

Background

- Sepsis is a life-threatening syndrome characterized by systemic inflammation and microcirculatory dysfunction, leading to multi-organ failure [1].
- Gastrointestinal microcirculation is crucial for maintaining the mucosal barrier and preventing bacterial translocation, yet targeted strategies to support gut perfusion in sepsis remain poorly defined [2].
- Dobutamine and vasopressin are commonly used in the hemodynamic management of septic shock, but their specific effects on intestinal microcirculation are insufficiently understood [3].

We hypothesized that dobutamine, vasopressin, and their combination differentially affect intestinal microvascular oxygenation and perfusion in abdominal sepsis.

Methods

- Animals & model: 88 male Wistar rats; CASP-induced sepsis vs sham Microcirculation: μHbO_2 (%) and μFlow (AU) measured over 90 min
- Biomarkers: Arterial lactate (POCT) and IL-6 (ELISA)
- Statistics: Normality check; mixed-effects models + Dunnett for microcirculation; Sidak for lactate; Mann–Whitney U for IL-6

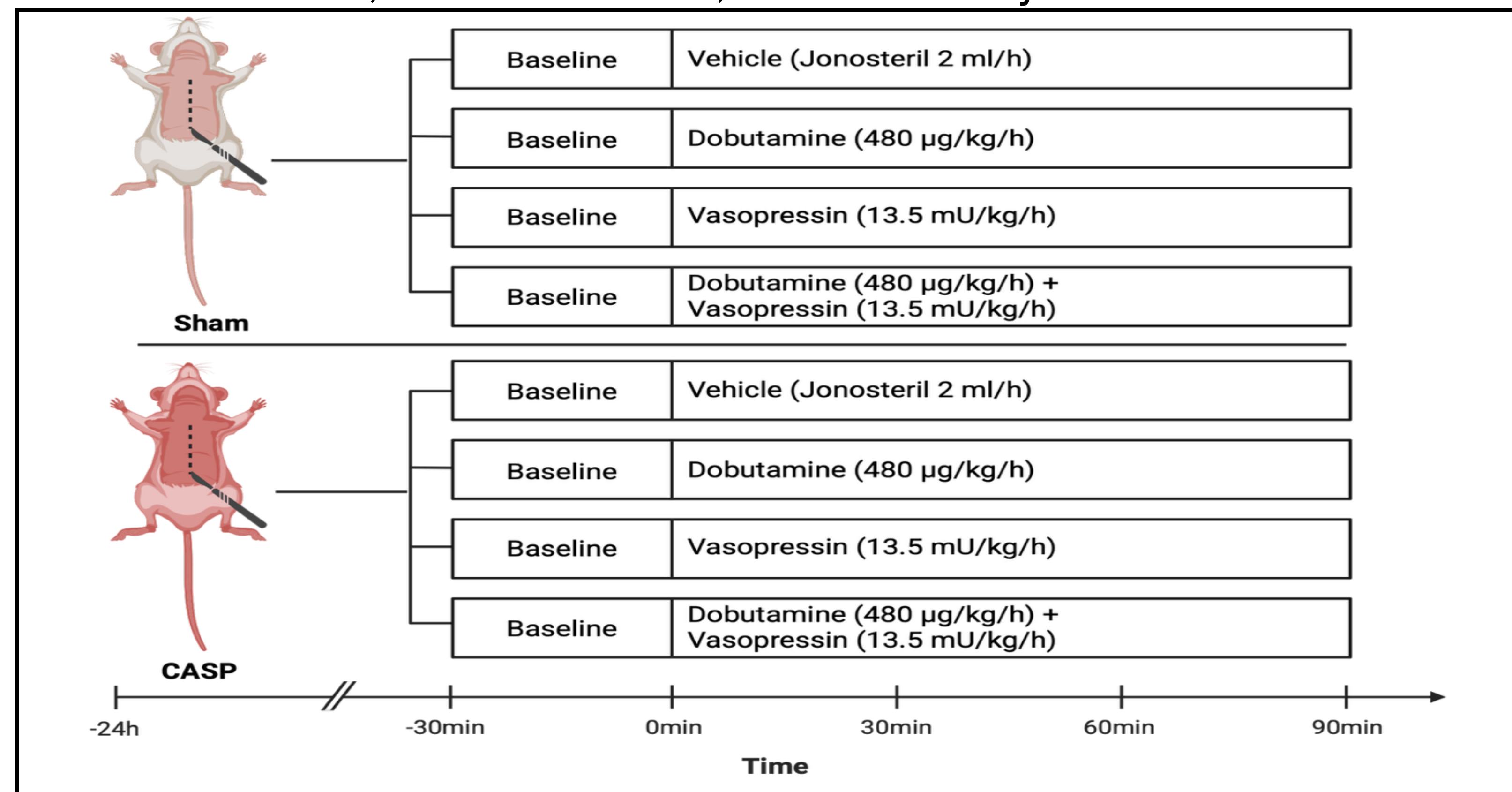


Figure 1 Experimental protocol. CASP and sham surgery were performed 24h before microcirculatory measurements. CASP = Colon ascendens stent peritonitis, ©Biorender.com

Results

- Intestinal oxygenation:** In septic rats, dobutamine increased μHbO_2 at 60 min ($\Delta +10.2 \pm 13.4\%$) vs control ($\Delta -2.3 \pm 4.4\%$, $p < 0.05$); combination therapy (dobutamine + vasopressin) showed similar improvements, while vasopressin alone had only small, transient effects.

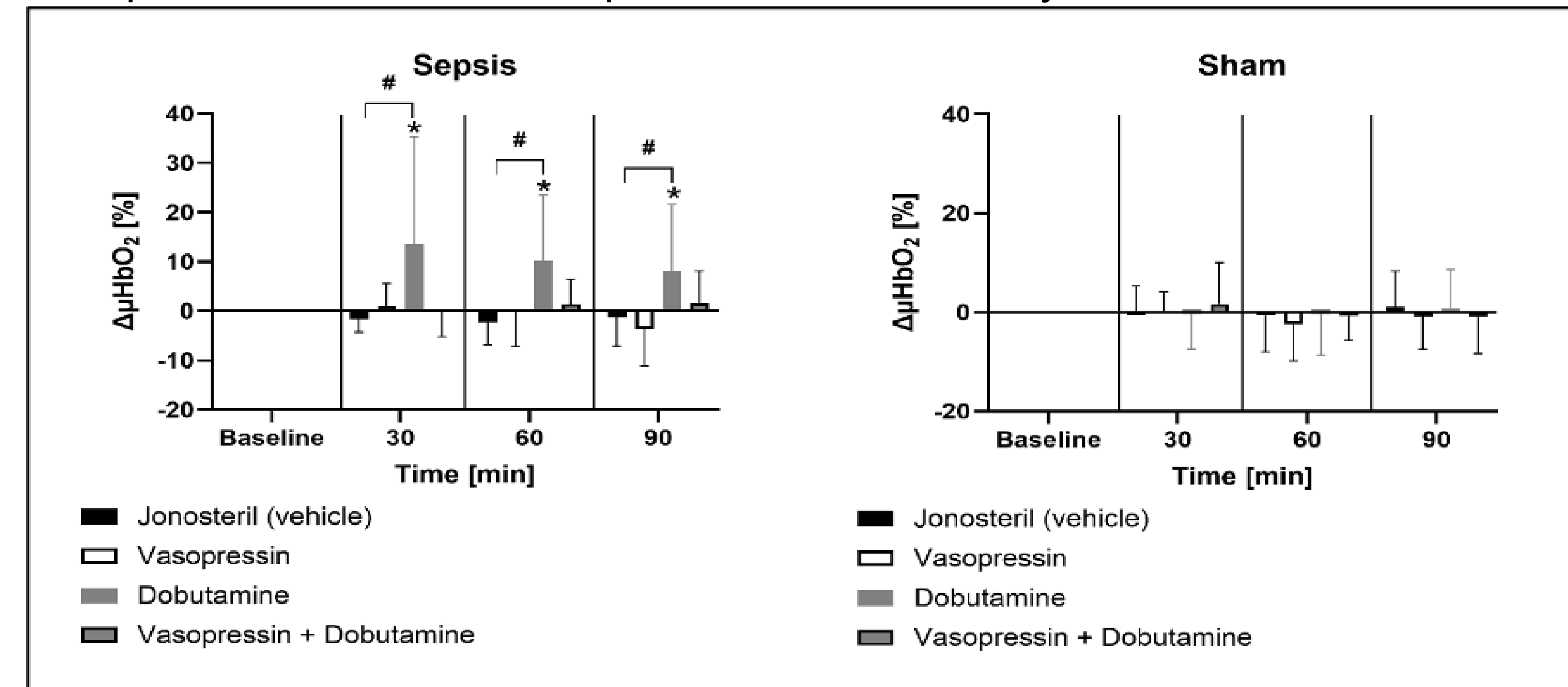


Figure 2 Effect of inotrope and vasopressor therapy on colonic microcirculatory flow (μFlow , AU). Data are presented as mean, * $p < 0.05$ vs. baseline, (two-way ANOVA with Dunnett/Tukey post hoc correction), $n = 12$ in CASP and $n = 10$ in sham groups.

- Microvascular perfusion:** Dobutamine enhanced μFlow ($\Delta 30 \pm 21$ AU vs baseline, $p < 0.05$); combination therapy achieved comparable increases ($\Delta 28 \pm 27$ AU, $p < 0.05$), whereas vasopressin alone had minimal impact.

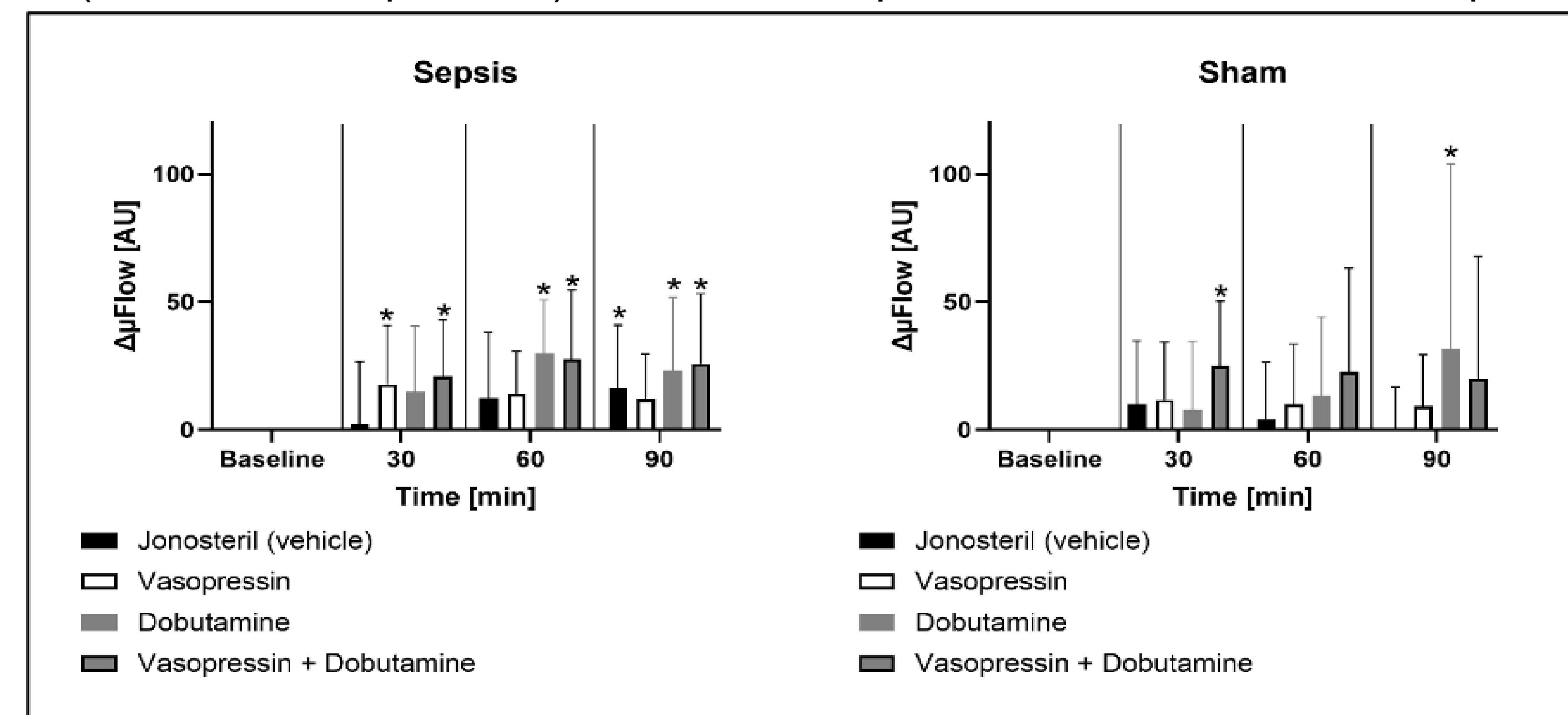


Figure 3 Effect of inotrope and vasopressor therapy on colonic microcirculatory flow (μFlow , AU). Data are presented as mean, * $p < 0.05$ vs. baseline, (two-way ANOVA with Dunnett/Tukey post hoc correction), $n = 12$ in CASP and $n = 10$ in sham groups.

Results (cont.)

- Model validation:** CASP animals had higher baseline lactate (1.6 ± 0.6 vs 0.9 ± 0.4 mmol/L, $p < 0.05$) and IL-6 (275 ± 162 vs 162 ± 145 pg/mL, $p < 0.05$), confirming systemic inflammation and hypoperfusion.

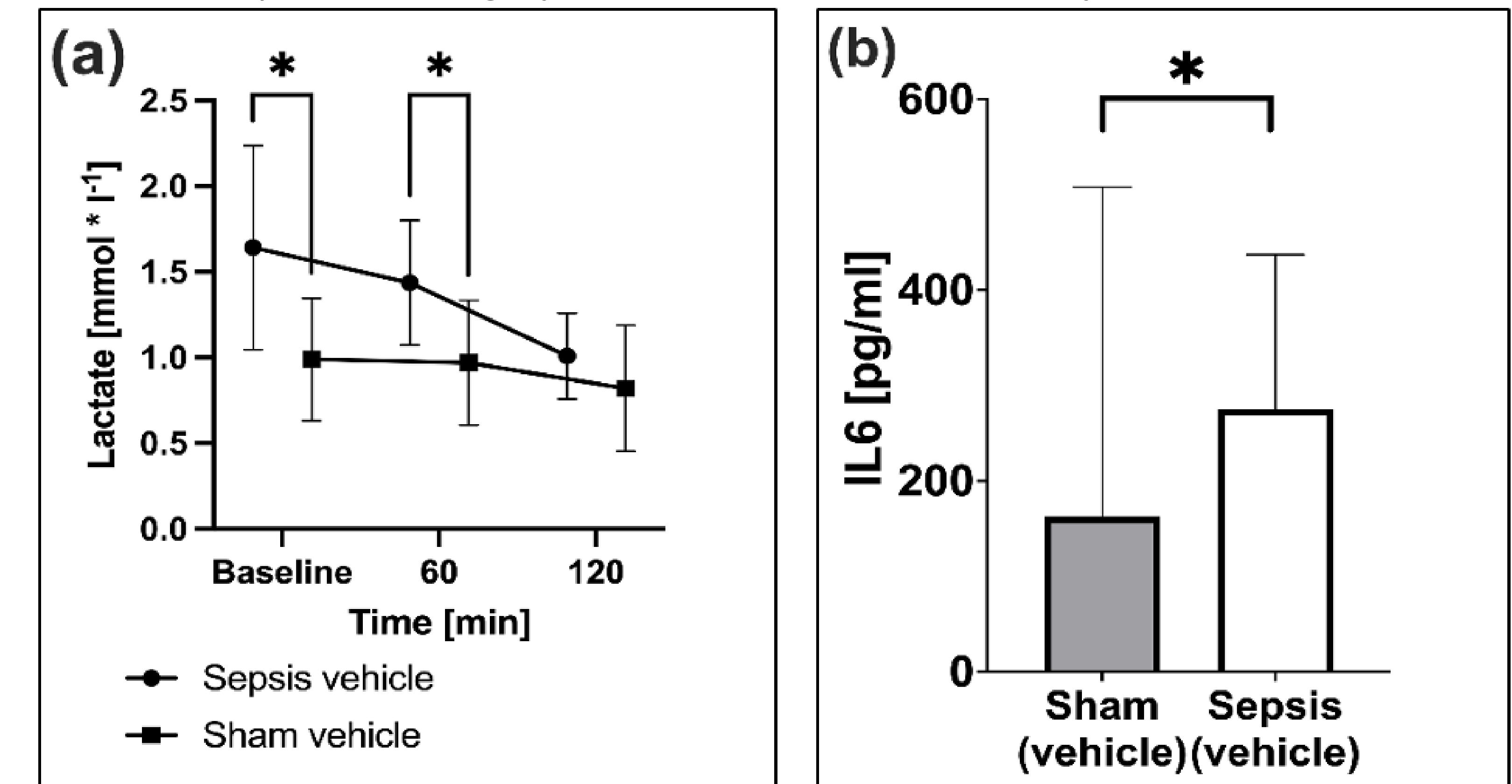


Figure 4 a) Lactate measurements of Sham and CASP control animals via blood gas analysis at baseline, after 60 and 120 minutes. b) IL-6 level measured via ELISA in sham and CASP control groups at baseline. Both presented as mean $\pm$ SD

Conclusion

Dobutamine improves intestinal oxygenation and perfusion in a rat model of abdominal sepsis. Vasopressin alone had limited effects, while the combination with dobutamine enhanced perfusion but not oxygenation. Elevated IL-6 and lactate levels confirmed systemic inflammation and tissue hypoperfusion, validating the sepsis model. These findings highlight the potential of dobutamine to target gastrointestinal microvascular dysfunction in sepsis. Further studies are needed to confirm clinical applicability and optimal drug combinations.

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Acknowledgment:

This work was accepted for publication in "Shock" on November 14, 2025 (DOI: 10.1097/SHK.0000000000002765).

References:

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