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Immune recovery after fluid resuscitation in rats with severe hemorrhagic shock

Key words: Regulatory T, Helper T, Cytotoxic T, Hemorrhagic shock

Research Summary

This article mainly investigated the effects of three resuscitation fluids on immune cell regulation in the early stages of hemorrhagic shock.

Three resuscitation fluids:

- NS: Normal saline
- HTS: Hypertonic saline
- HES: Hydroxyethyl starch

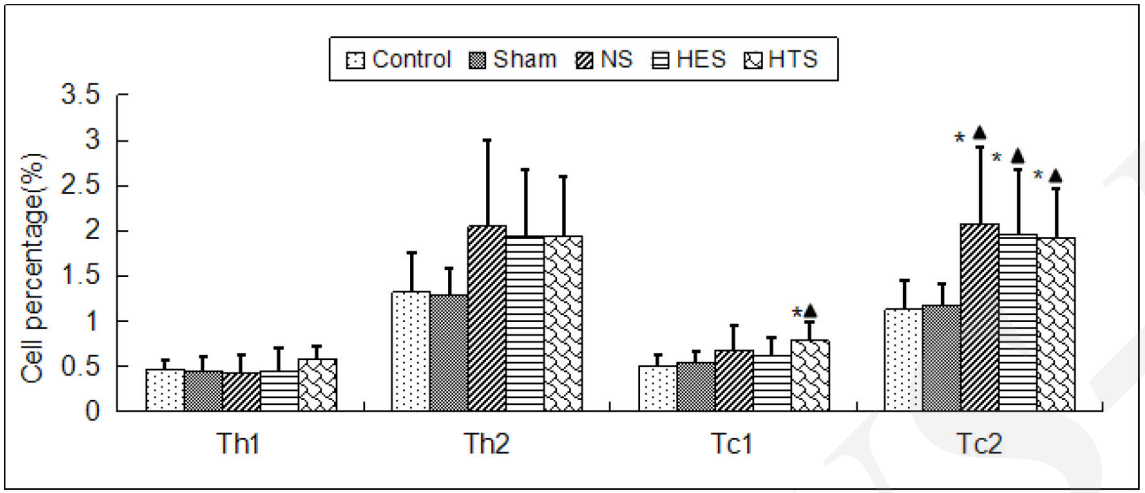
Table 1 Percentages of $CD4^+CD25^+Foxp3^+$ regulatory T cells (Tregs) in the spleen

Group	*n*	Tregs (%)
Control	8	2.21±0.35
Sham	8	1.96±0.30
NS	8	$1.36±0.19^{*▲}$
HTS	8	$2.10±0.31^{\#■}$
HES	8	$1.24±0.34^{*▲}$
F		17.072
P		0.000

- **The proportion of Tregs did not differ among control, sham and HTS groups.**
- **The proportion of Tregs in NS and HES groups were similar and significantly lower than in the control and sham groups (*P*s<0.05).**

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Research Summary



- The percentage of Tc1 cells was significantly higher only in the HTS group
- The levels of Tc2 in all three groups were equally and significantly improved (Ps<0.05 vs control, sham)

Table 2 T helper (Th)1/Th2 and cytotoxic T lymphocyte (Tc)1/Tc2 ratios

Group	*n*	Th1/Th2	Tc1/Tc2
control	8	0.37±0.08	0.46±0.10
sham	8	0.35±0.08	0.47±0.11
NS	8	0.22±0.06*▲	0.33±0.04*▲
HTS	8	0.32±0.07#■	0.42±0.08#■
HES	8	0.23±0.07*▲	0.32±0.08*▲
F		7.051	5.395
P		0.000	0.002

- The ratios of Th1/Th2 and Tc1/Tc2 did not differ among control, sham and HTS groups.
- The ratios of Th1/Th2 and Tc1/Tc2 in NS and HES groups were similar and significantly lower than in the control and sham groups (*P*s<0.05).

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Innovation points

- **This study shows that resuscitation with a small volume of HTS has a stronger impact on the spleen immune system than HES or NS.**

- **Specifically, HTS preserves Treg proportions in the spleen, while increasing the cell number of Th1 and Tc1 cells and maintaining the balance between Th1/Th2 and Tc1/Tc2.**

- **HTS resuscitation provides potential immunomodulatory activity in the early stages after hemorrhagic shock.**

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Figure 4