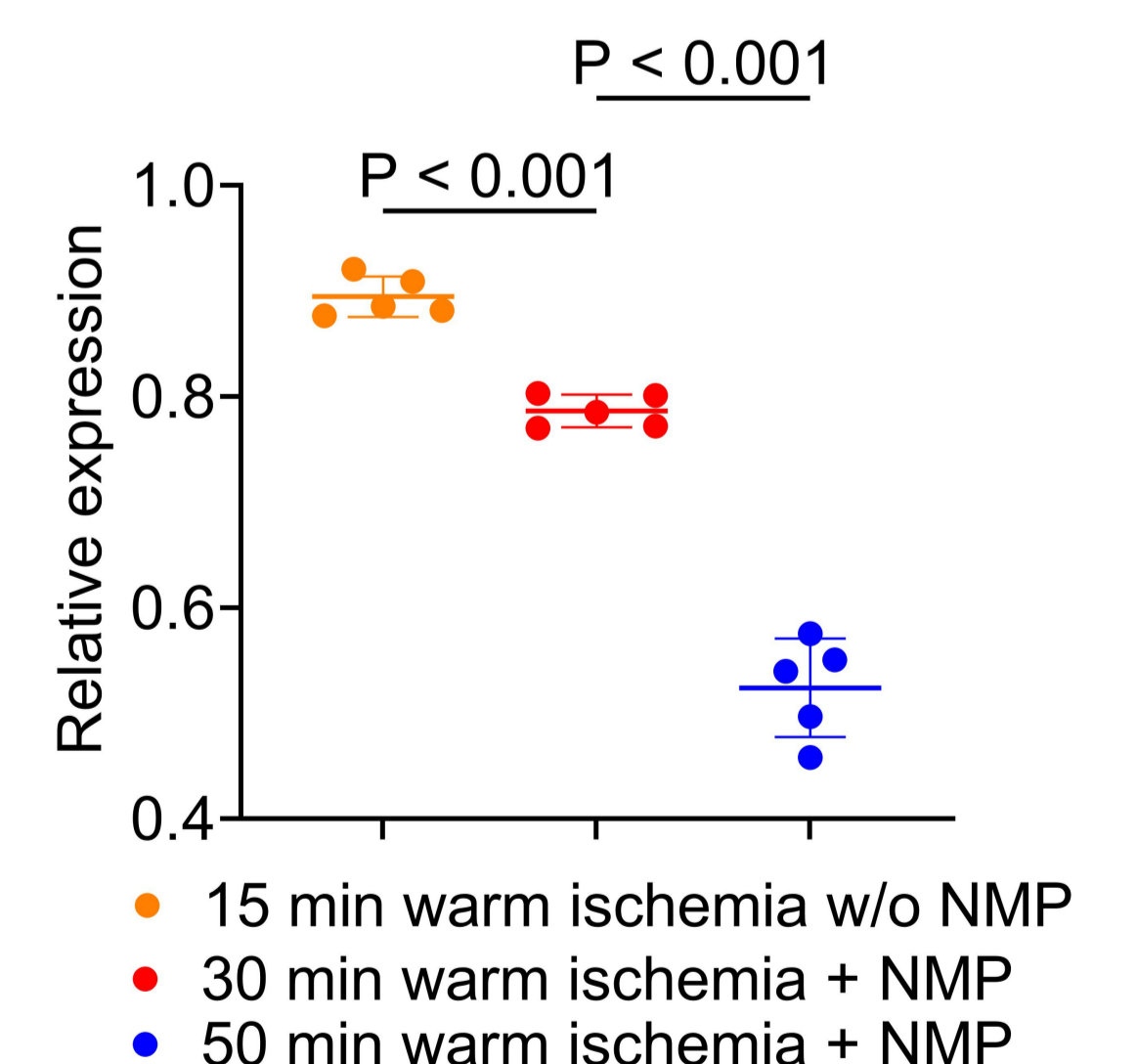
Perfusate LDH release increases with ischemic burden, indicating progressive hepatocellular injury

Pericentral hepatocyte injury score



Pericentral hepatocyte injury increases with ischemic burden, indicating progressive hepatocellular injury

HMGB1 (Tissue injury) marker



HMGB1 nuclear expression decreases with ischemic burden, indicating progressive hepatocellular injury

CONCLUSION

Liver adaptation = spatial axis driven by perfusion redistribution + temporal axis defined by ischemic burden.

Integrating these models links structural remodeling to functional resilience and, enables systems-level modeling of liver adaptation.

