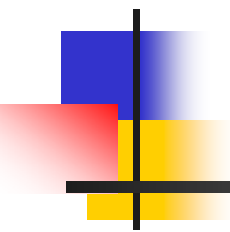


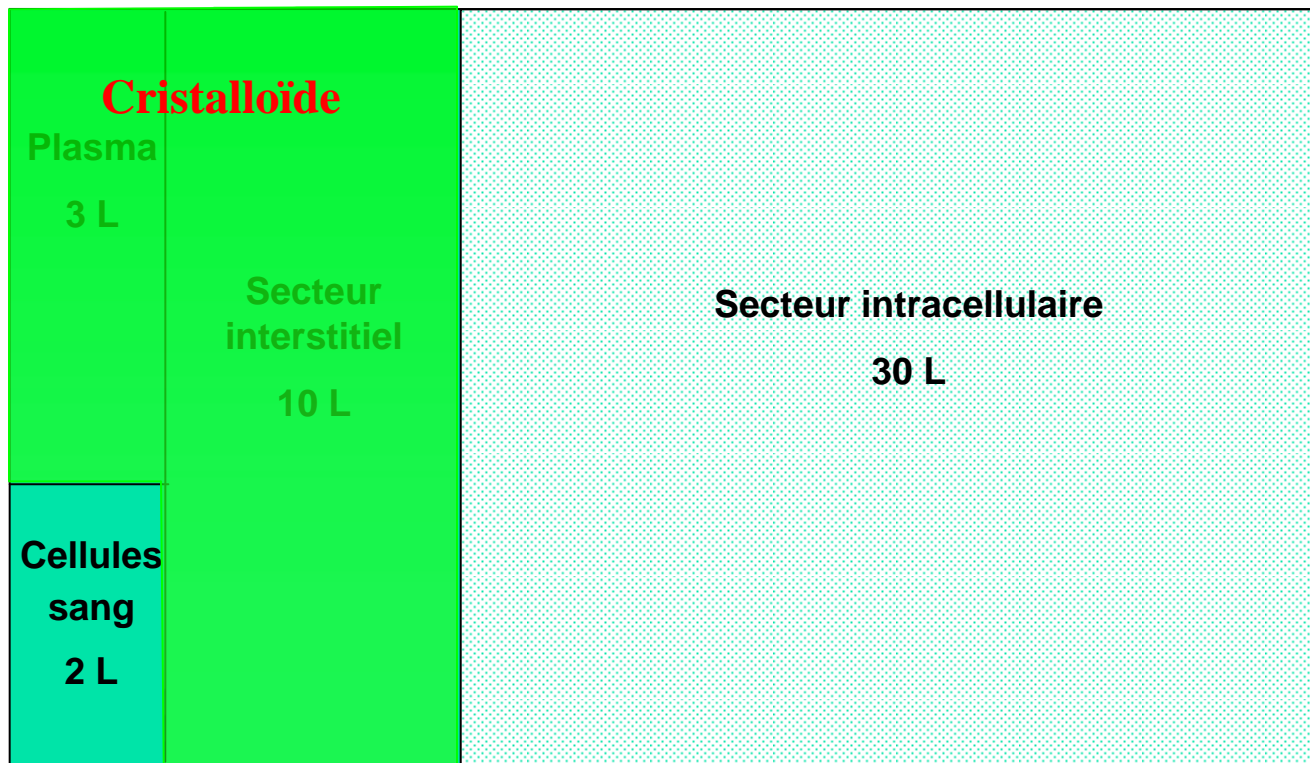
Remplissage vasculaire peropératoire : des cristalloïdes, bien sûr !



B. Tavernier
Pôle d'Anesthésie-Réanimation
Hôpital Roger Salengro, CHU de Lille

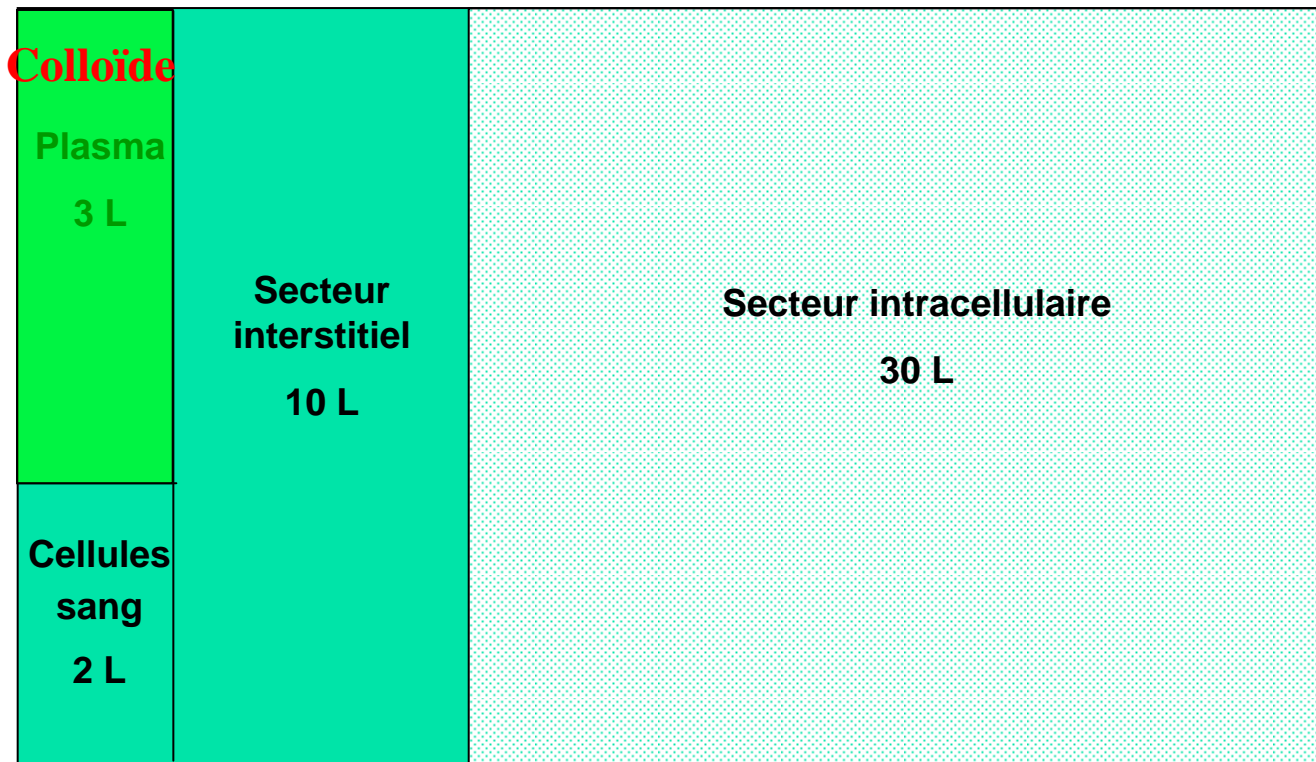
Volumes de distribution des solutions de remplissage

Adulte 75 kg



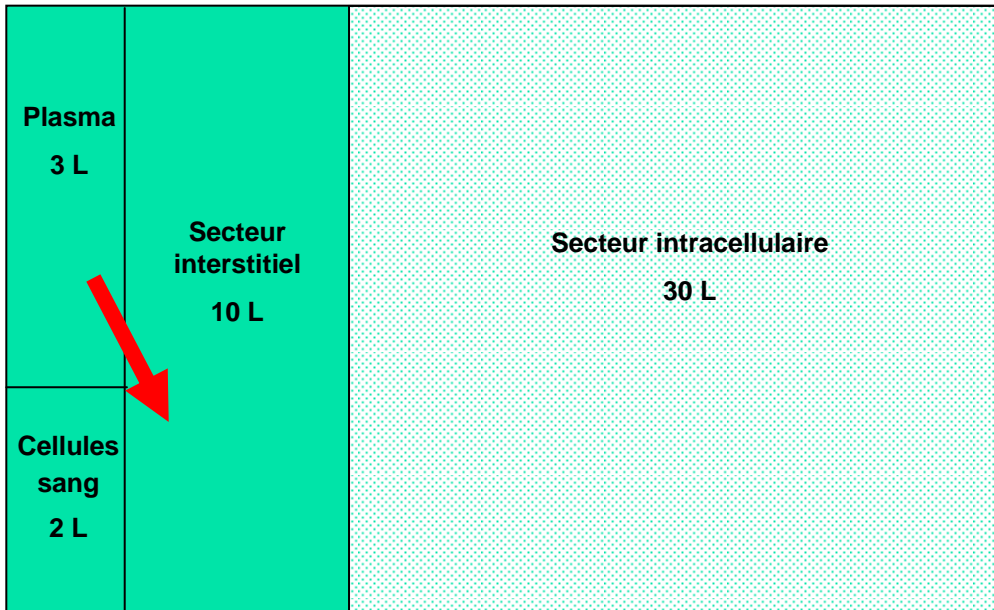
Volumes de distribution des solutions de remplissage

Adulte 75 kg



Modifications périopératoires

Adulte 75 kg



Préop

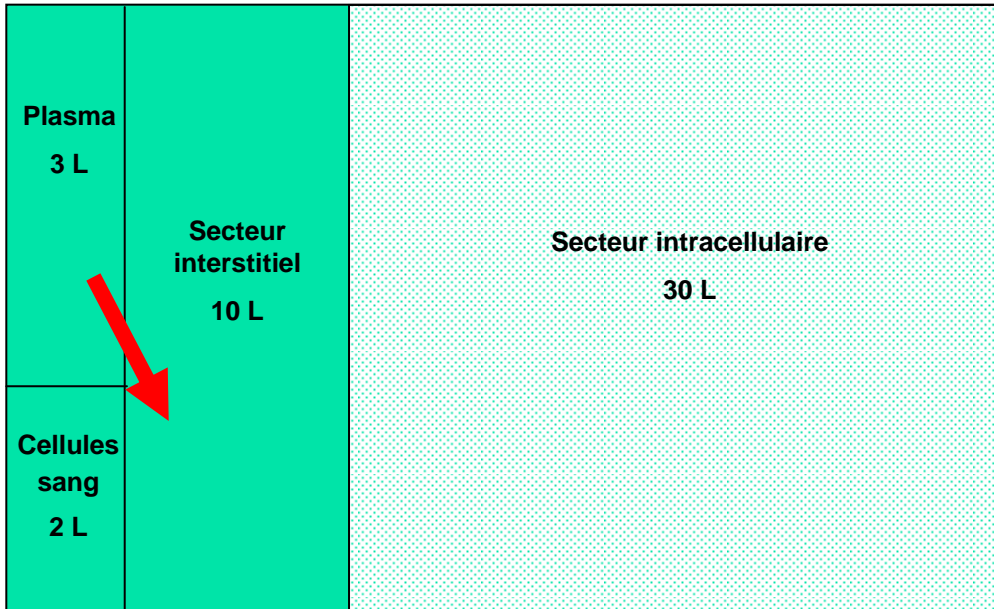
- jeûne
- traitements
- prépa colique

Perop

- saignement
- pertes insensibles "physio"
- effets CV de l'anesthésie

Modifications périopératoires

Adulte 75 kg



Préop

- jeûne
- traitements
- prépa colique

Perop

- saignement
- pertes insensibles "physio"
- effets CV de l'anesthésie

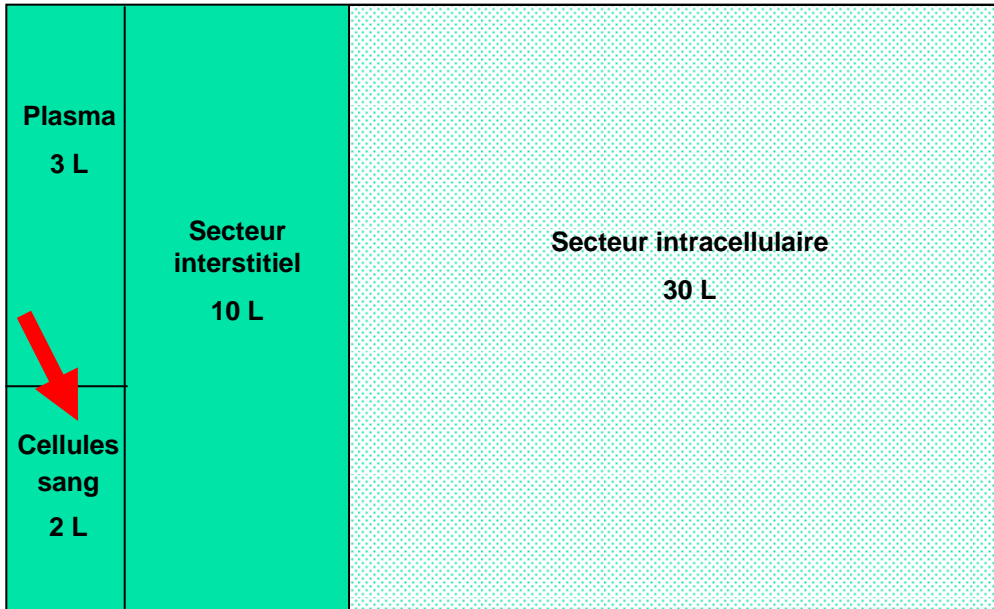
Apport liquidiens en chirurgie "mineure"

Etude	Patients	Résultats
Yogendran, 1995	Ambulatoire Sérum Salé 20 ml/kg préop (vs 2ml/kg)	↓ soif, vertiges ↓ somnolence
Elhakim, 1998	Curetage utérin Ringer lactate 1 l (vs 0)	↓ NVPO
Ali, 2003	Laparoscopie Hartmann 15 ml/kg préop (vs 2ml/kg)	↓ NVPO
Magner, 2004	Laparoscopie gynéco (ambulatoire) Ringer lactate 30 ml/kg (vs 10 ml/kg)	↓ NVPO
Maharaj, 2005	Laparoscopie gynéco Ringer lactate 2 ml/kg/h de jeûne (vs 3 ml/kg)	↓ NVPO ↓ douleur PO

NVPO : nausées et vomissements postopératoires

Modifications périopératoires

Adulte 75 kg



Préop

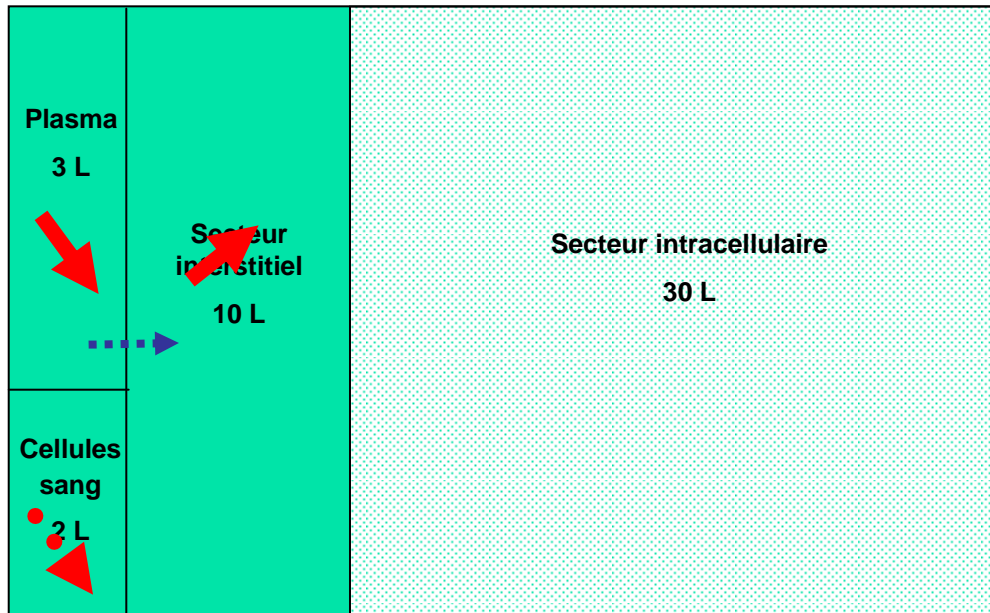
- jeûne
- traitements
- prépa colique

Perop

- effets CV de l'anesthésie
- pertes insensibles "physio"
- saignement

Répartition liquidiennes dans l'organisme

Adulte 75 kg



Inflammation

(attrition tissulaire, ischémie-reperfusion, sepsis, CEC)

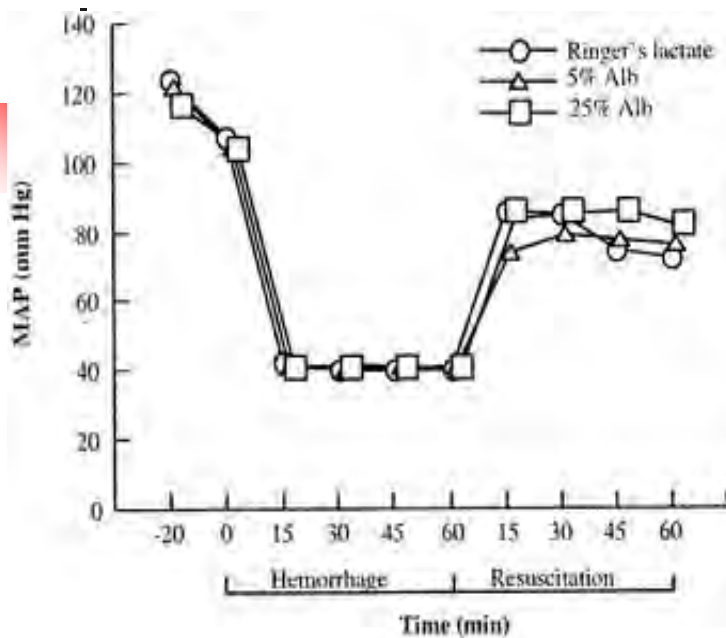
- ↑ perméabilité vasculaire : "fuite" dans **secteur interstitiel**
- **"3eme secteur"**



Pourquoi utiliser un colloïde?

- Volume de distribution intravasculaire
= efficacité plus rapide pour un moindre volume

Haemorrhagic shock

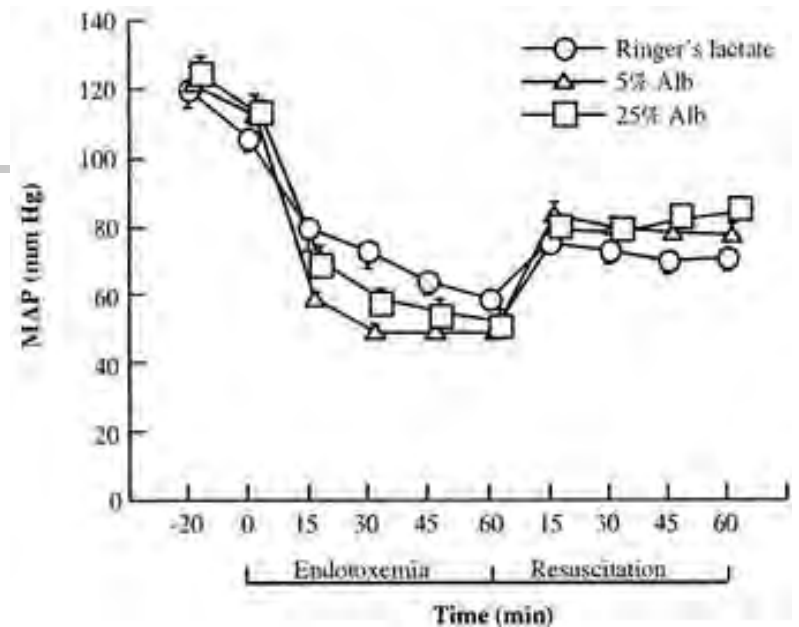


Amount of fluid required

5% albumin 11.6 ± 0.7 mL

RL 50.2 ± 2.7 mL

Endotoxic shock



Amount of fluid required

5% albumin 18.6 ± 2.3 mL

RL 63.5 ± 6.0 mL

Etudes cliniques à objectifs hémodynamiques

(d'après F Schortgen)

	Indication	objective	Fluids	Colloids : Crystalloids
Rackow 1983	Septic shock	250 ml/15 mins until PAOP 15 mmHg	NS Hetastarch 5% alb	1 : 1.8 to 2.4
Haupt 1982	Hypovolemic shock	250 ml/15min until PAOP 10-15 mmHg	NS Hetastarch 5% alb	1 : 1.4 to 2
Moss 1981	Trauma + choc	PAM>80 mmHg	RL Alb 5%	1 : 1
Shires 1982	Vascular surgery	PAOP maintenance	RL Plasma	1 : 1.9
Virgilio 1979	Vascular surgery	PAOP and CI maintenance	RL Alb 5%	1 : 1.7
Dawidson 1991	Vascular surgery	PAOP maintenance	RL Dextran 60	1 : 2.9
Hankeln 1989	Critically ill patients	PAPO 16-18	RL HES 10%	1 : 1.6
Ueyama 1999	Surgery	Increase in Blood Volume: 500 ml	RL Pentastarch	1 : 3
SAFE study 2004-2007	Réa (traumato, sepsis)	Hemodynamic para	SSI SAD 4%	1 : 1.4
WISEP study 2008	Sepsis sévère	Hemodynamic para	RL HES 200/0.5	1 : 1.5



Pourquoi utiliser un colloïde?

- Volume de distribution intravasculaire
= efficacité plus rapide pour un moindre volume
- Propriété spécifiques
 - effets anti-inflammatoires, perméabilité capillaire
 - pouvoirs anti-oxydants
 - fonction de transport (alb)



Pourquoi ne pas utiliser un colloïde ?

- coagulation
- rein
- allergie
- accumulation SRE
- voire ... risque agents pathogènes (?)

Colloids versus crystalloids for fluid resuscitation in critically ill patients.

Roberts I, Alderson P, Bunn F, Chinnock P, Ker K, Schierhout G.

Cochrane Database Syst Rev. 2004 Oct

19 études contrôlées

7576 patients : trauma, post op, brûlés

REVIEWERS' CONCLUSIONS: There is no evidence from randomised controlled trials that resuscitation with colloids reduces the risk of death, compared to resuscitation with crystalloids, in patients with trauma, burns or following surgery.

ORIGINAL ARTICLE

A Comparison of Albumin and Saline for Fluid Resuscitation in the Intensive Care Unit

The SAFE Study Investigators*

2004;350:2247

RCT
6997 patients
18 mois
16 ICUs

Table 1. Baseline Characteristics of the Patients.*

Characteristic	Albumin Group	Saline Group
Age — yr	58.6±19.1	58.5±18.7
Female sex — no. (%)	1424 (40.7)	1376 (39.3)
Reason for admission to ICU — no. (%)		
Surgical	1473 (43.0)	1465 (42.8)
Medical	1955 (57.0)	1958 (57.2)
Predefined subgroups — no. (%)		
Trauma	597 (17.4)	590 (17.2)
Severe sepsis	603 (18.1)	615 (18.4)
Acute respiratory distress syndrome	61 (1.8)	66 (1.9)
APACHE II score [†]	18.7±7.9	19.0±8.0
Physiological variables		
Heart rate — beats/min	91.4±23.5	92.3±23.5
Mean arterial pressure — mm Hg	77.8±16.4	78.2±16.3
Central venous pressure — mm Hg	9.0±4.7	8.6±4.6‡
Urine output — ml/hr	89.7±132.4	95.0±161.4
Serum albumin — g/liter	27.4±7.8	27.7±7.9
Organ failure — no. (%)§		
No failure	1962 (57.2)	1885 (55.1)
1 organ	1075 (31.4)	1148 (33.5)
2 organs	335 (9.8)	329 (9.6)
3 organs	50 (1.5)	57 (1.7)
4 organs	5 (0.1)	4 (0.1)
5 organs	1 (<0.1)	0
Mechanical ventilation — no. (%)	2186 (63.8)	2217 (64.8)
Renal-replacement therapy — no. (%)	45 (1.3)	41 (1.2)
Albumin in previous 72 hr — no. (%)	127 (3.7)	135 (3.9)

ORIGINAL ARTICLE

A Comparison of Albumin and Saline for Fluid Resuscitation in the Intensive Care Unit

The SAFE Study Investigators*

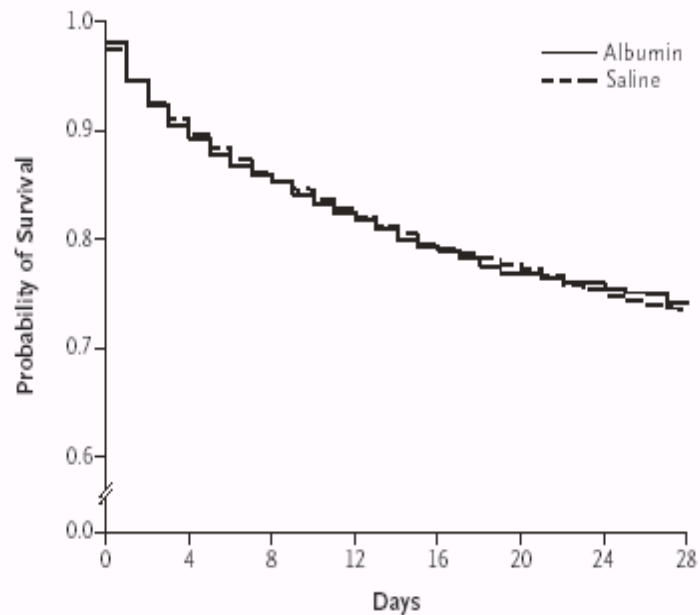


Figure 1. Kaplan–Meier Estimates of the Probability of Survival.

P=0.96 for the comparison between patients assigned to receive albumin and those assigned to receive saline.



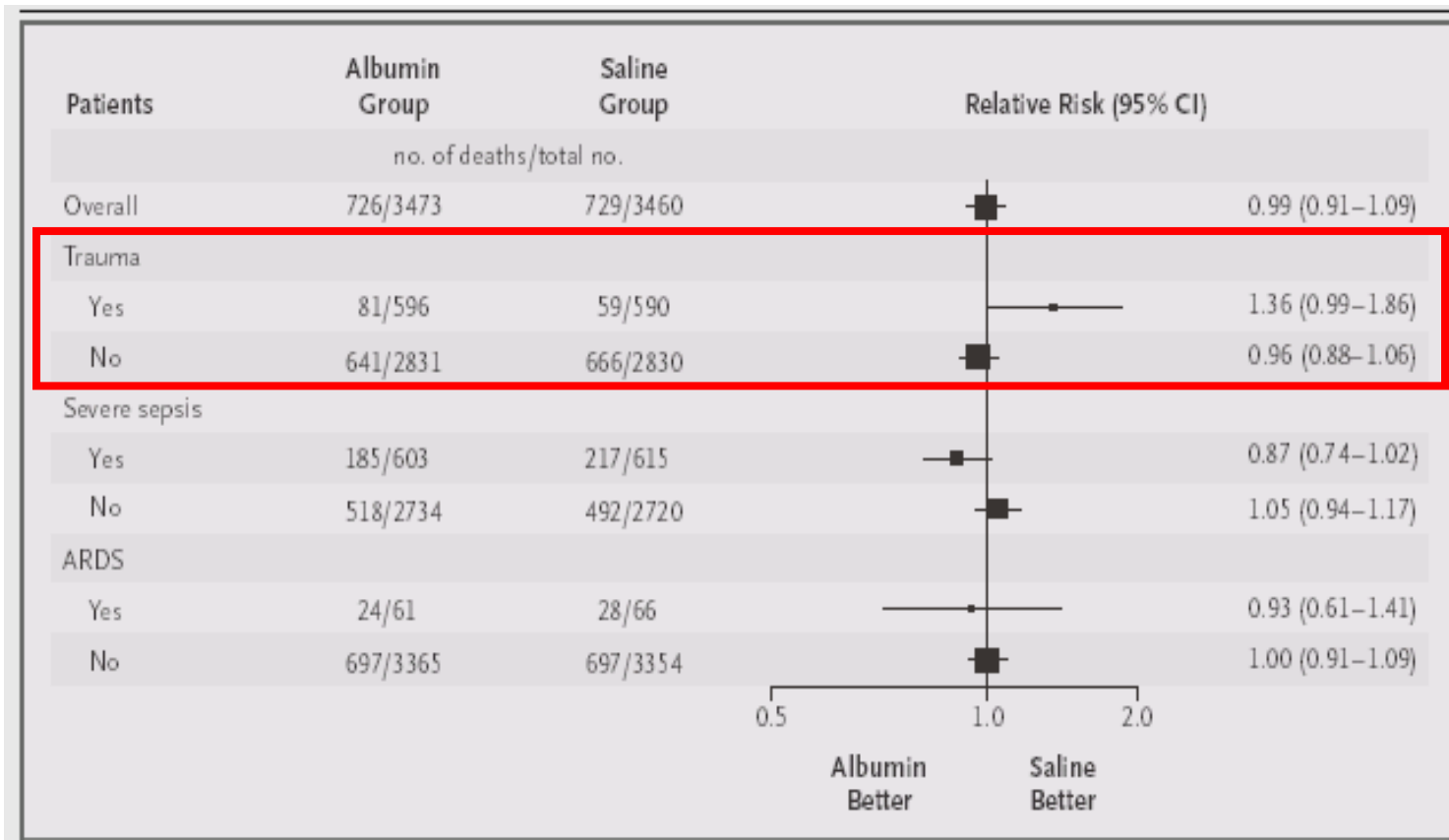
Table 3. Primary and Secondary Outcomes.*

Outcome	Albumin Group	Saline Group	Relative Risk (95% CI)	Absolute Difference (95% CI)	P Value
Status at 28 days — no./total no. (%)					
Dead	726/3473 (20.9)	729/3460 (21.1)	0.99 (0.91 to 1.09)		0.87
Alive in ICU	111/3473 (3.2)	87/3460 (2.5)	1.27 (0.96 to 1.68)		0.09
Alive in hospital [†]	793/3473 (22.8)	848/3460 (24.5)	0.93 (0.86 to 1.01)		0.10
Length of stay in ICU — days	6.5±6.6	6.2±6.2		0.24 (−0.06 to 0.54)	0.44
Length of stay in hospital — days [†]	15.3±9.6	15.6±9.6		−0.24 (−0.70 to 0.21)	0.30
Duration of mechanical ventilation — days	4.5±6.1	4.3±5.7		0.19 (−0.08 to 0.47)	0.74
Duration of renal-replacement therapy — days	0.48±2.28	0.39±2.0		0.09 (−0.0 to 0.19)	0.41
New organ failure — no. (%) [‡]					0.85 [§]
No failure	1397 (52.7)	1424 (53.3)			
1 organ	795 (30.0)	796 (29.8)			
2 organs	369 (13.9)	361 (13.5)			
3 organs	68 (2.6)	75 (2.8)			
4 organs	18 (0.7)	17 (0.6)			
5 organs	2 (0.1)	0			

ORIGINAL ARTICLE

A Comparison of Albumin and Saline for Fluid Resuscitation in the Intensive Care Unit

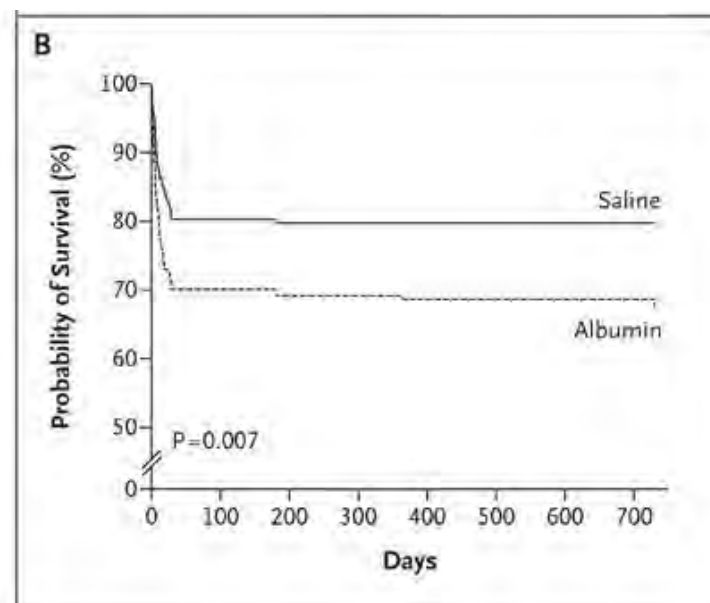
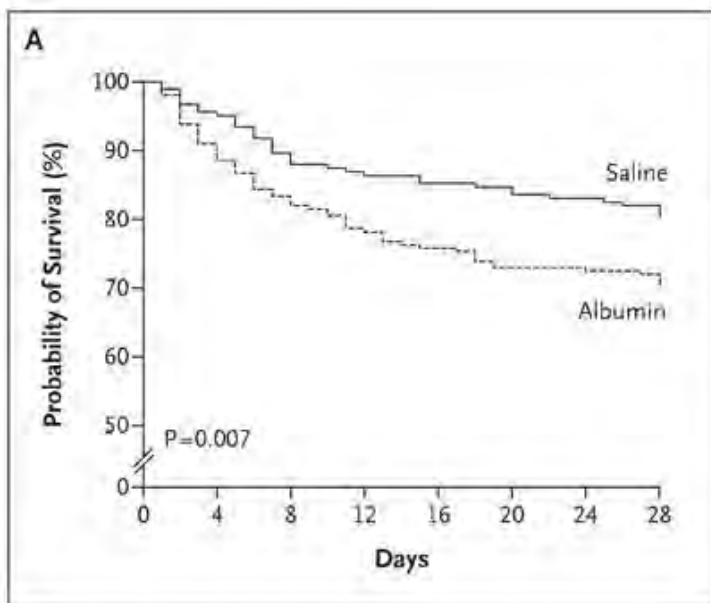
The SAFE Study Investigators*



ORIGINAL ARTICLE

Saline or Albumin for Fluid Resuscitation in Patients with Traumatic Brain Injury

The SAFE Study Investigators*



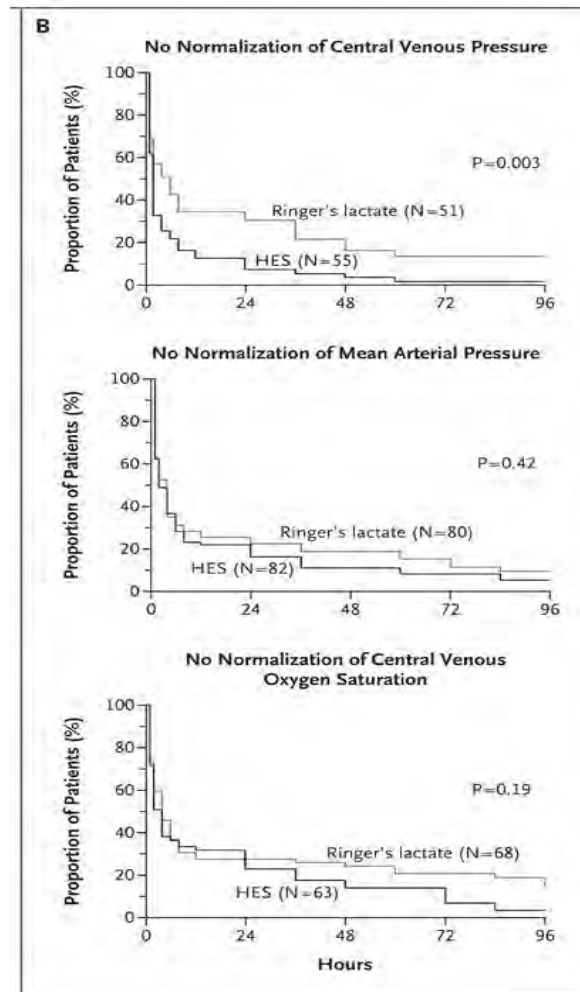
ORIGINAL ARTICLE

Intensive Insulin Therapy and Pentastarch
Resuscitation in Severe Sepsis

N Engl J Med 2008;358:125-39.

Copyright © 2008 Massachusetts Medical Society.

- 537 patients
- HEA 200/0.5 vs Ringer-lactate
- Objectif
 - PVC ≥ 8 mm Hg
 - PAM ≥ 70 mmHg
 - ScvO₂ ≥ 70 %
- RL / HEA : 1.58 (J1)

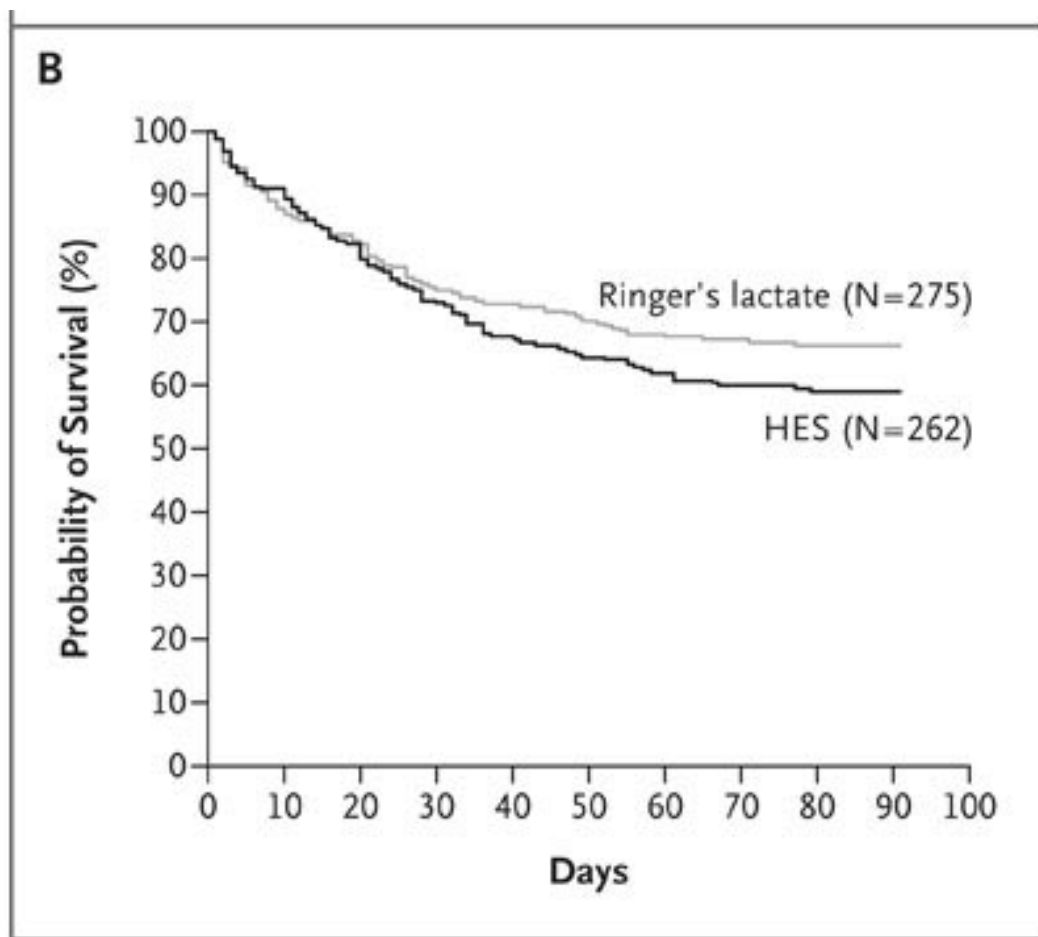


ORIGINAL ARTICLE

Intensive Insulin Therapy and Pentastarch Resuscitation in Severe Sepsis

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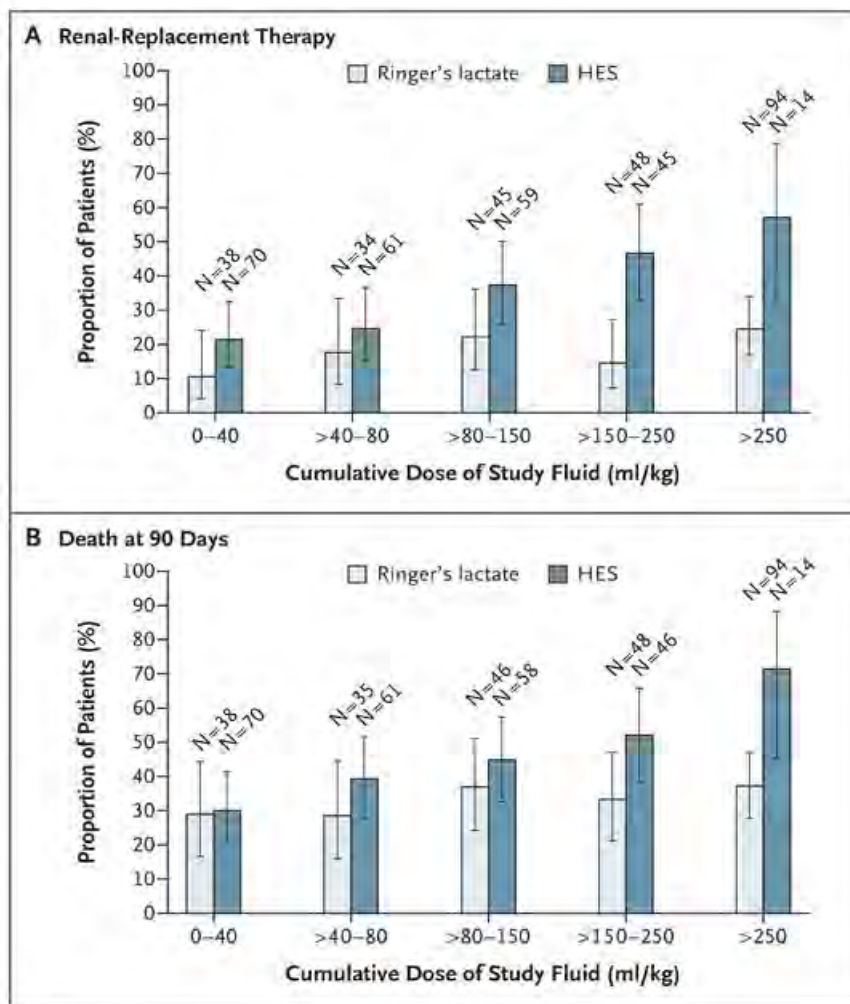


ORIGINAL ARTICLE

Intensive Insulin Therapy and Pentastarch Resuscitation in Severe Sepsis

N Engl J Med 2008;358:125-39.

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"Intraoperative colloid administration reduces postop nausea and vomiting and improves postop outcomes compared with crystalloid administration"

Moretti EW *et al.*, *Anesth Analg* 2003

- 90 pts, chir "lourde non cardiaque"
- objectifs perop de PA, FC, diurèse et PVC

Attention : 6 L de RL!

Table 4. Relative Risks of Development of Postoperative Nausea and Vomiting with Crystalloid (HS-NS and HS-BS) Compared

with Intraoperative Colloid Compared

Variable	Relative risk (95% CI)	P value
Nausea	0.26 (0.10–0.69)	0.007
Emesis	0.3 (0.12–0.75)	0.01
Rescue antiemetics	0.26 (0.10–0.66)	0.005
Dependent edema	0.51 (0.20–1.30)	0.16
Orbital edema and double vision	0.34 (0.13–0.90)	0.03
Pain severity	0.1 (0.02–0.50)	0.005
Nausea severity	0.28 (0.12–0.65)	0.003

CI = confidence interval; HS = hetastarch; NS = normal saline; BS = balanced salt; LR = lactated Ringer's solution.



"Effects of intravenous fluid restriction on postoperative complications: comparison of two perioperative regimens"

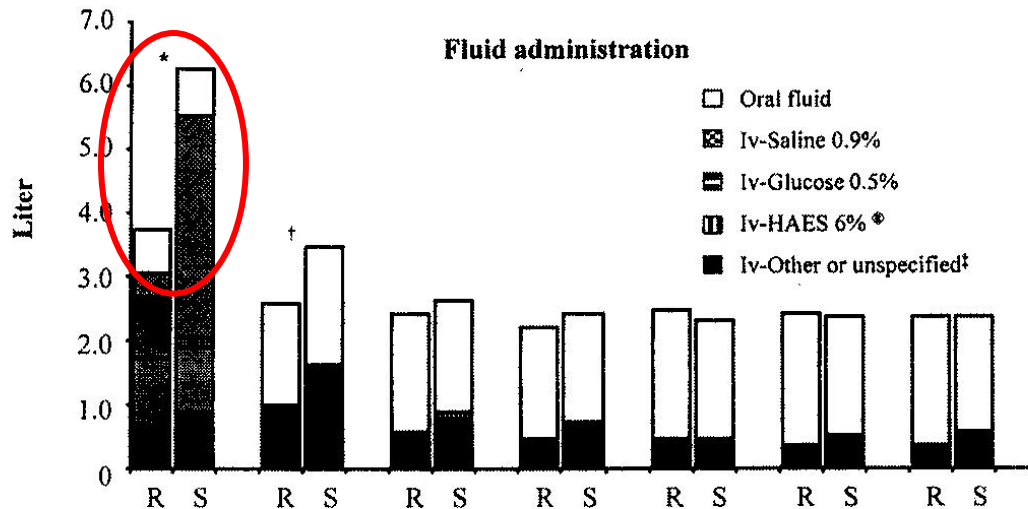
Brandstrup et al., Ann Surg 2003

- 172 patients (# ASA 1-2), résection colique
- Etude prospective, randomisée, multicentrique
- "Restriction" (but : maintien du poids préop) vs apport intraveineux "standard"

- Resultats : effets de la "restriction"
 - ↓ complications postop (33 % vs 51 %; $p = 0,013$)
 - ↓ complications cardiopulmonaires
 - ↓ complications du site opératoire
 - Décès: 0 vs 4,7 % ($p = 0,12$)

"Effects of intravenous fluid restriction on postoperative complications: comparison of two perioperative regimens"

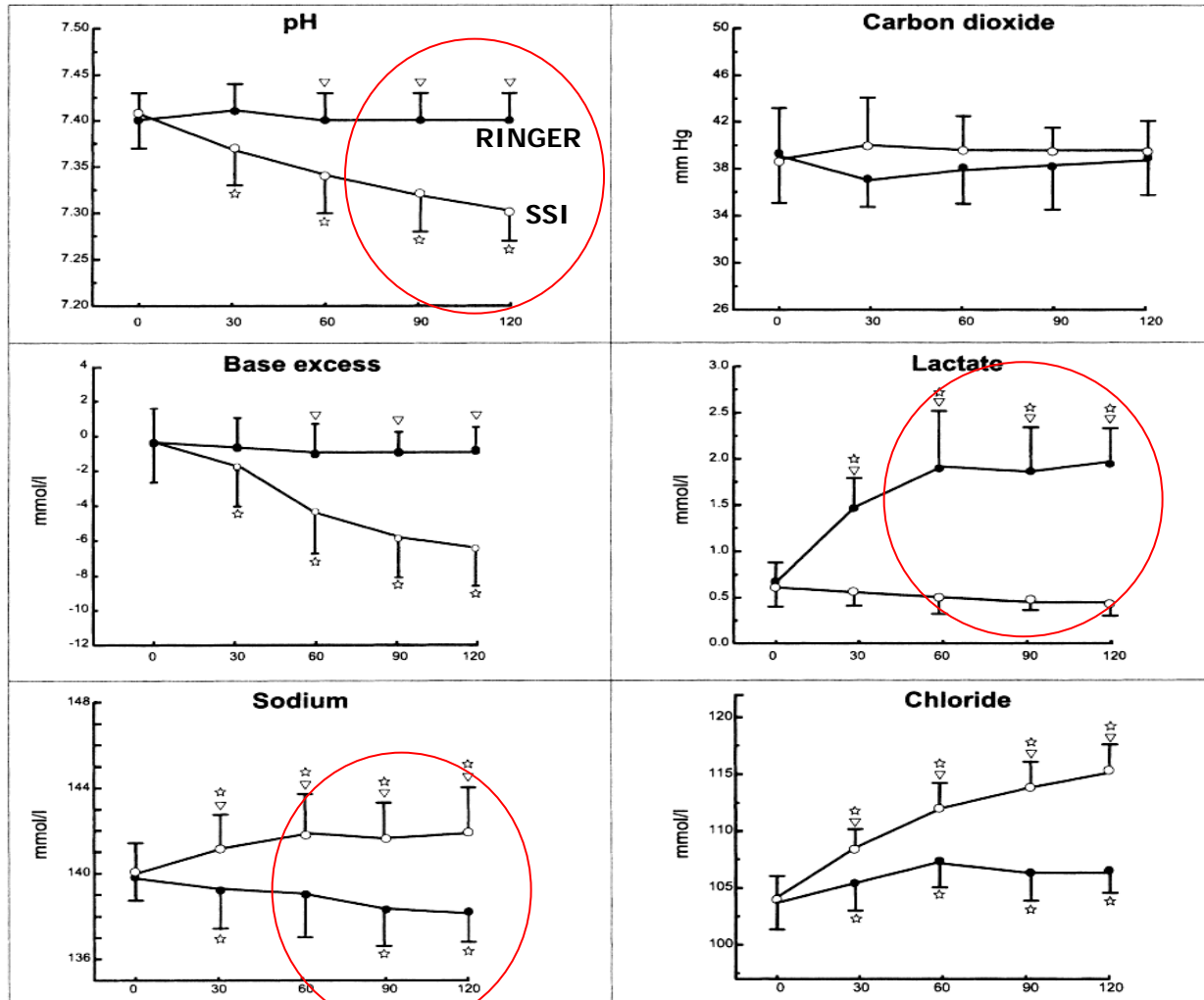
Brandstrup et al., Ann Surg 2003



Acidose "hyperchlorémique" : un problème ?

Scheingraber S et al, Anesthesiology 1999;90:1265

6 L en 2 h



Acidose "hyperchlorémique" : un problème ?

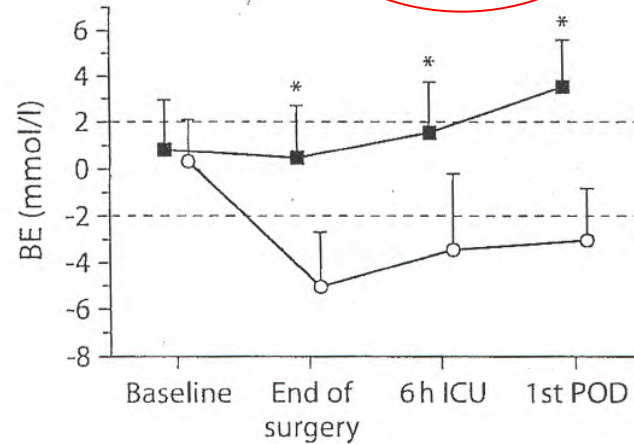
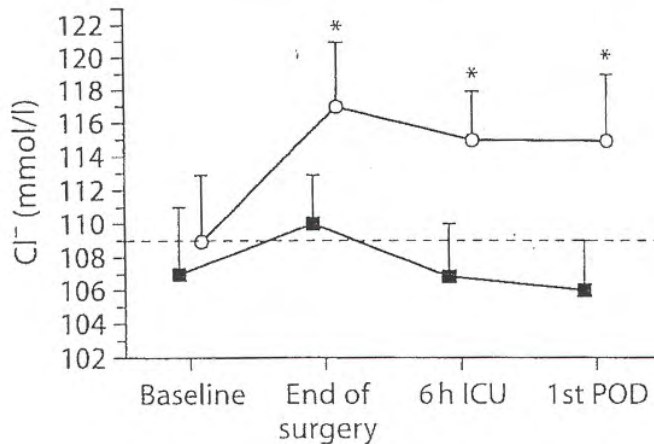
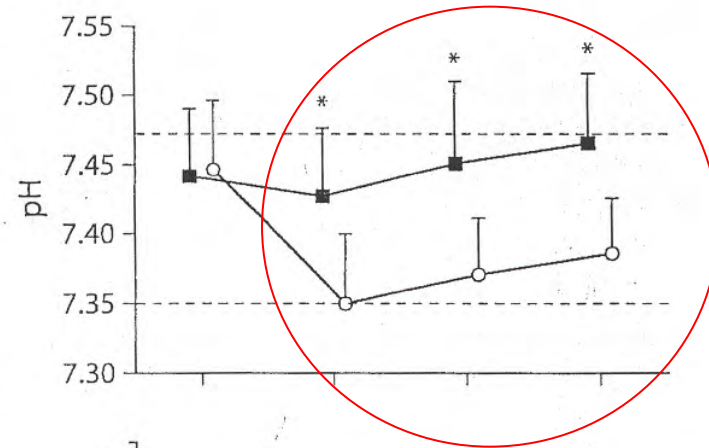
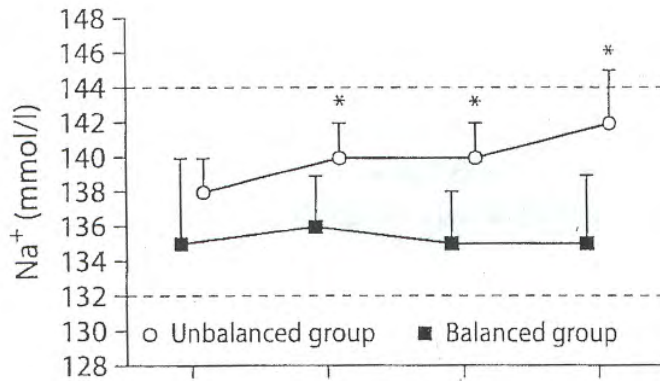
Williams EL et al, Anesth Analg 1999;88:999-1003

Volontaires sains, 50 ml/kg en 1 h

	Before infusion (T1)	End of infusion (T2)	End of infusion + 1h (T3)
Serum osmolality (mOsm / kg)			
SSI	288 ± 5	289 ± 5	290 ± 5
RL	288 ± 4	285 ± 5	287 ± 4
Serum sodium concentration (mEq/L)			
SSI	140 ± 2	141 ± 2	141 ± 2
RL	140 ± 1	139 ± 2	140 ± 2
Whole blood pH (mg/dL)			
SSI	7.42 ± 0.04	7.38 ± 0.05	7.38 ± 0.05
RL	7.41 ± 0.05	7.44 ± 0.05	7.43 ± 0.05

Acidose "hyperchlorémique" : un problème ?

Boldt J et al, Eur J Anaesthesiol 2007;24:267



■ HEA équilibré

○ HEA + NaCl



Pour le même prix

0.5 L

ALB 4%

2 L

HEA

7 L

Gélatine

40 L

Cristalloïde



Conclusion

- "compensation liquidienne" : cristalloïdes
- remplissage vasculaire : d'abord les cristalloïdes ("evidence-based"; tous consensus et recommandations)
- limites
 - RV "très" rapide
 - chir (abdo) lourde : dose max cristalloïdes = 3-4 L ?
- colloïdes : 90 % du contenu = cristalloïdes !!