Les anesthésiques locaux
Complications Systémiques

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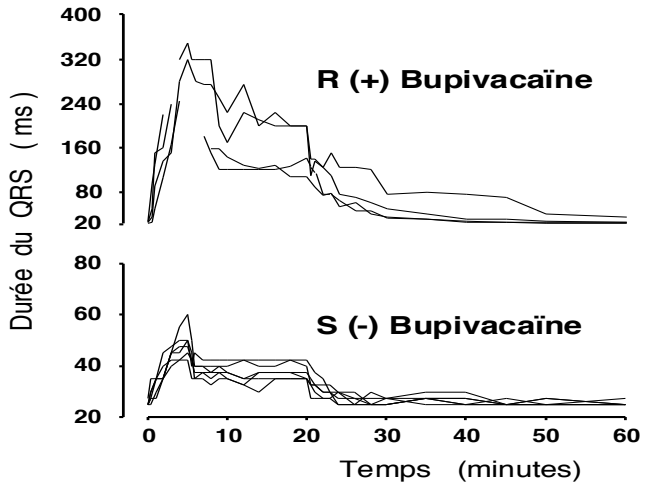
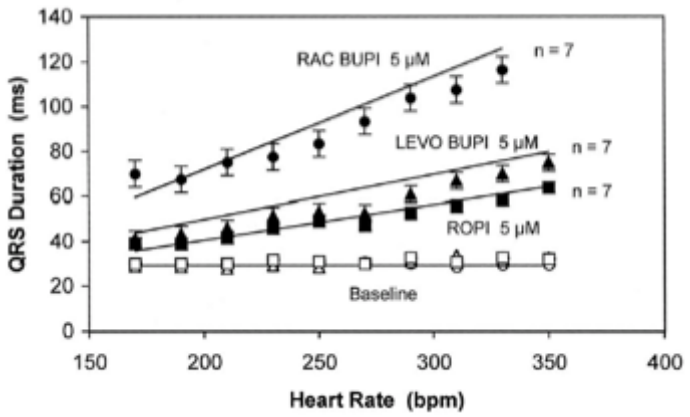
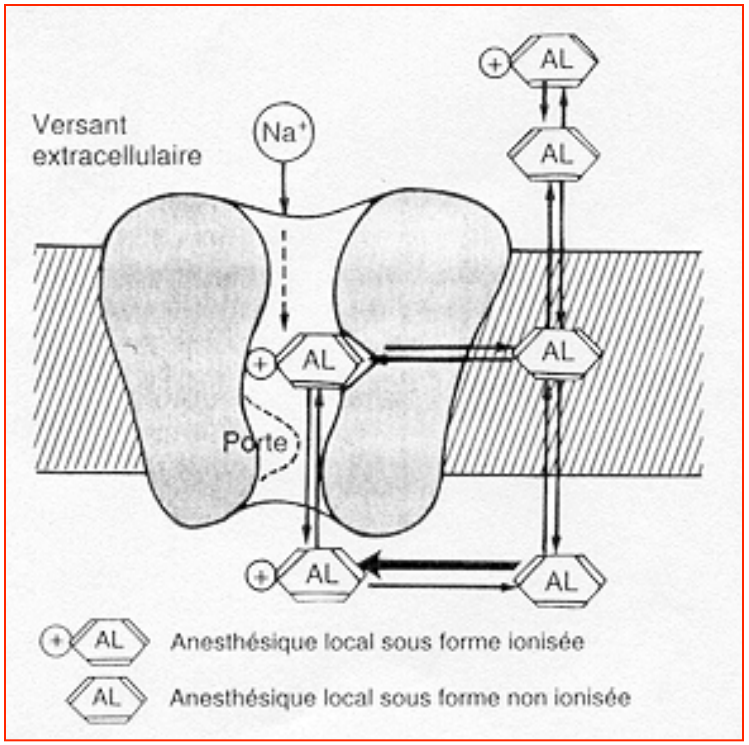
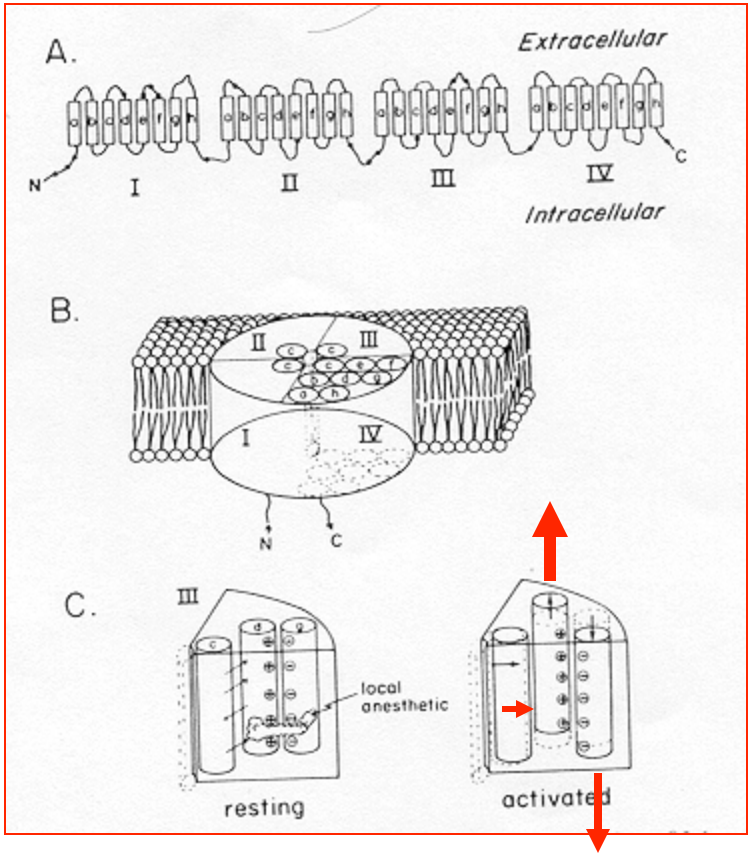




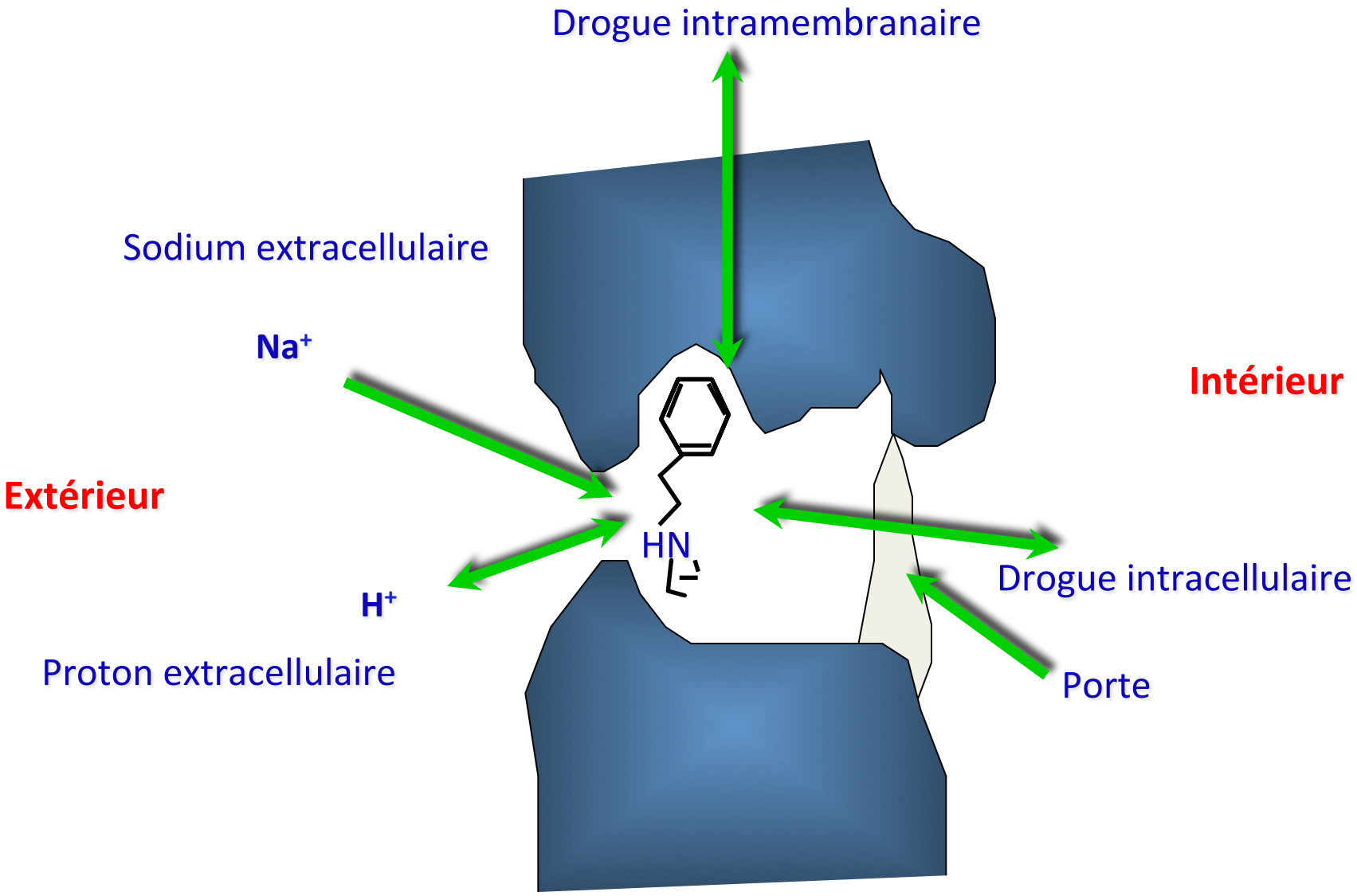
Le canal sodique est respectivement au repos, fermé,ouvert puis inactif . La forme non ionisée pénètre la membrane (modifications de la matrice lipoprotéïque qui diminue le port sodé) et la forme cationique atteint le site actif par l ' axoplasme

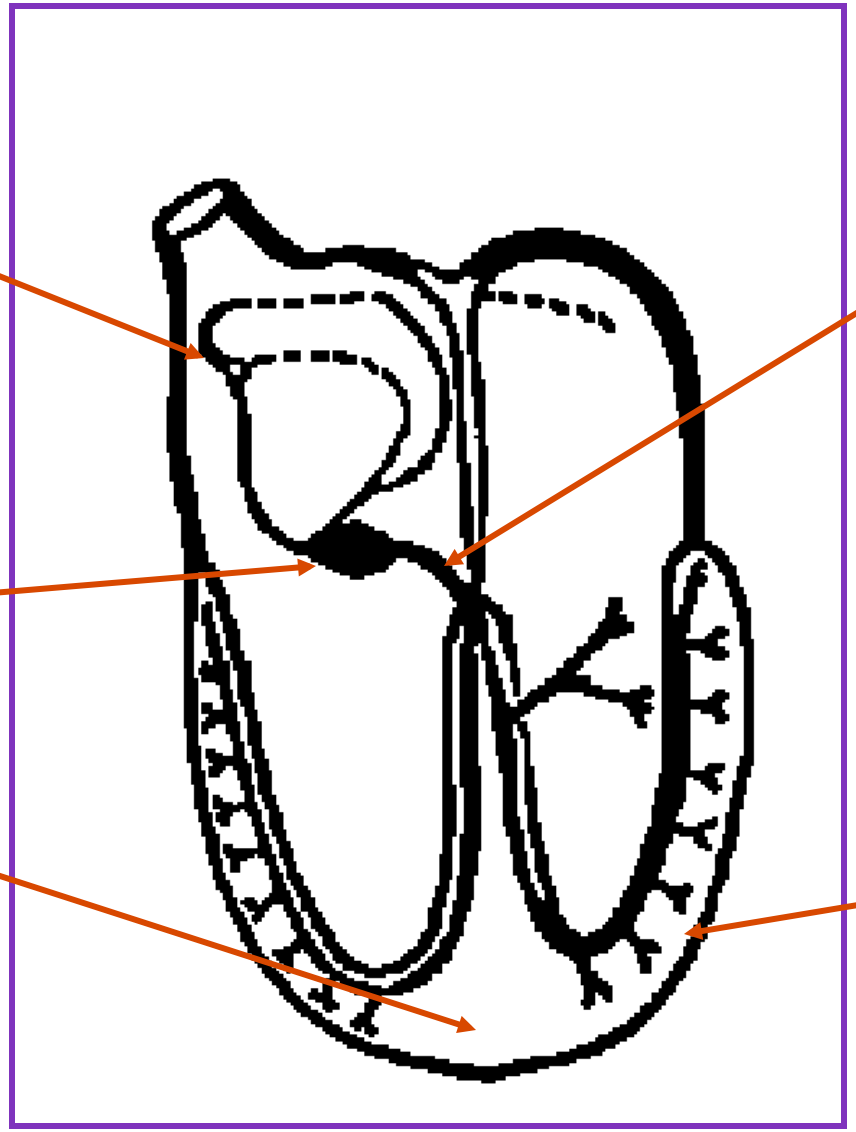




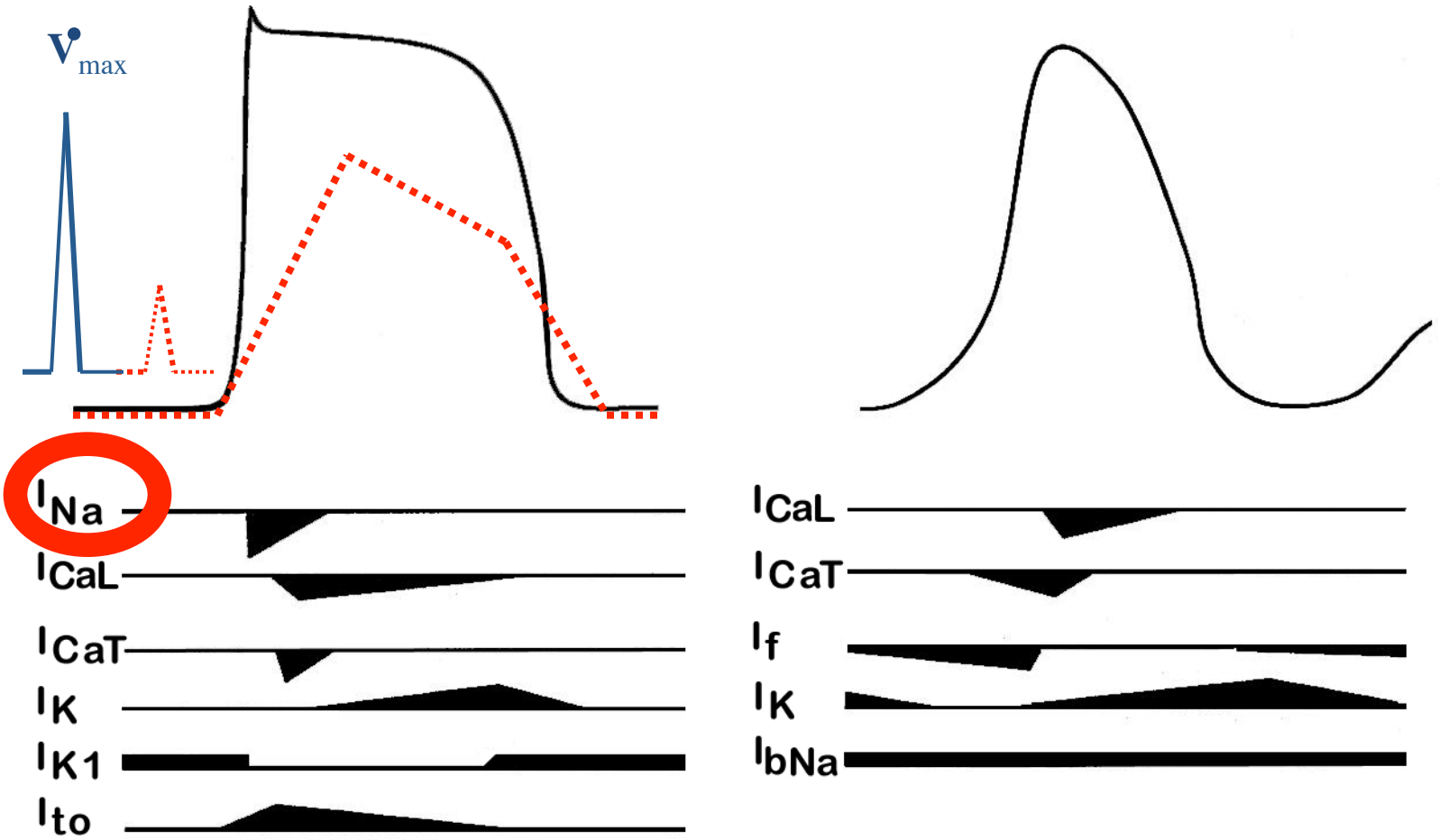
3 formes : canal ouvert bloqué, activation inhibée (AL sur canal semi fermé) et inactivation de longue durée

Canal ionique transmembranaire

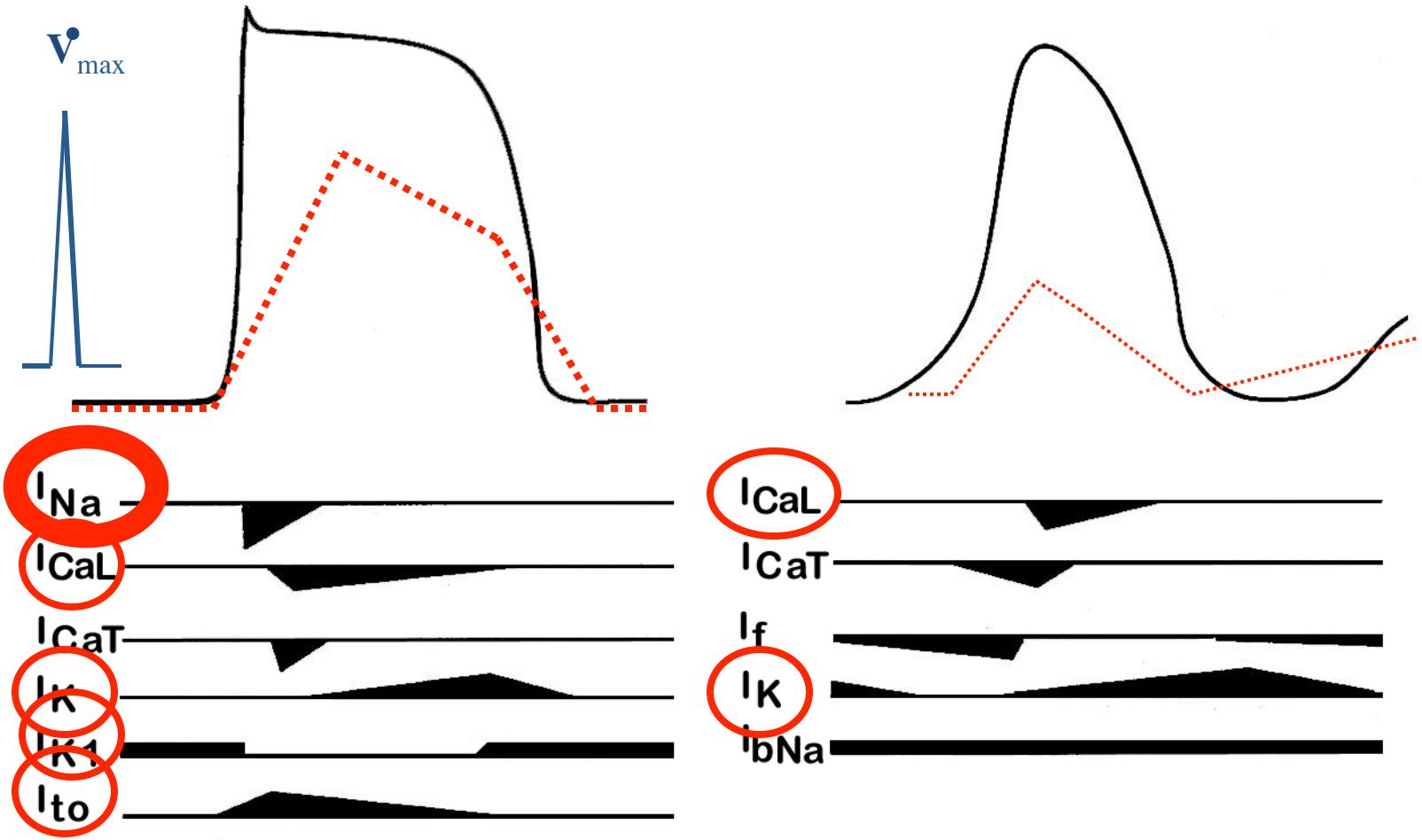



Nœud sinusal
Na +
Nœud AV
Ca ++
Muscle
Ventriculaire
Na +
Faisceaux de
His
Na +
Fibres Purkinje
Na +

EFFETS CARDIAQUES DES A.L.
Courants ioniques

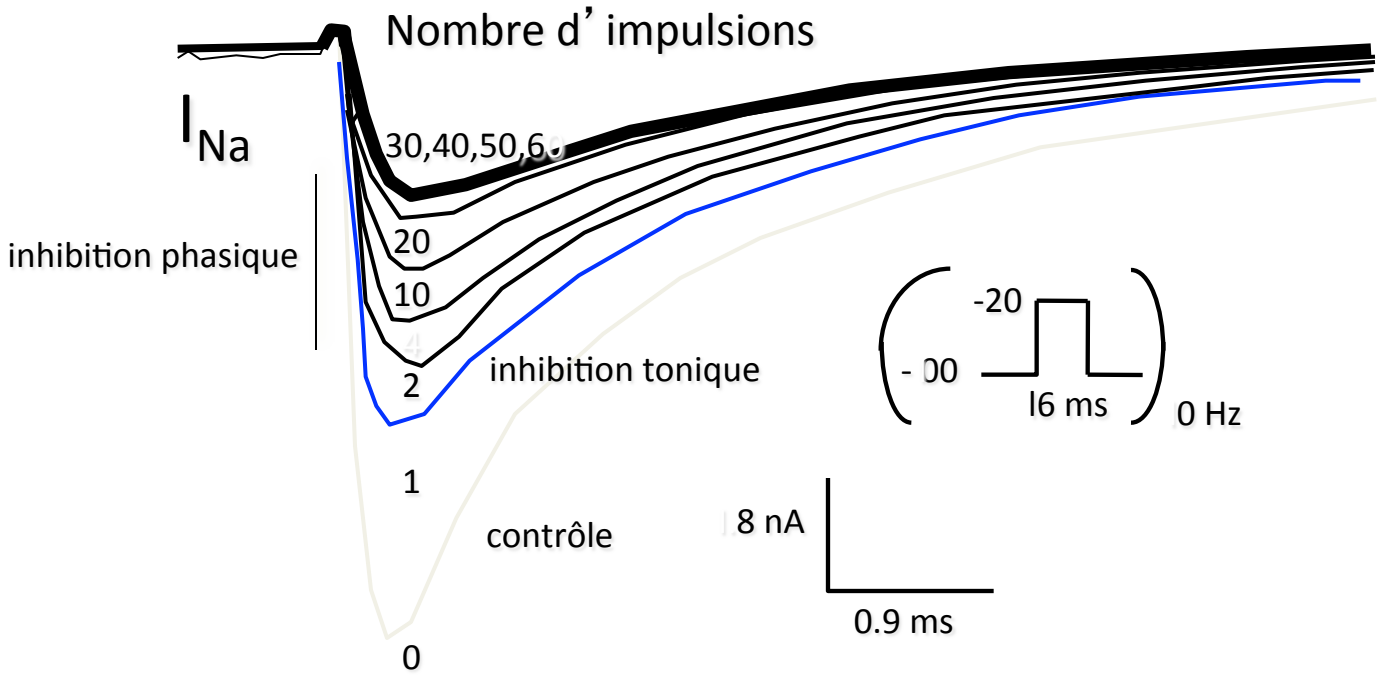


EFFETS CARDIAQUES DES A.L.
Courants ioniques



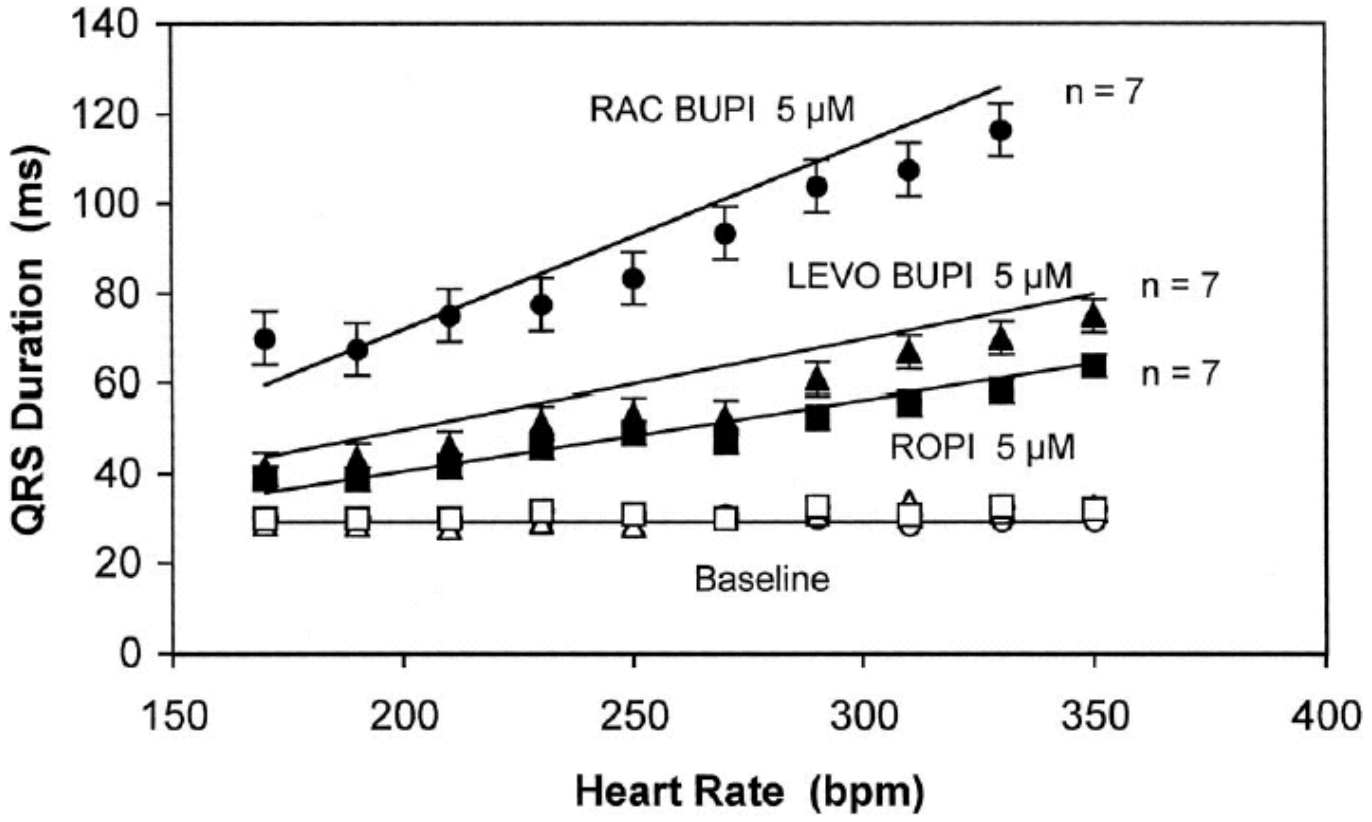
La use dependence
ou rate dependence
ou frequency dependence
ou bloc phasique

200 mM de lidocaïne



Chernoff DM 1990

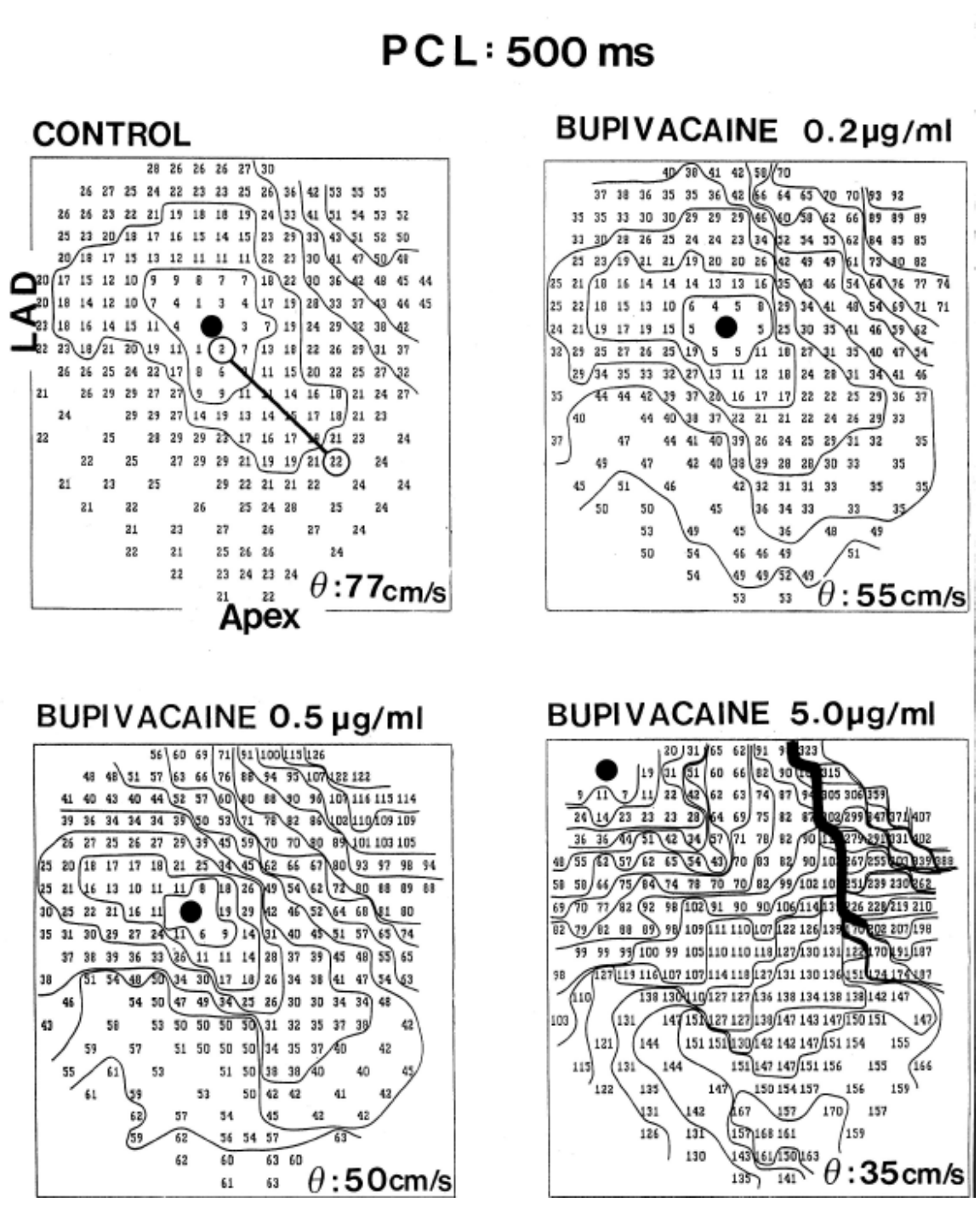
EFFETS CARDIAQUES DES A.L.
Comparaison Bupi/L-bupi/Ropi



Dose-dep:**1 / 0.4 / 0.3**

Rate-dep:**1 / 0.5 / 0.25**

Mazoit et al,
Anesthesiology, 2002

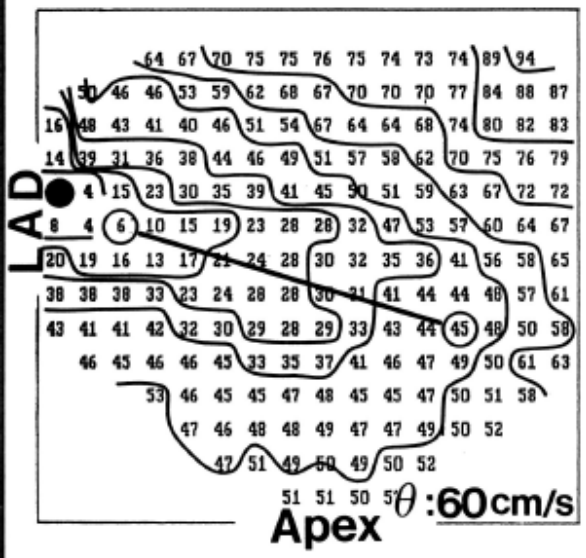


Dose-dépendance

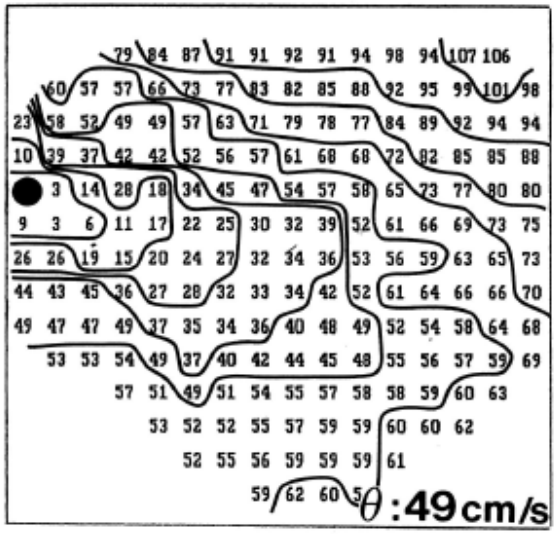
La Coussaye et al.
Anesthesiology 1992

BUPIVACAINE 0.2µg/ml

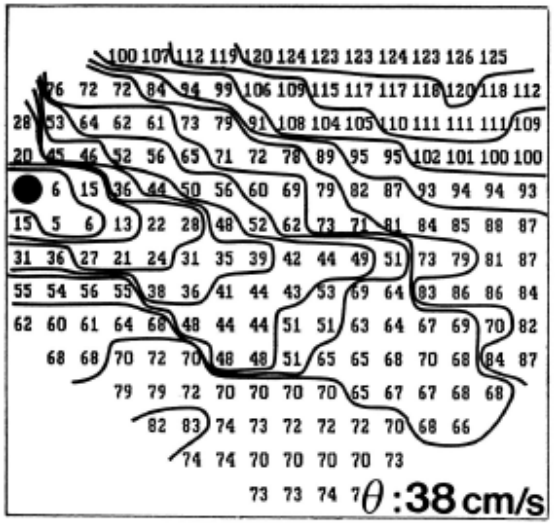
PCL: 1000 ms



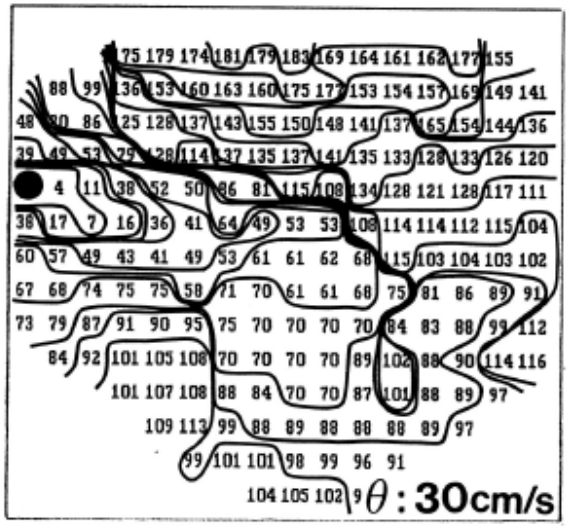
PCL: 700 ms



PCL: 400 ms



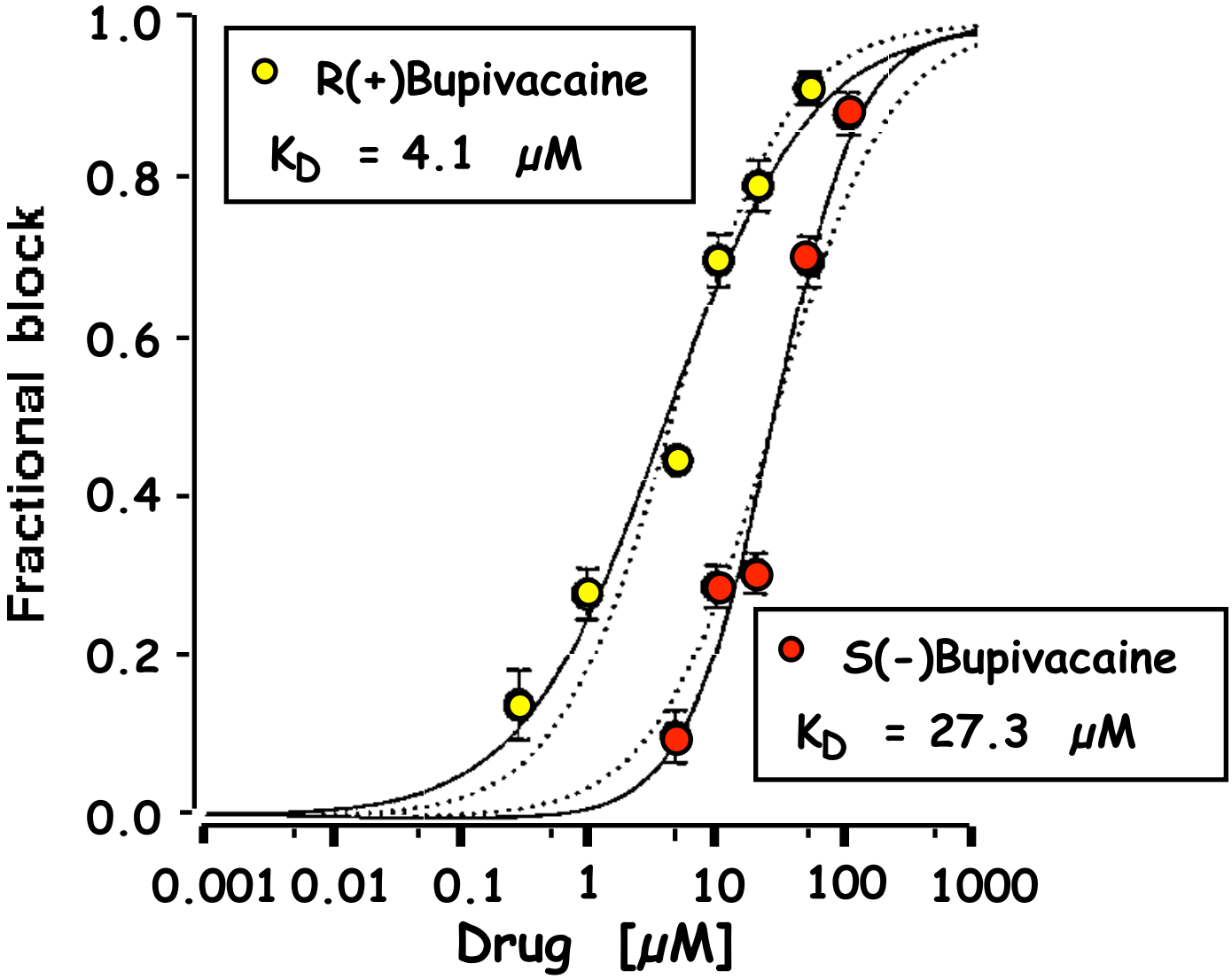
PCL: 200 ms

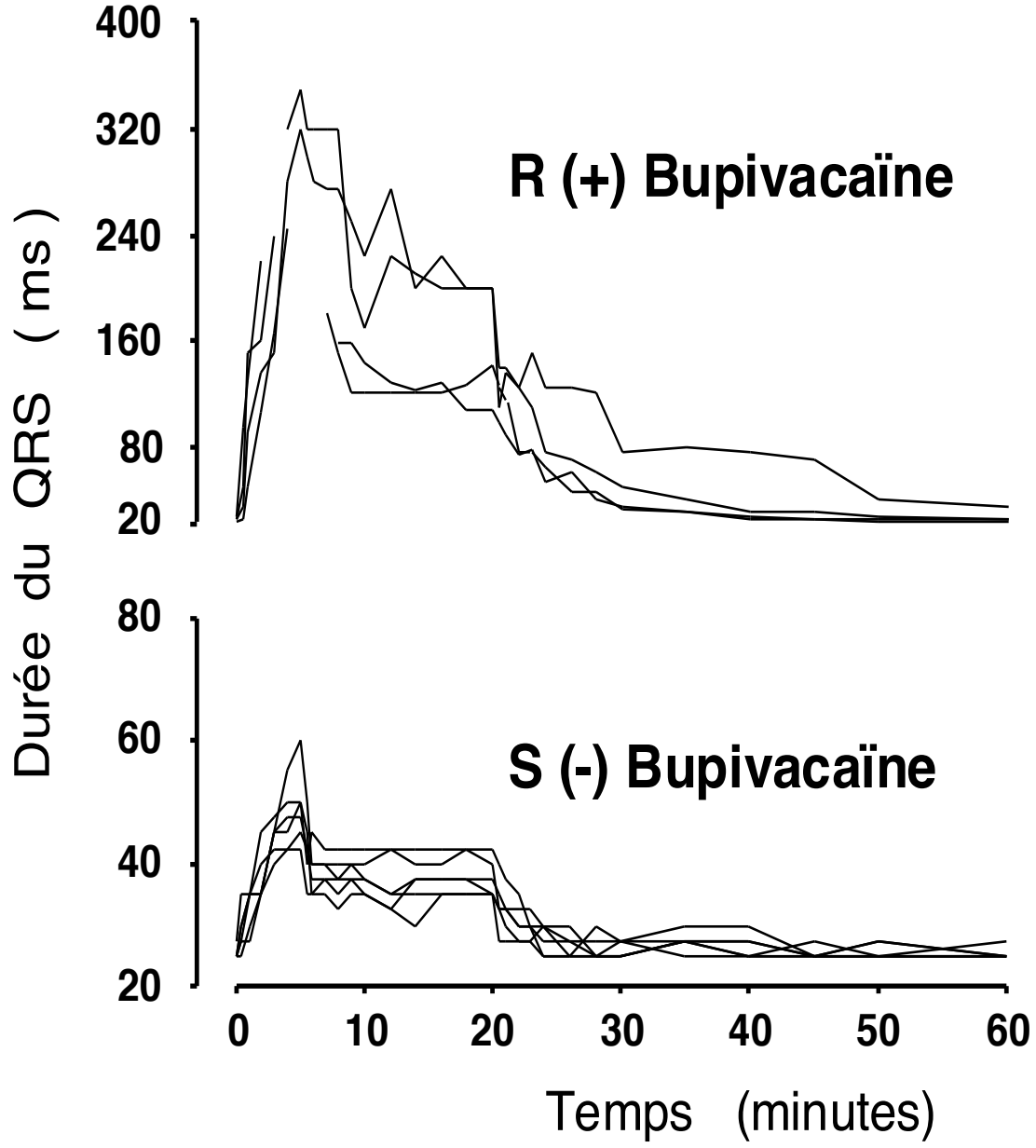


Use-dépendance

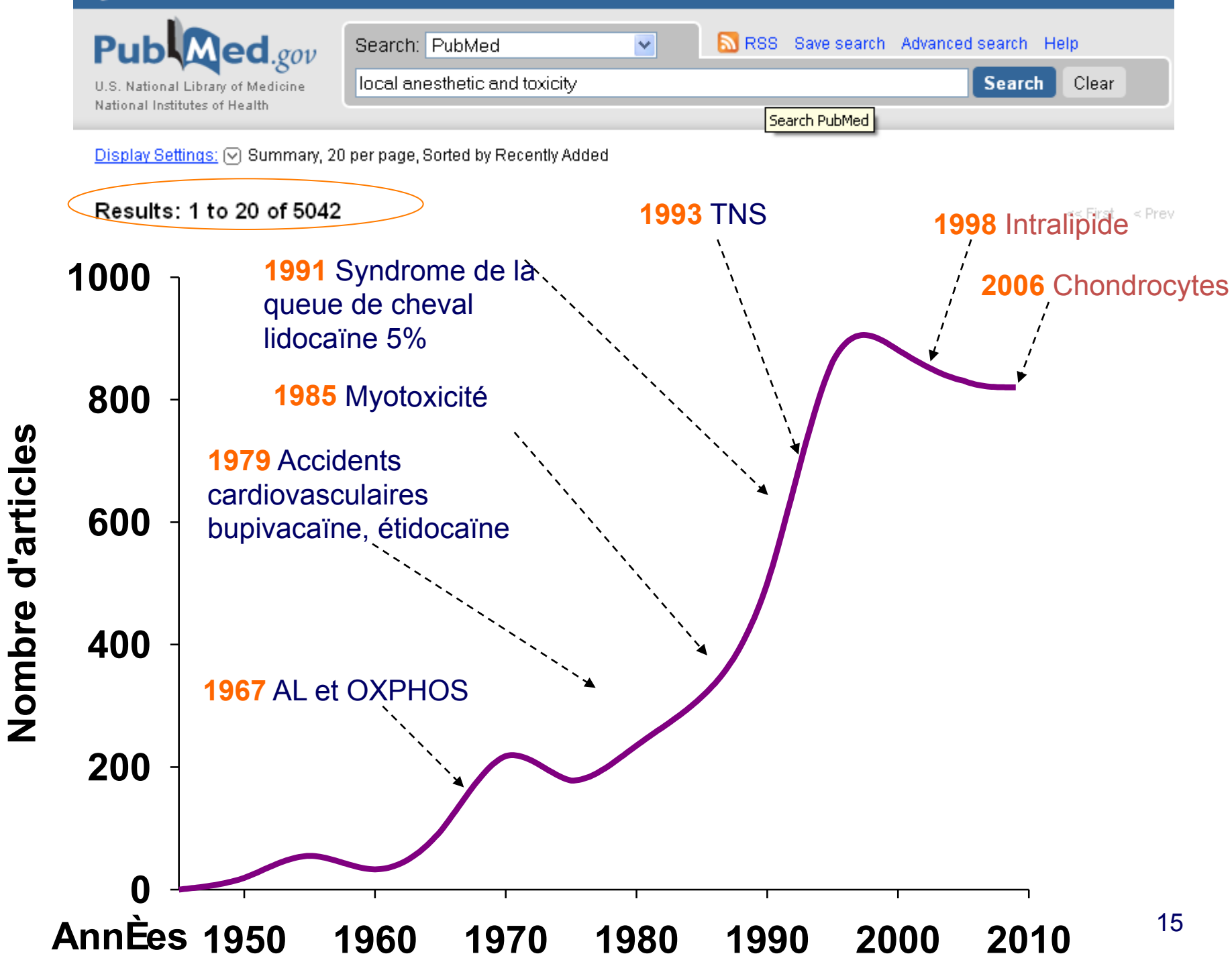
La Coussaye et al.
Anesthesiology 1992

Valenzuella C et col. Biophys J 1995; 69: 418-27.




400
320
240
160
80
20
Durée du QRS (ms)
R (+) Bupivacaïne
80
60
40
20
S (-) Bupivacaïne
0
10
20
30
40
50
60
Temps (minutes)

Toxicité systémique


PubMed.gov
U.S. National Library of Medicine
National Institutes of Health
Search: PubMed
RSS Save search Advanced search Help
local anesthetic and toxicity
Search
Clear
Search PubMed
Display Settings: Summary, 20 per page, Sorted by Recently Added
Results: 1 to 20 of 5042
1993 TNS
1998 Intralipide
1991 Syndrome de la queue de cheval lidocaïne 5%
2006 Chondrocytes
1985 Myotoxicité
1979 Accidents cardiovasculaires bupivacaïne, étidocaïne
1967 AL et OXPHOS
Nombre d'articles
1000
800
600
400
200
0
AnnÈes
1950
1960
1970
1980
1990
2000
2010

Toxicité des AL

Molécule

Patient

Toxicité locale

Musculaire
Nerveuse
Chondrocyte

Toxicité systémique

Neurologique
Cardiovasculaire

Facteurs extrinsèques

Médicaments
Anesthésie

Facteurs intrinsèques

I. respiratoire, rénale, hépatique
Maladies neurologiques
Grossesse
Chronobiologie
Génétique

Anesthesiology

Volume 99 • Number 6 • December 2003

- EDITORIAL VIEWS : Polley L, et al. Cardiac Arrest following Regional Anesthesia with Ropivacaine - Here We Go!
- Chazalon P, et al. Ropivacaine-induced Cardiac Arrest after Peripheral Nerve Block - Successful Resuscitation.
- Huet O, et al. Cardiac Arrest after Injection of Ropivacaine for Posterior Lumbar Plexus Blockade.

Anesthesiology 2003; 99:1449–51

Ropivacaine-Induced Cardiac Arrest after Peripheral Nerve Block: Successful Resuscitation

Pascal Chazalon, M.D., Jean P. Tourtier, M.D.,* Thierry Villevielle, M.D.,* Didier Giraud, M.D.,* Jean M. Saissy, M.D.,† Georges Mion, M.D.,‡ Dan Benhamou, M.D.§*

Table 1. Previously Reported Cases of Severe Neurologic or Cardiac Adverse Effects Induced by Ropivacaine after Regional Anesthesia

Regional Anesthetic Technique, Reference No.	Dose of Ropivacaine Injected (mg)	Side Effect(s)	Plasma Concentration (mg/l)*	Time (min)	Proposed Mechanism
Epidural anesthesia[10]	20	Convulsions, sinus tachycardia, intraventricular conduction defect	1.4	40	Intravascular injection
Epidural anesthesia[11]	279 mg/5 h (150 mg in 3 bolus last 30 min)	Convulsions	3.5	60	Overdose
Interscalene brachial plexus block[12]	400	Convulsions	2.09	40	Overdose, 6.15 mg/kg
Interscalene brachial plexus block[13]	300	Mental confusion, convulsions, sinus tachycardia, arterial hypertension	6.0, 5.4, 4.6, 4.0	40, 60, 80, 96	Overdose, 6 mg/kg
Brachial plexus block[14]	300	Mental confusion convulsions	2.70	2	Intravascular injection
Brachial plexus block[15]	100	Convulsions	3.3, 1.6, 1.2, 1.0	15, 45, 75, 155	Intravascular injection
Midhumeral brachial plexus block[16]	300	Convulsions	2.27	120	Overdose, 4.28 mg/kg
Midhumeral brachial plexus block[17]	262.5	Mental confusion, convulsions, sinus tachycardia	5.22, 3.79	0, 15	Overdose, 5.36 mg/kg
Sciatic nerve block[8]	225	Convulsions, severe bradycardia, QRS enlargement complex	3.6, 1.6	7, 12	Intravascular injection
Sciatic nerve block + 3-in-1 nerve block[18]	225	Convulsions, sinus tachycardia	3.58	15	Intravascular injection

* Total Ropivacaine plasma concentrations (venous samples).

Major Complications of Regional Anesthesia in France.

The SOS Regional Anesthesia Hotline Service

Table 2. Complications Reported and Their Relation to Regional Anesthesia

	Related	Unrelated*	Unclassified	Total
Cardiac arrest†	11	1	0	12
Respiratory failure‡	7	2	0	9
Seizures§	8	1	0	9
Peripheral neuropathy‖	26	7	6	39
Cauda equina syndrome#	3	1	1	5
Central neurologic event**	0	2	0	2
Meningitis	1	0	0	1
Total	56	14	7	77
Death	4	0	0	4

158 083 ALR

487 Anesthésistes

Incidence:

5/10 000

Auroy et al. *Anesthesiology 2002; 97:1274–80*

Évolution des complications de l'ALR en France entre 1997 et 2002

Type d'ALR	Année	n	Arrêts cardiaques	Convulsions	Neuropathies	SQC
Rachianesthésie	1997	40 640	26 (1,0)	0	19 (4,9)	5 (1,2)
Rachianesthésie	2002	41 079				
Hors obstétrique		35 439	9 (2,4)	1 (0,3)	9 (2,4)	3 (0,8)
Obstétrique		5 640	1 (1,7)	0	2 (3,5)	0
Péridurale	1997	40 640	3 (1,0)	4 (1,3)	5 (1,6)	0
Péridurale	2002					
Hors obstétrique		5 561	0	1 (1,8)	0	0
Obstétrique		29 732	0	2 (0,7)	0	0
ALR Mb Sup + Inf	1997	21 278	3 (1,4)	16 (1,9)	4 (1,9)	-
ALR Mb Sup	2002	23 784	0	3 (1,3)	4 (1,6)	-
ALR Mb Inf	2002	20 162	1 (0,5)	3 (1,5)	8 (3,9)	-

Tableau 1 : Nombre et incidence (pour 10 000 anesthésies) des complications des blocs centraux et périphériques en France en 1997 et 2002.

Clinical Presentation of Local Anesthetic Systemic Toxicity

A Review of Published Cases, 1979 to 2009

Guido Di Gregorio, MD, Joseph M. Neal, MD,† Richard W. Rosenquist, MD,‡ and Guy L. Weinberg, MD§*

93 Patients

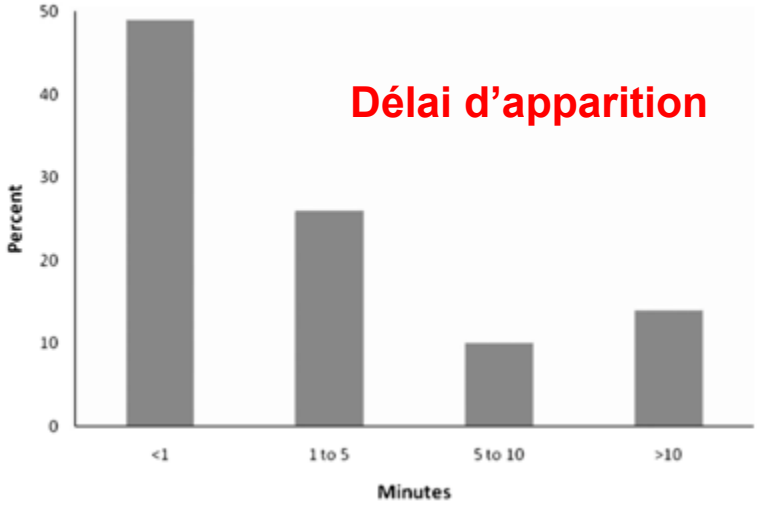
Anesthésie Péridurale 33%

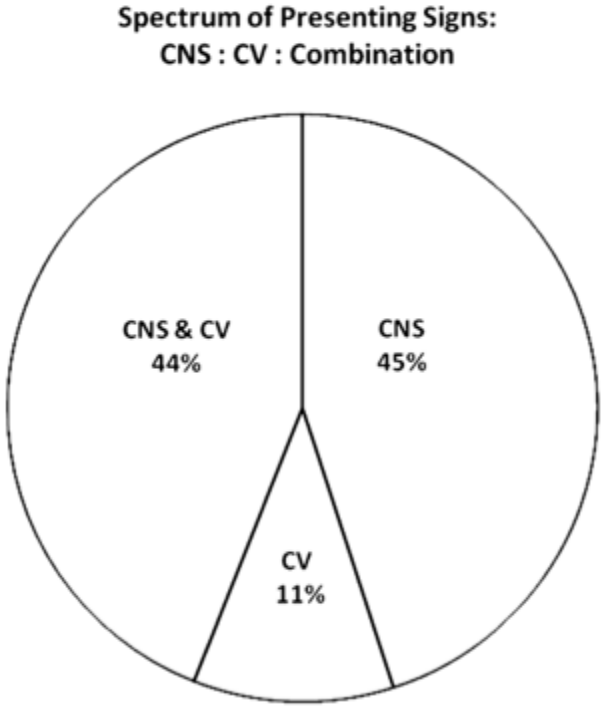
Bloc axillaire 17%

BIS 13%

77 Patients single shot

14 Patients blocs continus





Reg Anesth Pain Med 2010;35: 181-187

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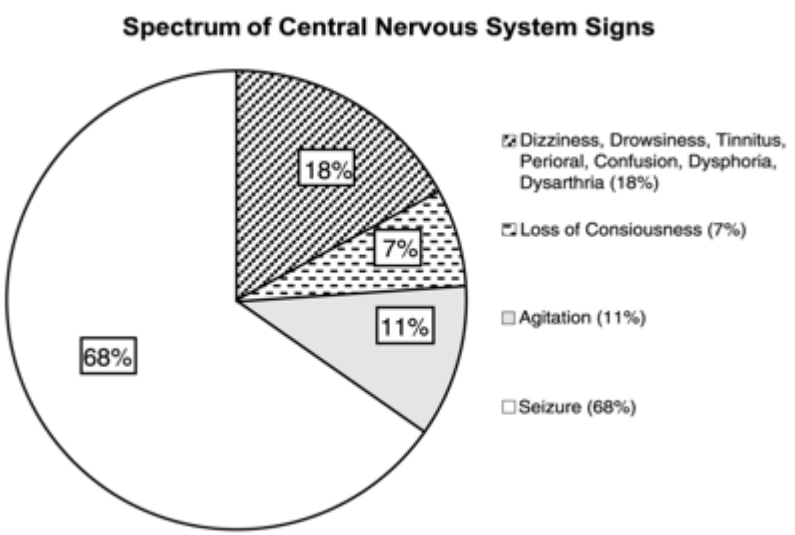
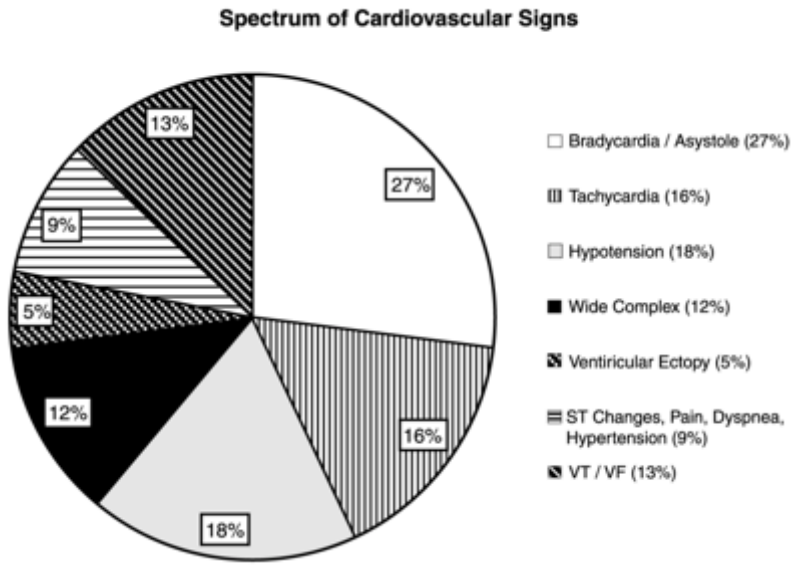
93 Patients



I. The distribution frequencies of all reported signs of CNS toxicity among published cases of LAST.



Reg Anesth Pain Med 2010;35: 181-187

Signes cliniques neurologiques (SNC)

- Rechercher les 1ers signes de l'intoxication
  - Subjectifs
    - paresthésies des lèvres
    - étourdissement
    - bourdonnement
    - diplopie
    - somnolence
  - Objectifs
    - frissons
    - trémulations
    - nystagmus
    - gêne à la parole
- Convulsions généralisées
- Coma

Concentrations croissantes d'AL

Artériel libre

Ropivacaine~0,6 mg/l

Bupivacaine ~ 0,3 mg/

Artériel total

Ropi ~ 4 mg/ml

Bupi ~ 4mg/ml

Knudsen et al. *Br J Anaesth 1997, 78 : 507-14*

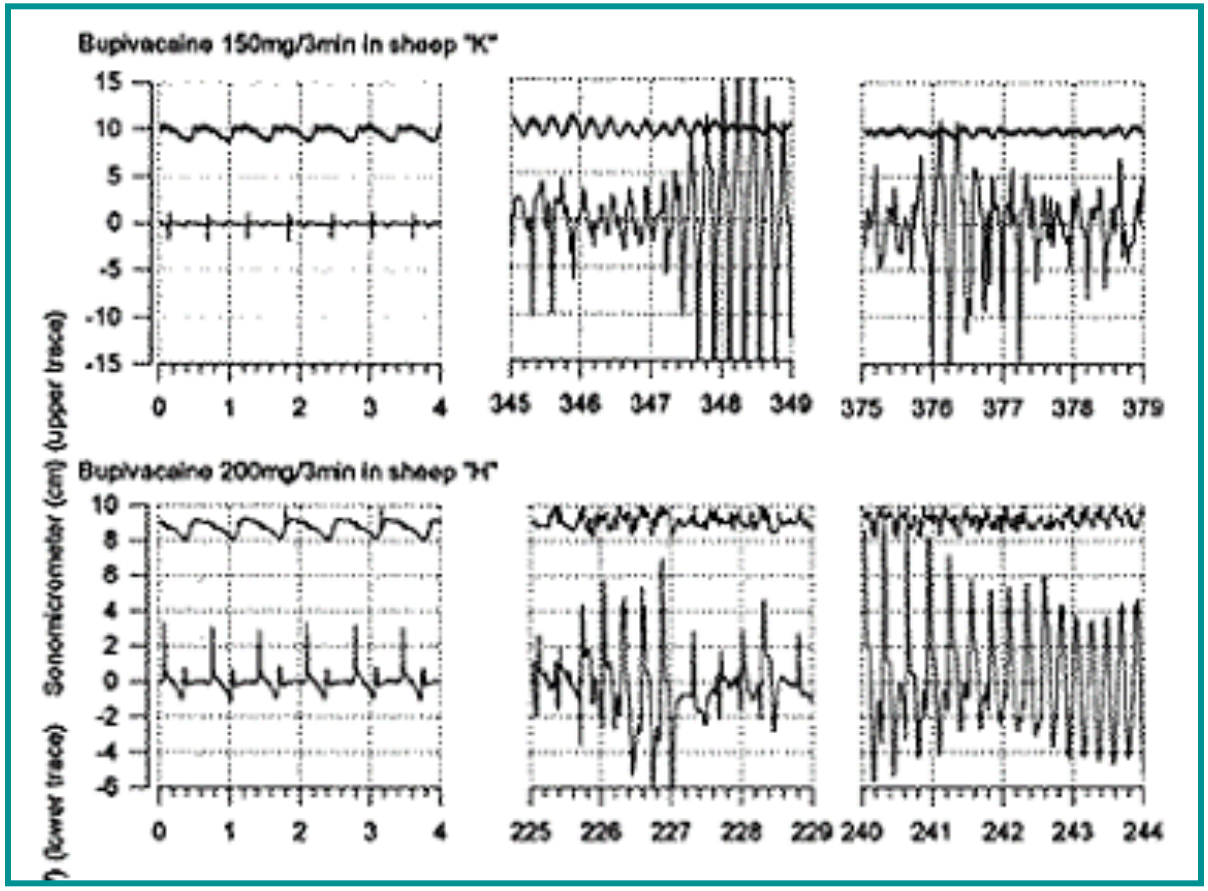
TOXICITE SYSTEMIQUE: le cœur

- Cardiologues
  - Anti-arythmiques de classe Ib
- Anesthésistes
  - Toxicité (Albright)

Effets majeurs

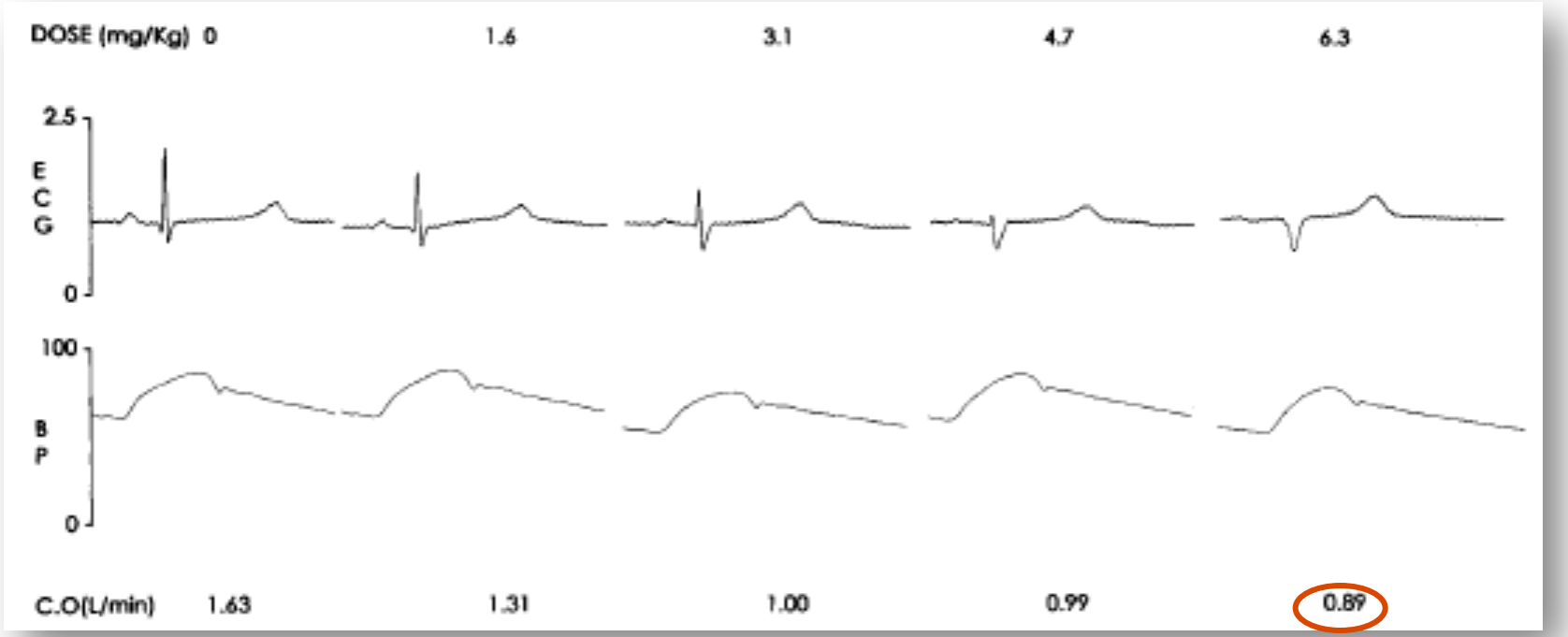
- Sur la conduction (bloc du canal sodique cardiaque)
  - Ralentissement de la conduction ventriculaire.
  - Le bloc augmente quand la fréquence augmente (*use dependence*).
- Contractilité (action mitochondriale)
  - Effet à des concentrations supérieures

Exemple d'ECG et d'arythmie ventriculaire après bupivacaïne IV



Anesth Analg 1998;86:797-804

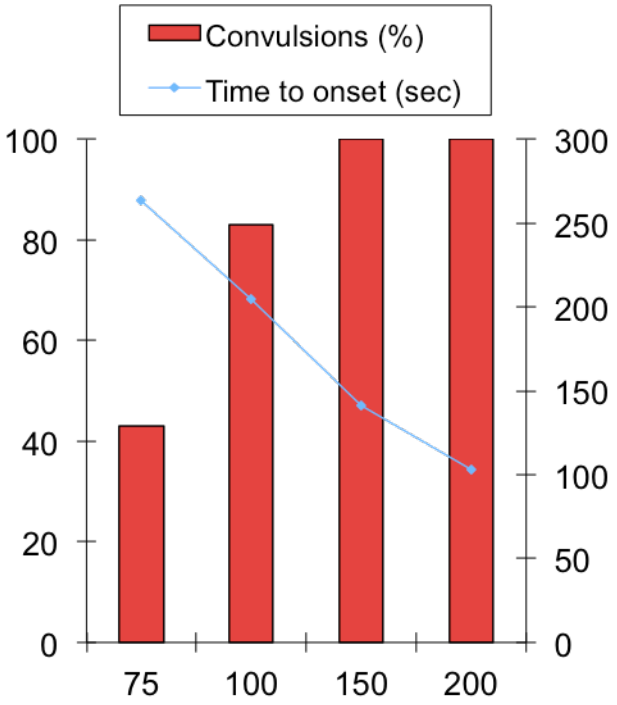
Effets cardiodépresseurs de la bupivacaine



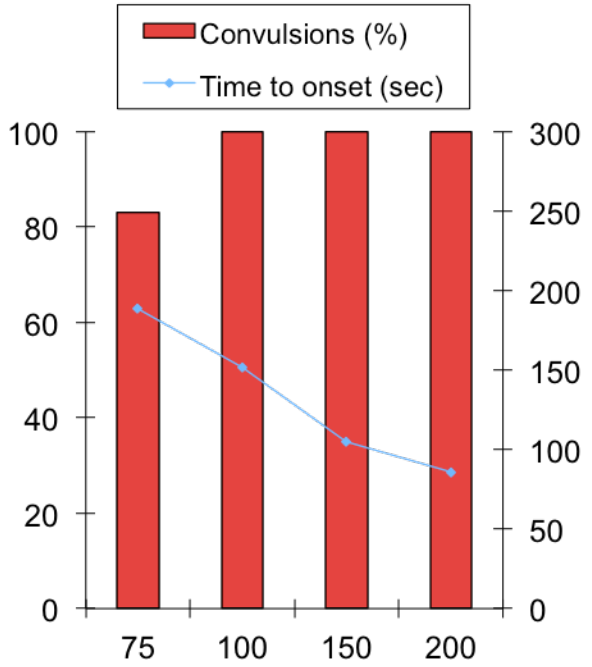
Nystrom et al. *Anesth Analg 1999; 88: 1143-8*

CV and CNS effects of IV levobupivacaine and bupivacaine in conscious sheep

Huang YF et al, Anesth Analg 1998;86:797-804



Dose of L-Bupi (mg)

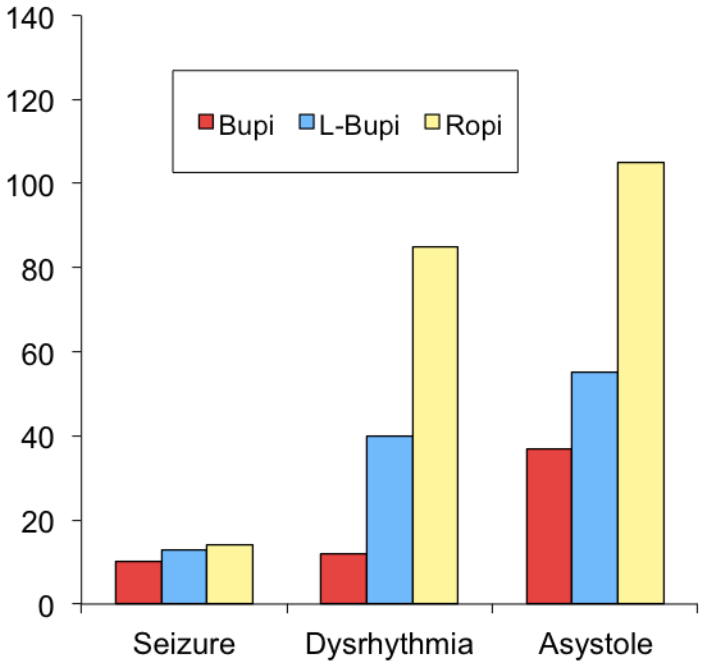


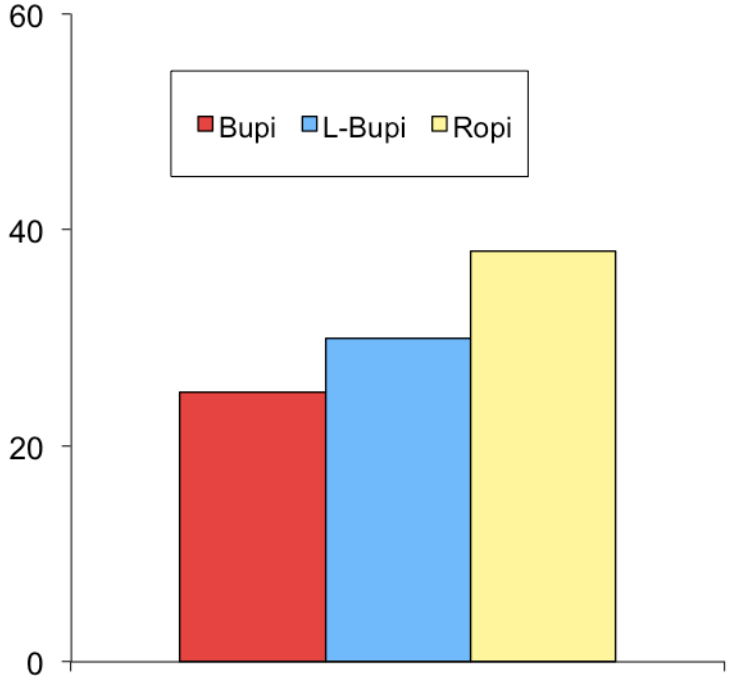
Dose of Bupi (mg)

Systemic toxicity and resuscitation in bupivacaine-, levobupivacaine- or ropivacaine infused anesthetized rats

Ohmura S et al, Anesth Analg 2001;93:743-8

Cumulative dose (mg)

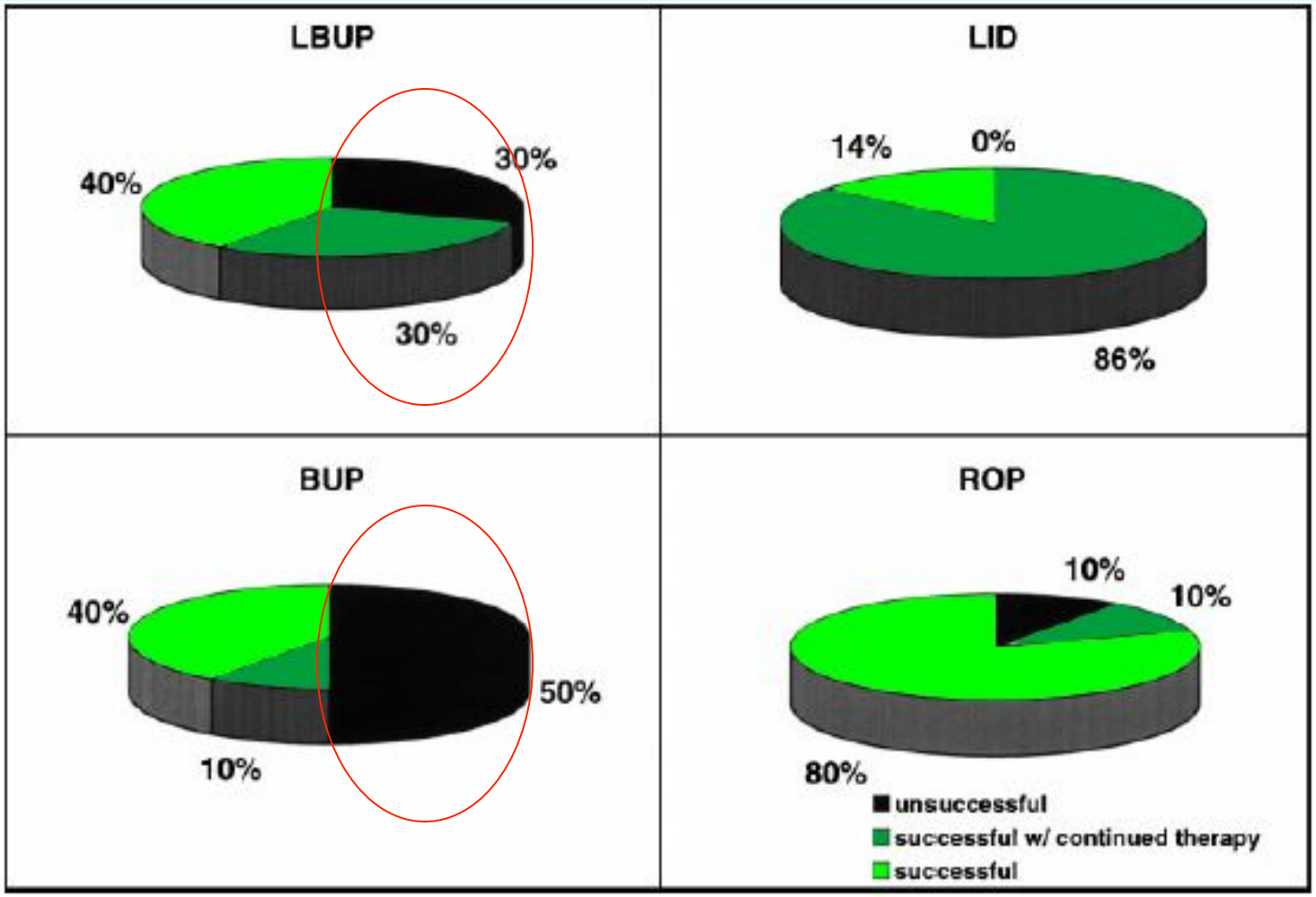




Plasma concentration at resuscitation (mg/L)

COMPARISON ROPIVACAINE, LÉVOBUPIVACAINE, BUPIVACAINE and LIDOCAINE

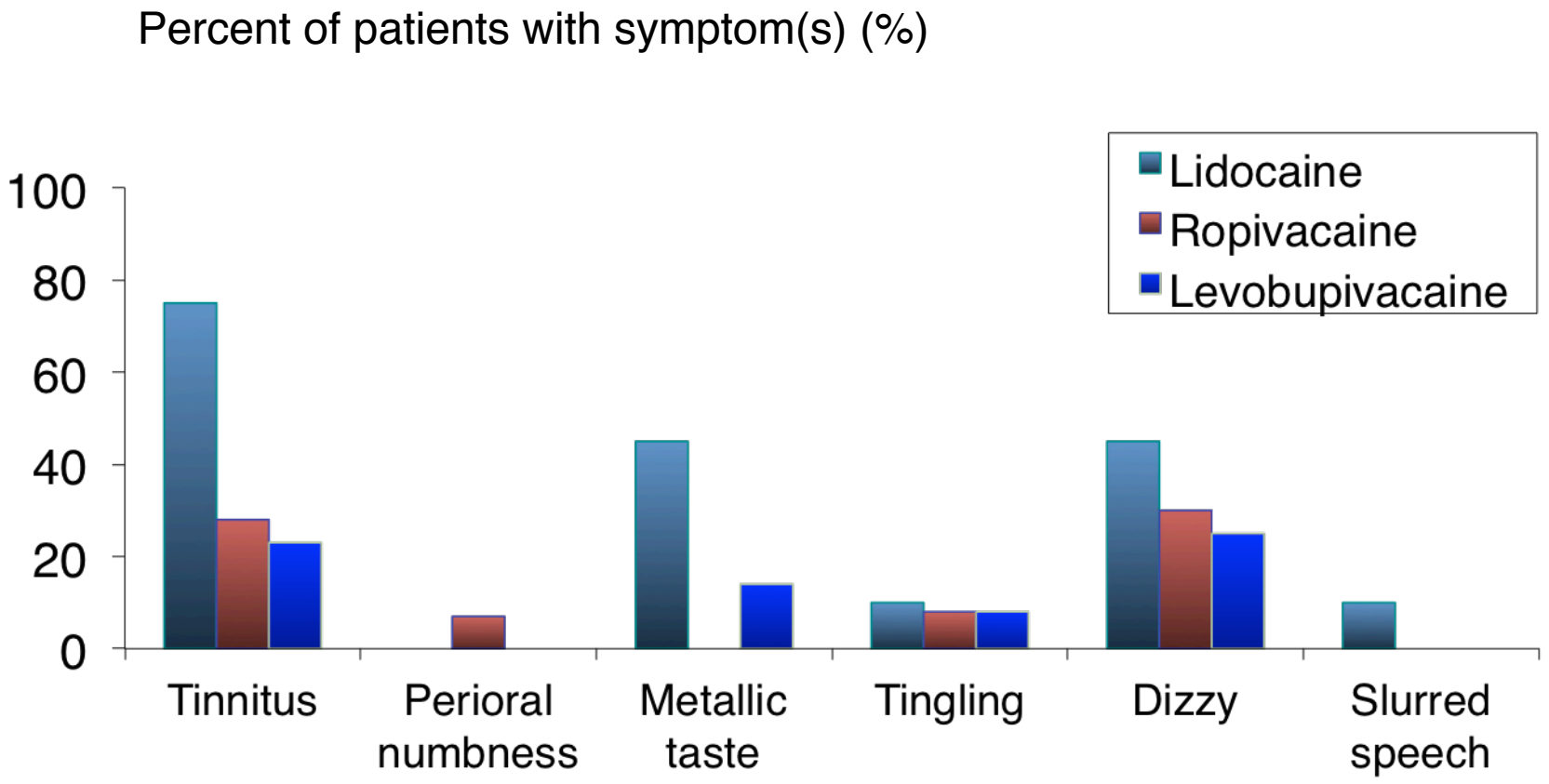
Acute toxicity and resuscitation (anesthetised dog)



Groban et al. Anesth Analg 2001

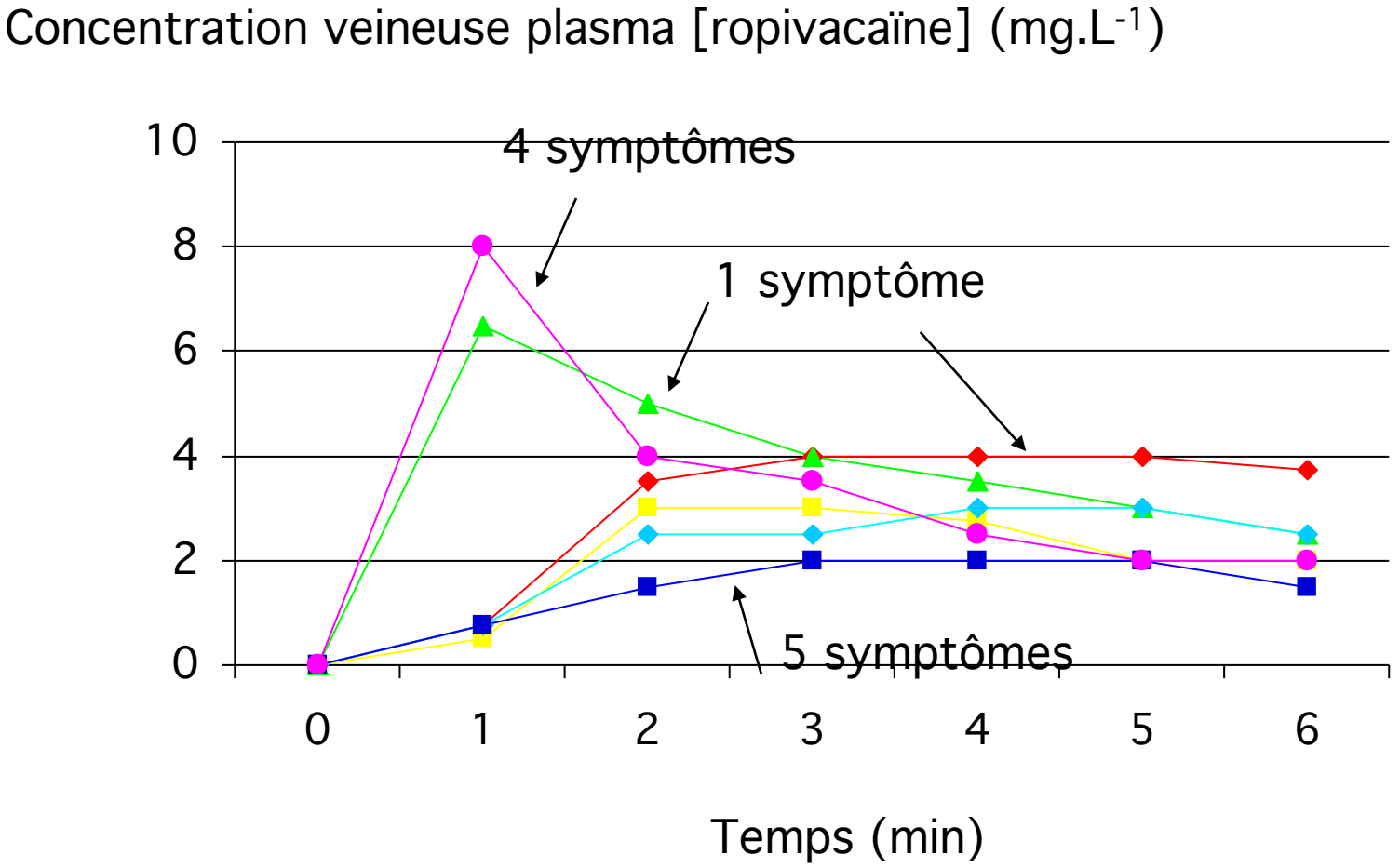
Can ropivacaine and levobupivacaine be used as a test dose during regional anesthesia?

Owen MD et al, Anesthesiology 2004



IV ropivacaine bolus is a reliable marker of IV injection in premedicated healthy volunteers

McCartney CJL et al, Can J Anesth 2003;50:795-800



CARDIOTOXICITE

Etudes animales en résumé …

- Dose cumulative pour une symptomatologie identique :

  Ropi > L-bupi > Bupi

- Concentration plasmatique lors de l'arrêt circulatoire ou au moment de la récupération au cours de la réanimation :

  Ropi > L-bupi ≈ Bupi

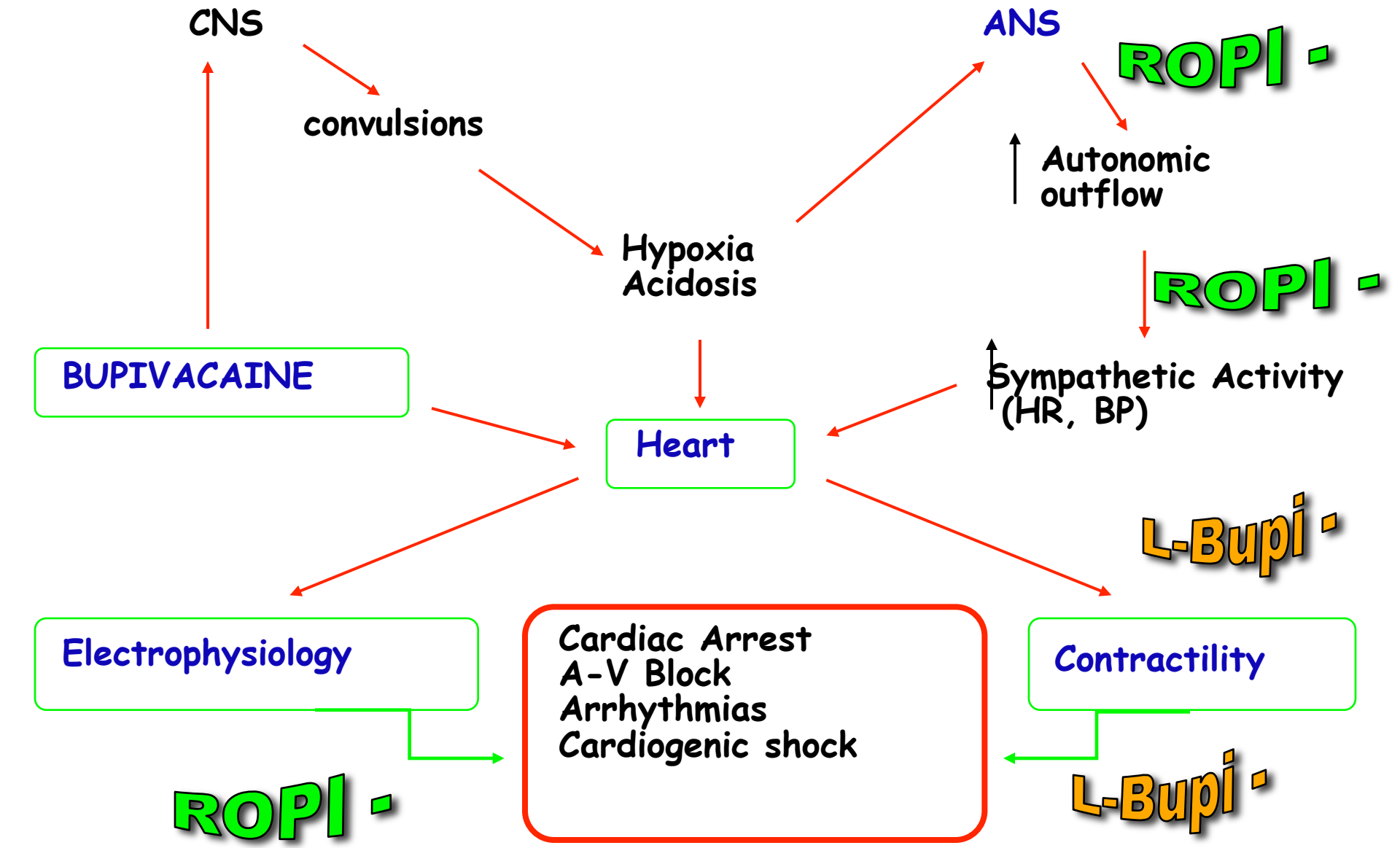
- Fréquence des dysrythmies induites par l'adré :

  Bupi > L-bupi > Ropi

- Taux de succès de la réanimation après intoxication :

  Ropi > L-bupi > Bupi

EFFETS CARDIAQUES DES A.L.
En conclusion ...



Echographie: Evite les complications?

Complications	Neurostimulation (n=2507)	US guidage (n=5141)	P
Toxicité locale	1,2 (0,25-3,5)	0,8 (0,2-2)	Ns
Ponction **vasculaire** accidentelle	13,9 (8,2-21-9)	5,1 (3-8,1)	P=0,001
Paresthésie accidentelle	10,8 (5,9-18,1)	20,5 (15,9-25,9)	Ns
Déficit neurologique retardé	0,8(0,1-2,9)	0,2(0,005-1,1)	Ns
Déficit neurologique **prolongé**	0,4 (0,01-2,2)	0,2(0,05-1,1)	Ns

Reg Anesth Pain Med 2009;34: 534-541

British Journal of Anaesthesia **102 (3):** 408–17 (2009)
doi:10.1093/bja/aen384 Advance Access publication January 26, 2009

BJA

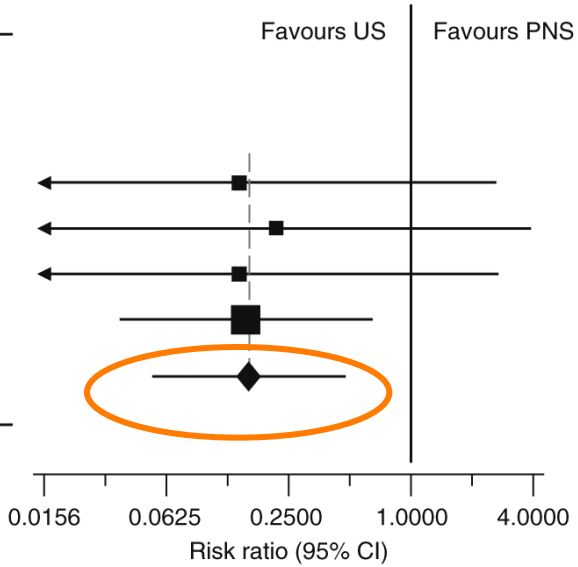
REGIONAL ANAESTHESIA

Ultrasound guidance compared with electrical neurostimulation for peripheral nerve block: a systematic review and meta-analysis of randomized controlled trials

M. S. Abrahams*, M. F. Aziz, R. F. Fu and J.-L. Horn

Complications
Incidence des ponctions vasculaires accidentelles: US/NS

	US group: number of punctures/ total number	PNS group: number of punctures/ total number	Risk ratio (95% CI)	% Weight
Marhofer, 1997	0/20	3/20	0.14 (0.008, 2.60)	15.2
Marhofer, 1998	0/20	4/40	0.22 (0.012, 3.84)	13.2
Liu, 2005	0/30	3/30	0.14 (0.008, 2.65)	15.2
Sauter, 2008	2/40	13/40	0.15 (0.037, 0.64)	56.4
All studies combined (test of heterogeneity: Q=0.06, I^2=0% ; df=3, P=0.996)			**0.16 (0.05, 0.47)**	



ORIGINAL ARTICLE

Incidence of Local Anesthetic Systemic Toxicity and Postoperative Neurologic Symptoms Associated With 12,668 Ultrasound-Guided Nerve Blocks

An Analysis From a Prospective Clinical Registry

Brian Daniel Sites, MD, Andreas H. Taenzer, MS, MD, Michael D. Herrick, MD, Constance Gilloon, MD, John Antonakakis, MD, Janeen Richins, MD, and Michael L. Beach, MD, PhD

The incidence of LAST was very low, at 0.08 per 1000,

Ultrasound Guidance Reduces the Risk of Local Anesthetic Systemic Toxicity Following Peripheral Nerve Blockade

Michael J. Barrington, PhD, MBBS, FANZCA and Roman Kluger, MBBS, FANZCA, PGDipBiostat

TABLE 1. Univariate Analysis of Potential Risk Factors for Local Anesthetic Systemic Toxicity

Categorical Variables		n (%)*	No. LAST Events	OR†	95% CI	*P*
Ultrasound	Yes	20,401 (81)	12	0.28	0.12–0.65	0.003
	No	4745 (19)	10	1.0		
	Total	25,146				
PNB category	Upper	7434 (29)	13	7.19	2.05–25.2	0.002
	Paravertebral	1657 (7)	6	14.9	3.73–59.7	<0.0005
	Lower limb	12,316 (49)	3	1.0		
	Trunk	3914 (15)	0			
	Total	25,321				
LA type	Ropivacaine	21,918 (87)	16	1.0		
	Lidocaine	1799 (7)	6	4.58	1.79–11.7	0.001
	Bupivacaine	982 (4)	0			
	L-Bupivacaine	453 (2)	0			
	Other	4 (0)	0			
	Total	25,156				

Adverse Outcomes Associated With Nerve Stimulator–Guided and Ultrasound-Guided Peripheral Nerve Blocks by Supervised Trainees

Update of a Single-Site Database

Steven L. Orebaugh, MD, Michael L. Kentor, MD, and Brian A. Williams, MD, MBA

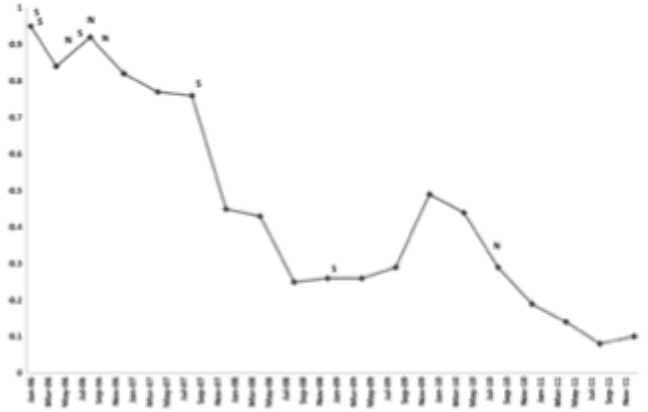


TABLE 4. Frequency and Techniques of Peripheral Nerve Blocks With Complications, January 2006 to December 2011

	ISB	AxB	Fem	Sci	PFB	Total	Nerve Injury 6–12 mo: n (95% CI)	Nerve Injury >12 mo: n (95% CI)	Seizure: n (95% CI)
LM-PNS	1764	183	1854	1113	522	5436	4 (0.3–1.9)	3 (0.2–1.6)	6 (0.5–2.4)
US-PNS	4903	977	1537	1129	523	9069	1 (0.03–0.6)	0 (0.003–0.41)	0 (0.003–0.41)
Total	6667	1160	3391	2242	1045	14505	$P = 0.13$	$P = 0.10$	$P = 0.006$

95% CI indicates the 95% confidence interval, expressed per 1000 blocks; ISB, interscalene block, AxB, axillary brachial plexus block; Fem, femoral nerve block; n, the number of complications in each category; Sci, transgluteal or infragluteal sciatic nerve block; PFB, popliteal-sciatic nerve block.

Anesthesiology 2006; 105:217–8

Successful Use of a 20% Lipid Emulsion to Resuscitate a Patient after a Presumed Bupivacaine-related Cardiac Arrest

Meg A. Rosenblatt, M.D., Mark Abel, M.D.,† Gregory W. Fischer, M.D.,† Chad J. Itzkovich, M.D.,‡ James B. Eisenkraft, M.D.§*

After 20 min, at which time plans were being made to institute cardiopulmonary bypass, the administration of a lipid emulsion was suggested, and 100 ml of 20% Intralipid (for Baxter Pharmaceuticals by Fresenius Kabi, Uppsala, Sweden) was given through the peripheral intravenous catheter. Cardiac compressions continued, and a defibrillation shock at 360 J was given. Within seconds, a single sinus beat appeared on the electrocardiogram, and 1 mg atropine and 1 mg epinephrine were administered. Within 15 s, while external chest compressions were continued, the cardiac rhythm returned to sinus at a rate of 90 beats/min. The blood pressure and pulse became detectable. An infusion of lipid emulsion was started and continued at 0.5 ml $\cdot$ kg^{-1} $\cdot$ min^{-1} over the following 2 h and then discontinued. The

This article is accompanied by an Editorial View. Please see: Weinberg G: Lipid infusion resuscitation for local anesthetic toxicity: Proof of clinical efficacy. ANESTHESIOLOGY 2006; 105:7–8.

implantable cardiac defibrillator was inserted without any complications, and the patient was discharged home.

Fiches Urgences

Mon espace Professionnel

Actualités

Outils professionnels

- Fiches Urgences
- Fiches Patients
- Contexte professionnel
- Informations aux patients
- Scores

Documentation

- Questions Fréquentes
- Conférence d'actualisation
- Alertes Sanitaires
- Santé publique
- Textes règlementaires
- Articles Commentés

Référentiels

SFAR Académie

Enquêtes SFAR

Hyperthermie

Arrêt cardiaque

Choc anaphylactique

Toxicité aux AL

Réactualisation des propositions du GIHP

pour la gestion périopératoire des patients sous AOD pour un acte programmé

ADMINISTRATION D'UNE EMULSION LIPIDIQUES A 20%

- La solution la plus utilisée dans les cas cliniques rapportés dans la littérature est l'INTRALIPIDES® 20%. La solution MEDIALIPIDES® 20% a également été rapportée efficace. L'efficacité d'autres solutions lipidiques n'a pas été rapportée.
- DOSE INITIALE :
    - **La dose d'INTRALIPIDES® 20% : 3 ml.kg^{-1} en bolus**
    - La dose de MEDIALIPIDES® 20% doit être supérieure (6 à 9 ml.kg^{-1})
- DOSES D'ENTRETION
    - Une perfusion continue d'entretien n'est pas indispensable
    - Dans quelques cas cliniques, le reste de la poche d'émulsion lipidique était perfusé

SURVEILLANCE DU PATIENT

- Il est possible de prélever du sang périphérique pour le dosage sanguin de(s) l'anesthésique(s) local(ux).
- Une **SURVEILLANCE DU RYTHME CARDIAQUE ET DE L'HEMODYNAMIQUE** du patient est **IMPERATIVE** (risque de récidive du trouble du rythme cardiaque important):
    - La durée de surveillance dépend de l'anesthésique local responsable de la toxicité
    - Un minimum de 6 HEURES DE SURVEILLANCE rythmique est recommandé

IL EST FORTEMENT RECOMMANDE DE DISPOSER D'AU MOINS UNE POCHE DE 500 ML D'UNE EMULSION LIPIDIQUE DANS LE BLOC OPERATOIRE OU SONT PRATIQUEES LES TECHNIQUES D'ANESTHESIE LOCOREGIONALE.

American Society of Regional Anesthesia and Pain Medicine

Practice Advisory on Treatment of Local Anesthetic Systemic Toxicity

For Patients Experiencing Signs or Symptoms of Local Anesthetic Systemic Toxicity (LAST)

Checklist for Treatment of Local Anesthetic Systemic Toxicity

The Pharmacologic Treatment of Local Anesthetic Systemic Toxicity (LAST) is Different from Other Cardiac Arrest Scenarios

- ❑ **Get Help**
- ❑ **Initial Focus**
  - ❑ **Airway management:** ventilate with 100% oxygen
  - ❑ **Seizures uppression:** benzodiazepines are preferred; **AVOID propofol** in patients having signs of cardiovascular instability
  - ❑ **Alert** the nearest facility having **cardiopulmonary bypass** capability
- ❑ **Management of Cardiac Arrhythmias**
  - ❑ **Basic and Advanced Cardiac Life Support (ACLS)** will require adjustment of medications and perhaps prolonged effort
  - ❑ **AVOID vasopressin, calcium channel blockers, beta blockers, or local anesthetic**
  - ❑ **REDUCE individual epinephrine doses to <1 mcg/kg**
- ❑ **Lipid Emulsion (20%) Therapy** (values in parenthesis are for 70kg patient)
  - ❑ **Bolus 1.5 mL/kg** (lean body mass) intravenously over 1 minute (~100mL)
  - ❑ **Continuous infusion 0.25 mL/kg/min** (~18 mL/min; adjust by roller clamp)
  - ❑ Repeat bolus once or twice for persistent cardiovascular collapse
  - ❑ Double the infusion rate to 0.5 mL/kg/min if blood pressure remains low
  - ❑ **Continue infusion** for at least10 minutes after attaining circulatory stability
  - ❑ Recommended upper limit: Approximately 10 mL/kg lipid emulsion over the first 30 minutes
- ❑ **Post LAST events at** www.lipidrescue.org and report use of lipid to www.lipidregistry.org

Protoc

PARAMETRES	Traitement par ELI (Intralipid® 20%) publié sur le site de la SFAR [45]	Traitement par ELI (Intralipid® 20%) publié sur le site de l'ASRA [4]
DOSE INITIALE	Bolus initial de 3 ml/kg IV	Bolus initial de 1,5 ml/kg IV en 1 minute
PERFUSION CONTINUE	Une perfusion continue d'entretien n'est pas indispensable	Perfusion continue de 0,25 ml/kg/min, possible jusqu'à 0,5 ml/kg/min en cas de collapsus
REPETITION DU BOLUS	-	Répéter le bolus une ou deux fois en cas de collapsus cardiovasculaire persistant
DURÉE	-	Perfusion continue au moins 10 min après le retour à un équilibre hémodynamique satisfaisant
DOSE MAXIMALE	-	Eviter de dépasser la dose maximale de 10ml/kg au cours des 30 premières minutes
DURÉE DE SURVEILLANCE	Un minimum de 6 heures de surveillance rythmique est recommandé	Surveillance prolongée supérieure à 12 heures, justifiée par un risque de récidive à l'arrêt de l'ELI

LipidRescue™ Resuscitation

... for drug toxicity

Click Here If You Need Help Right Now

Welcome
Background
Treatment Overview
Instructions (PDFs)
Introducing LipidRescue to Your Facility
Medical Literature
⊞ Local Anesthetic Toxicity
Post Your Cases
Sample LipidRescue™ Kit
LipidRescue™ Experiments (Videos)
Weinberg Bio Registry Proposal
Ask Us

An important request for all LipidRescuers

Post Your Cases

Please tell us about your clinical experiences with LipidRescue. Though this site was originally intended as a forum for local anesthetic toxicity, the focus has broadened to include all examples of drug-induced or toxin-related cardiac toxicity. If you've had such a case -whether or not lipid was used - we would like to hear from you and open it up for discussion. ALSO NOTE: WE ARE ALSO INTERESTED IN HEARING ABOUT FAILED RESUSCITATIONS WHETHER INVOLVING LIPID OR NOT. Please click on the "CreateNew Post" button to give us the details; however, be mindful of HIPAA regulations and make certain all aspects of the case are appropriately de-identified with respect to the patient and the institution. Thanks

Topic	Replies	Updated
LA allergy and ?LA toxicity by J Kua	0	August 12, 2013

Just Published.....

A Comprehensive Review of Lipid Resuscitation

Les recommandations des sociétés savantes

- **2003: Recommandations pour la Pratique Clinique**

  " Les blocs périphériques des membres chez l'adulte "

- **2010 SFAR Echographie et ALR**

Reg Anesth Pain Med 2008;33:404-415.

▽ ASRA Practice Advisory on Neurologic Complications

ASRA Practice Advisory on Neurologic Complications in Regional Anesthesia and Pain Medicine

Il est probablement recommandé de réaliser un bloc échoguidé chez un patient éveillé, calme et coopérant.

Toutefois, dans des situations où le rapport bénéfices-risques est favorable et justifié, il est possible de réaliser un bloc chez un patient sous anesthésie (générale ou régionale) ou sédation.

Dans ce cas, l'échoguidage apporte probablement une sécurité supplémentaire

Local Anesthetic-Induced Cardiac Toxicity: A Survey of Contemporary Practice Strategies Among Academic Anesthesiology Departments

- Les stratégies mises en route en cas d'arrêt cardio-respiratoire :

  - Intérêt d'un massage cardio-respiratoire prolongé (>45 min) ;

  - Médicaments d'urgence stockés dans un lieu identifié et rapidement accessibles (<10 min) dans la majorité des cas ;

VITE!!!

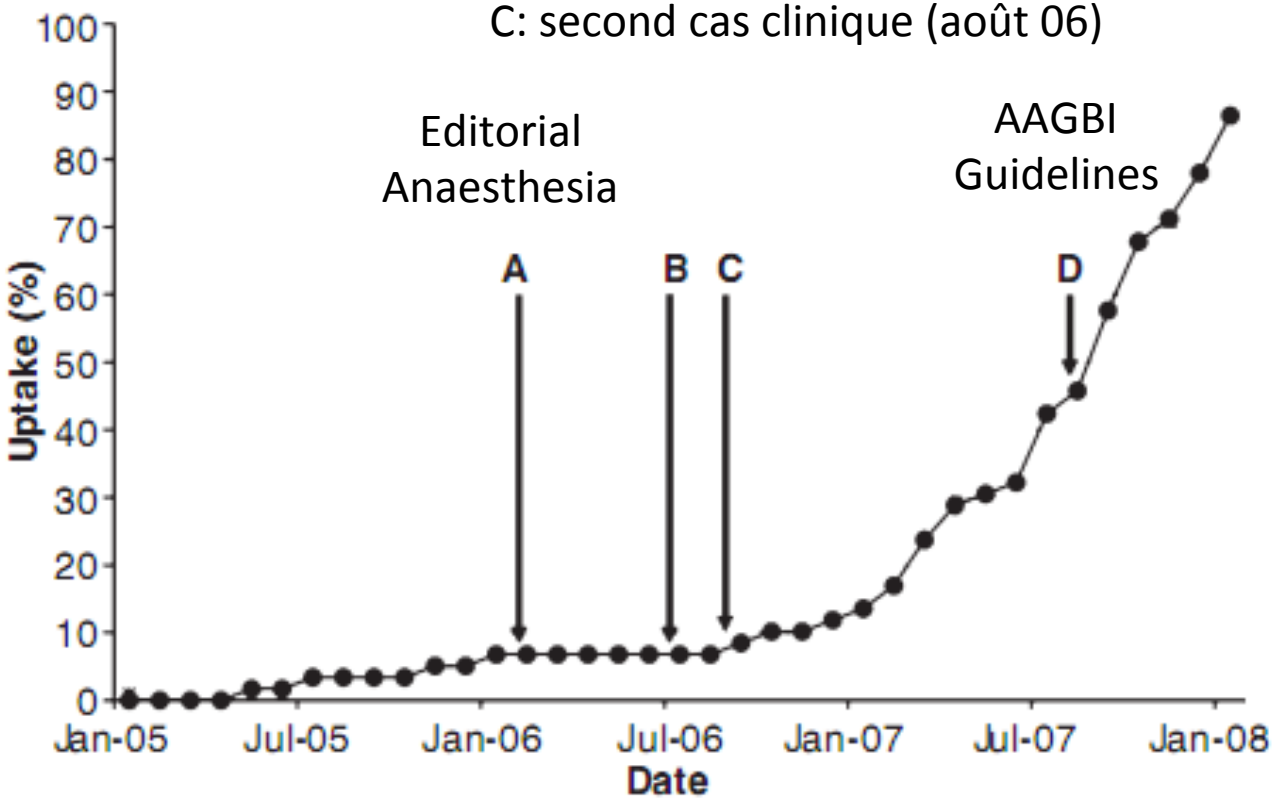
  - En cas de toxicité liée à la bupivacaïne, les centres « haut volume » paraissent plus convaincus de l'intérêt des émulsions lipidiques et peuvent en disposer rapidement ;

  - En cas d'échec de la réanimation pharmacologique, 59% des médecins ayant répondu n'ont pas de protocole établi pour la mise en place d'un support cardio-pulmonaire mécanique (CEC, ballon de contre-pulsion intra-aortique ou ECMO), ce tout centre confondu.

Corcoran Anesth Analg 2006;103:1322-26

« Lipid Rescue » therapy: Adoption d'un kit dans les endroits sensibles

B: premier cas clinique (juillet 06)
C: second cas clinique (août 06)



Picard J et al. Anaesthesia 2009

Lipid Emulsion Infusion

Resuscitation for Local Anesthetic and Other Drug Overdose

Guy L. Weinberg, M.D.*

Anesthesiology 2012; 117:180–7

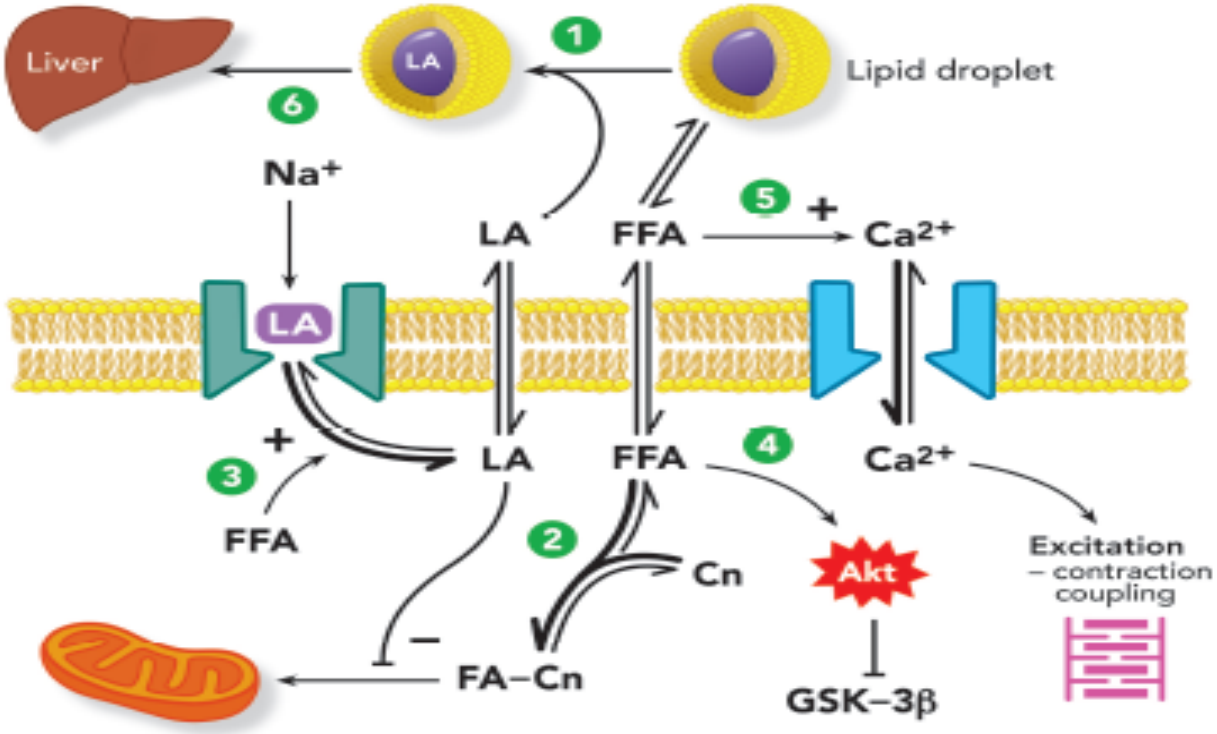


Fig. 1. Proposed mechanisms of lipid resuscitation. After infusion, the lipid emulsion exists in the blood as emulsified oil droplets or multilamellar vesicles. (1) Capture of local anesthetic (lipid sink); (2) Increased fatty acid uptake by mitochondria (metabolic effect); (3) Inteference with local anesthetic binding of sodium channels (membrane effect); (4) Activation of Akt cascade leading to inhibition of GSK-3β (cytoprotection); (5) Promotion of calcium entry *via* voltage-dependent calcium channels (ionotropic/inotropic; can also involve mitochondrial calcium dynamics); (6) Accelerated shunting (pharmacokinetic effects). Akt = a serine/threonine protein kinase important in cell survival, proliferation, and migration, also called protein kinase B; Ca^{2+} = calcium ion; Cn = carnitine; FA-Cn: fatty acyl carnitine; FFA = free fatty acids; GSK-3β = glycogen synthase kinase (phophorylates and thereby inhibits glycogen synthase; inhibition of GSK-3β has been implicated in preventing myocardial ischemia–reperfusion injury); LA = local anesthetic; Na^+ = sodium ion.

Intravenous lipid emulsion and local anesthetic-induced systemic toxicity: Mechanisms and limits

K. Nouette-Gaulain [a,b,*], X. Capdevila [c,d], F. Robin [a], H. Beloeil [d]

Annales Françaises d'Anesthésie et de Réanimation 33 (2014) 411–417

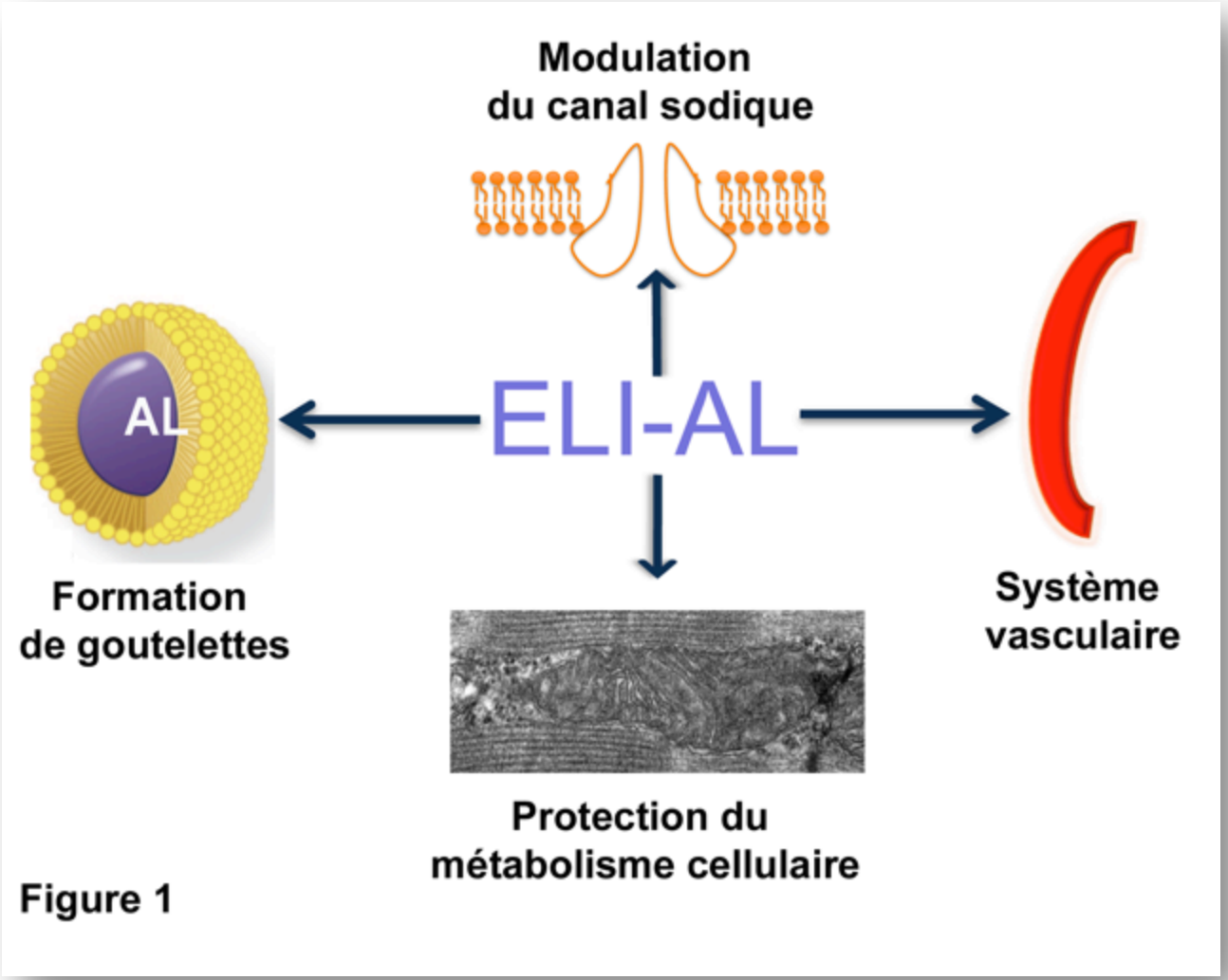


Figure 1

La théorie du « Lipid Sink »

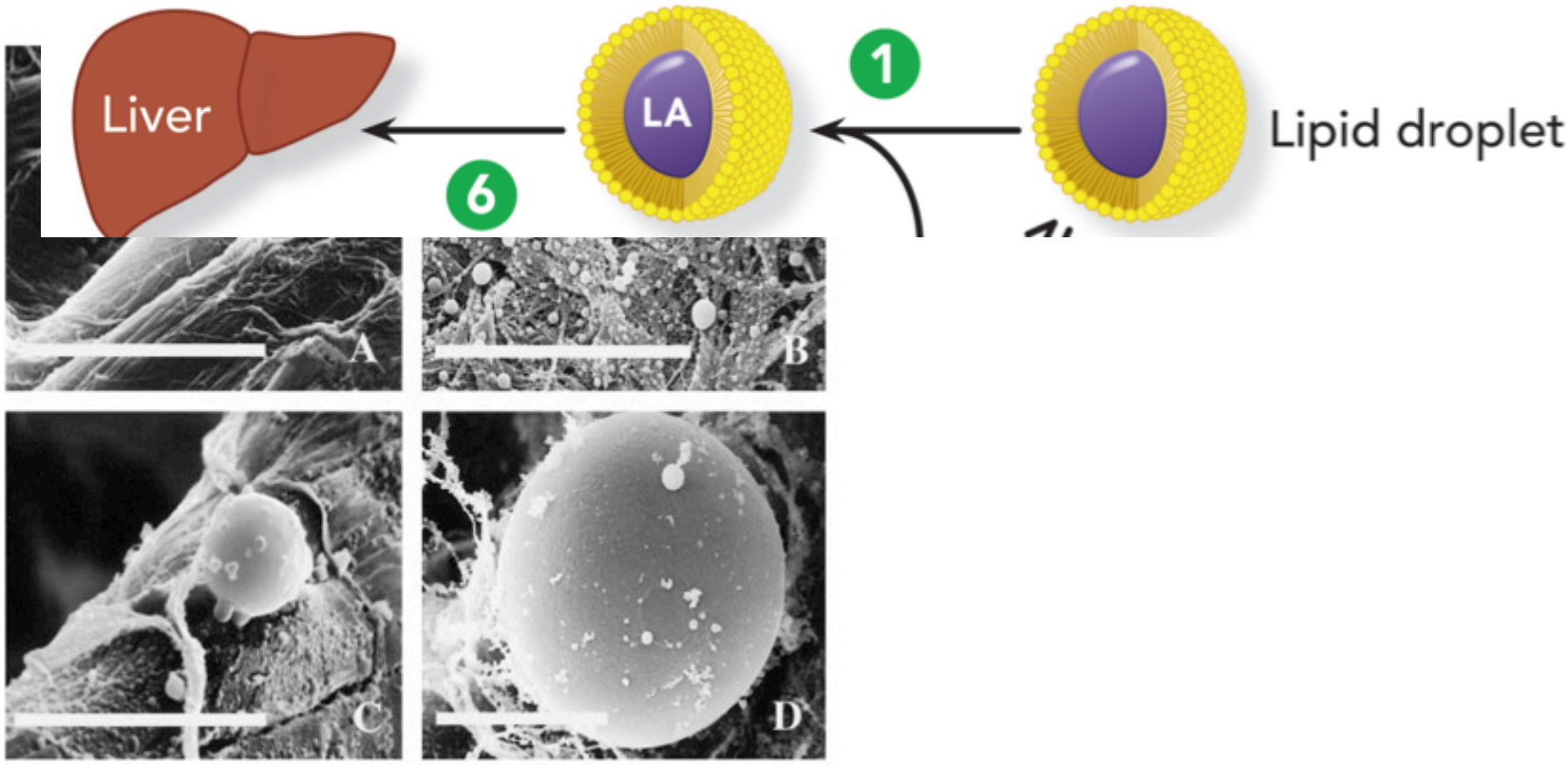
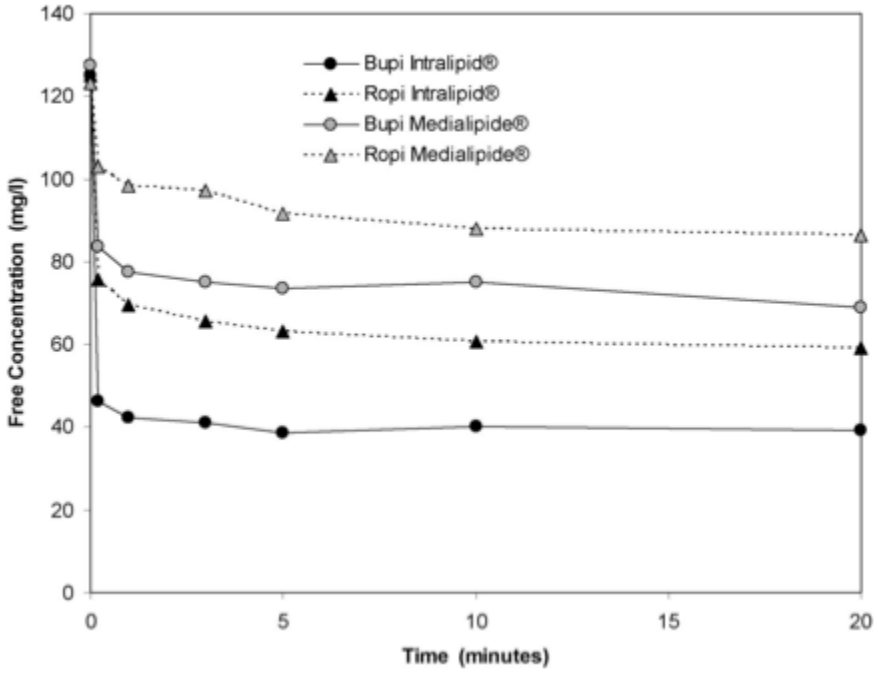


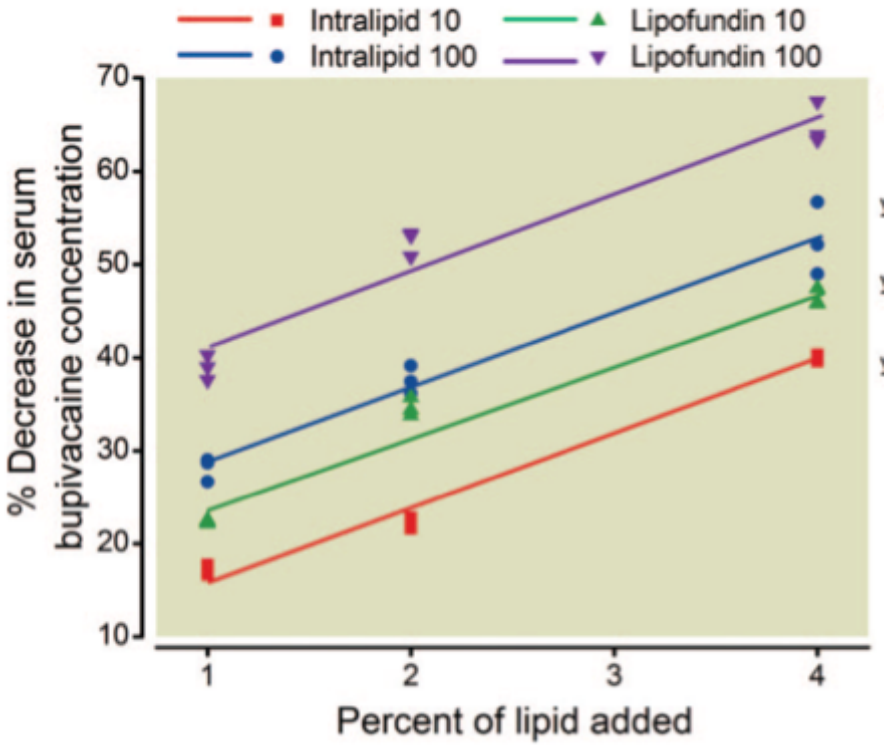
Figure 2. Scanning electron microscopy (SEM) micrographs of control background (panel A, 7500×), 1% propofol alone (panel B, 7500×), and oil droplets at 30 min (panel C, 7500×) and 24 h (panel D, 5000×) after the addition of lidocaine 40 mg to 20 mL of 1% propofol. The white line in each figure indicates 10 μm.

Masaki Y, Anesth Analg 2003; 97:1646–51

Quels Triglycérides:

Chaînes longues exclusives ou associées aux chaînes intermédiaires?



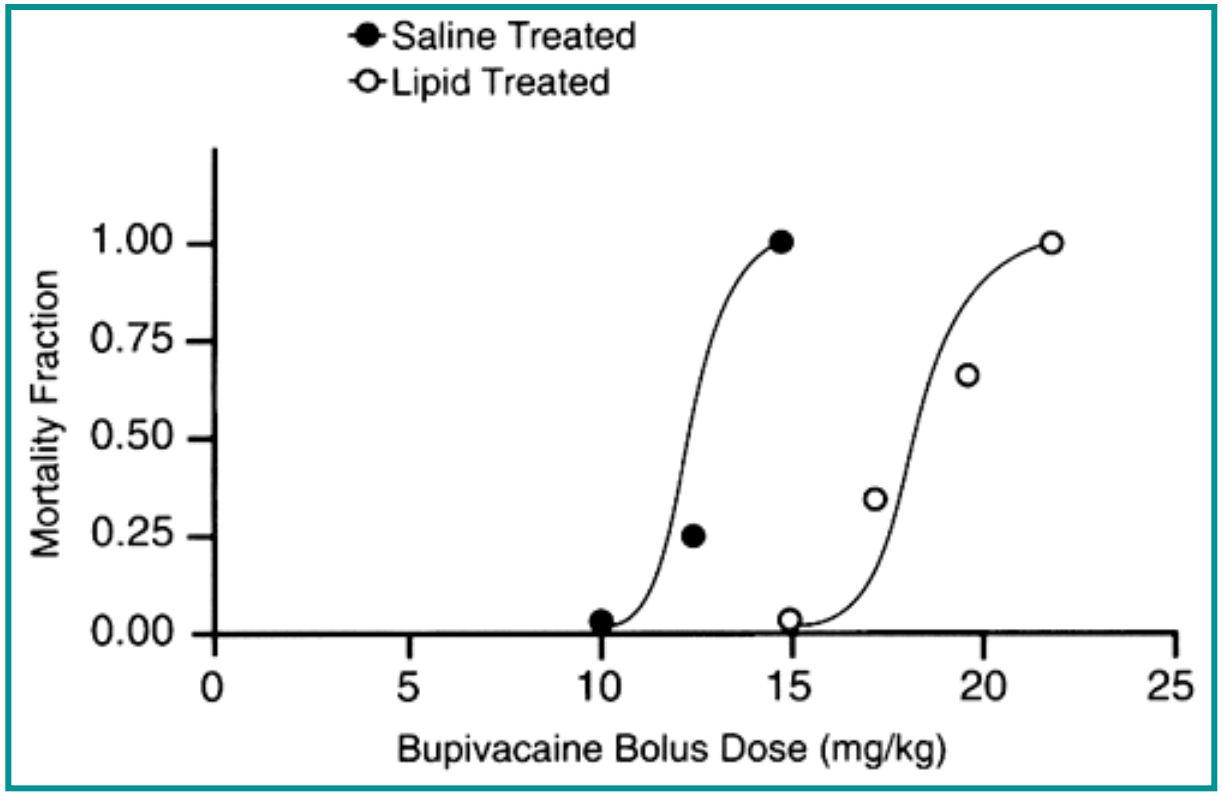


Mazoit JX, Anesthesiology 2009; 110:380–6

Ruan W, Anesthesiology 2012; 116:334–9

Pretreatment or Resuscitation with a Lipid Infusion shifts the Dose-Response to Bupivacaîne-induced Asystole in Rats

Dose Toxique d'AL plus élevée dans le groupe Intralipid



Rats : AG avec Isoflurane

IV de Bupivacaïne

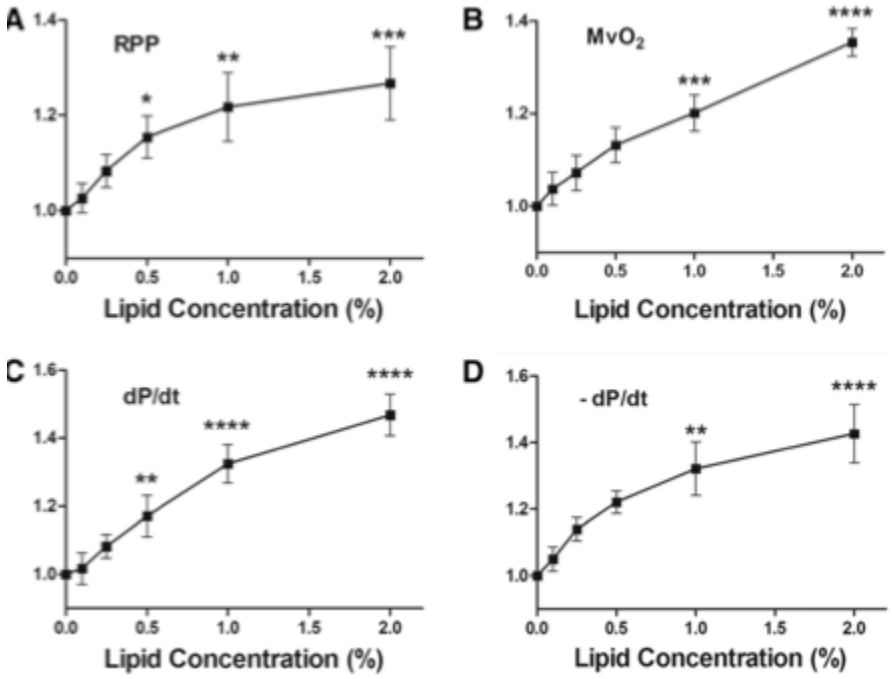
2 groupes:
- **Sérum Salé**
- **Intralipid**

Weinberg GL, Anesthesiology 1998; 88: 1071-5

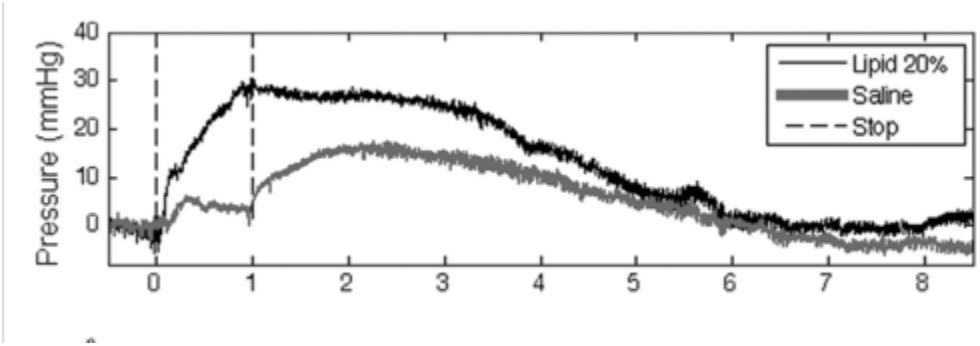
ELI et Paramètres Hémodynamiques

Effet cardiotonique des ELI

Sur Cœur Isolé

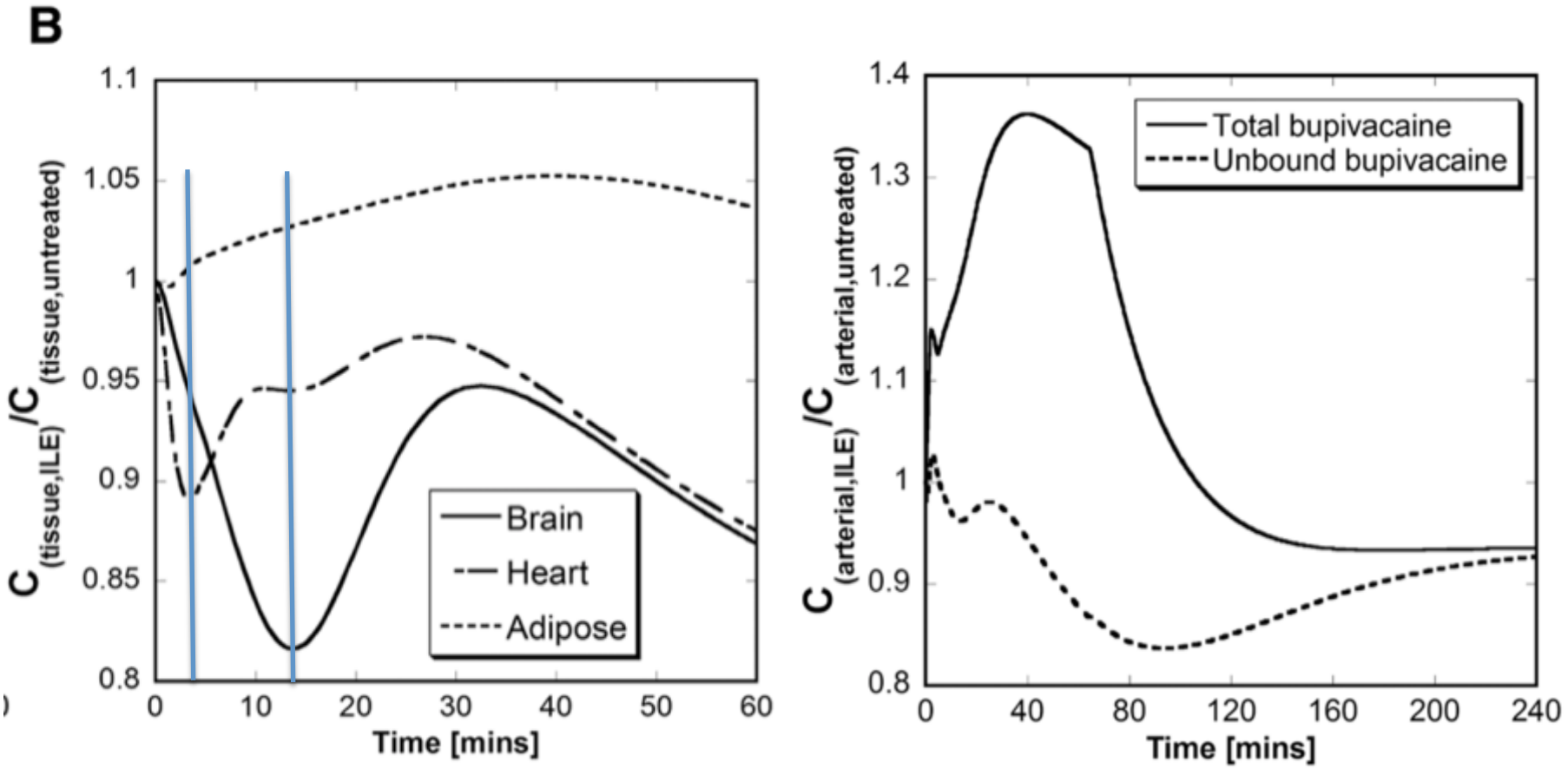


Sur Rat in vivo



Fertiplace MR, Crit Care Med 2013; 41:e156-e162.

Simulation PK d'une administration d'ELI



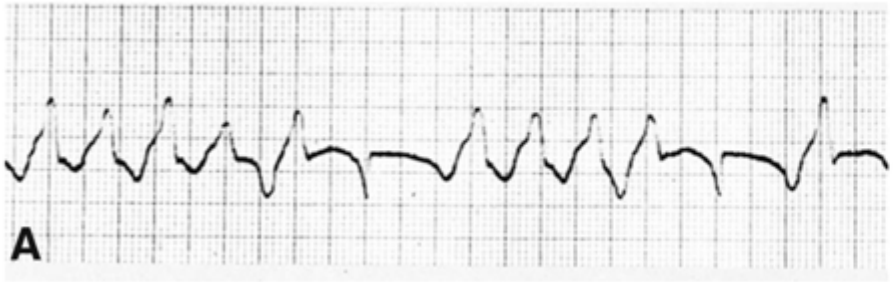
Kuo I, Anesthesiology 2013; 118: 1350-61

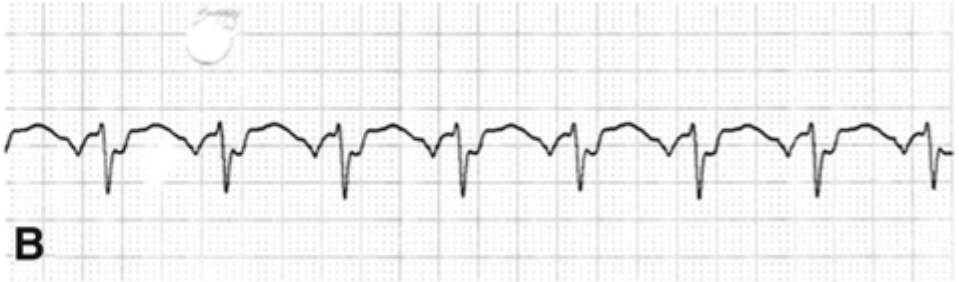
ELI et Cardiotoxicité des AL

Enfant de 13 ans
Bloc plexus lombaire
Abord postérieur

15 min après injection initiale
Lidocaïne adrénalinée 100mg
Ropivacaïne 75 mg

2 min après l'injection
de 3ml/kg de Médialipid 20%





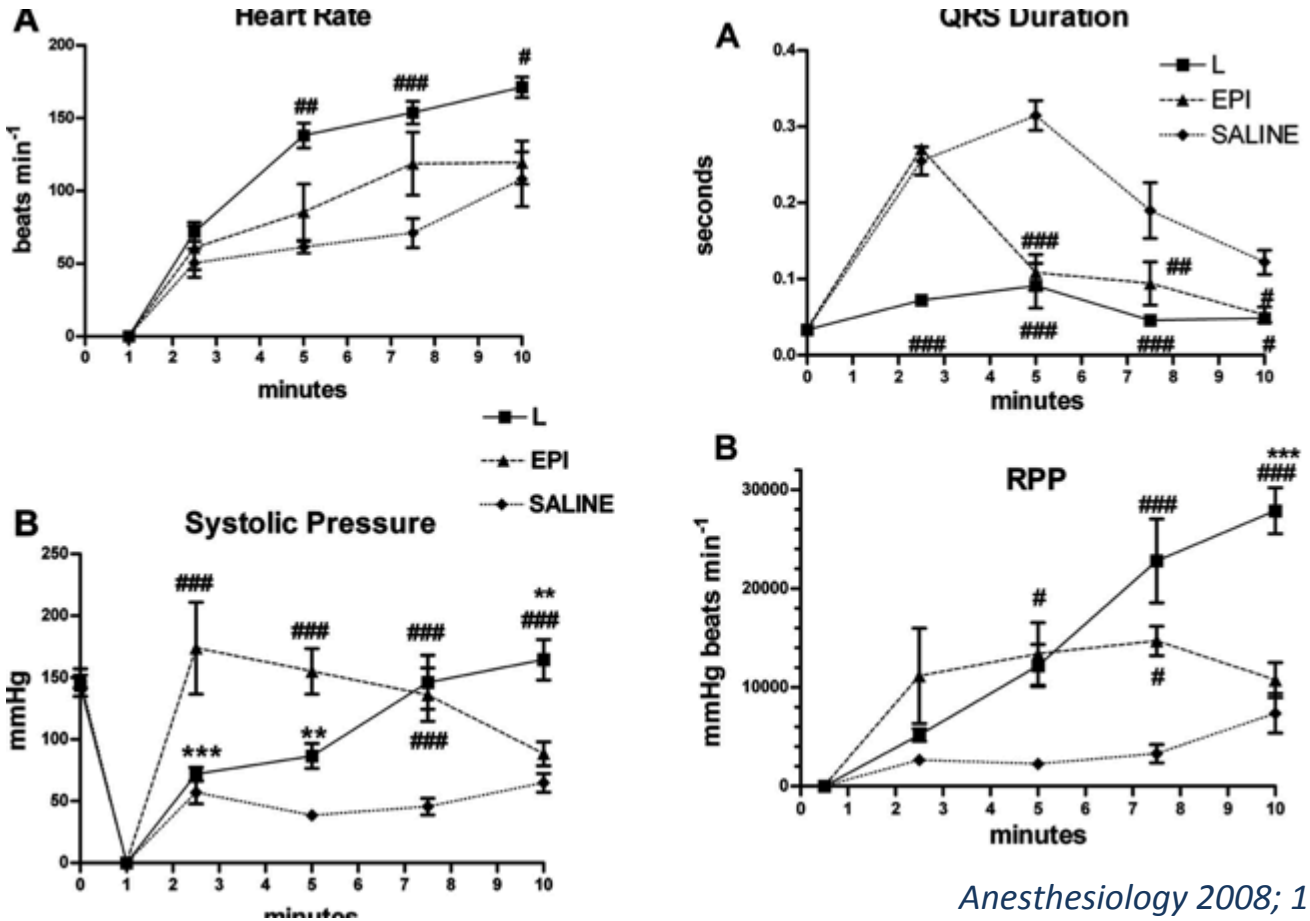
Kuo I, Anesth Analg 2008; 106: 1572-4

Anesthesiology 2008; 108:907–13

Resuscitation with Lipid versus *Epinephrine in a Rat Model of Bupivacaine Overdose*

Guy L. Weinberg, M.D., Guido Di Gregorio, M.D.,† Richard Ripper, C.V.T.,‡ Kemba Kelly, M.S.,‡ Malek Massad, M.D.,§ Lucas Edelman, B.S.,‖ David Schwartz, M.D.,# Nirali Shah, B.S.,‖ Sophie Zheng, B.S.,‖ Douglas L. Feinstein, Ph.D.***

Eviter les Concentrations élevées d'Adrénaline

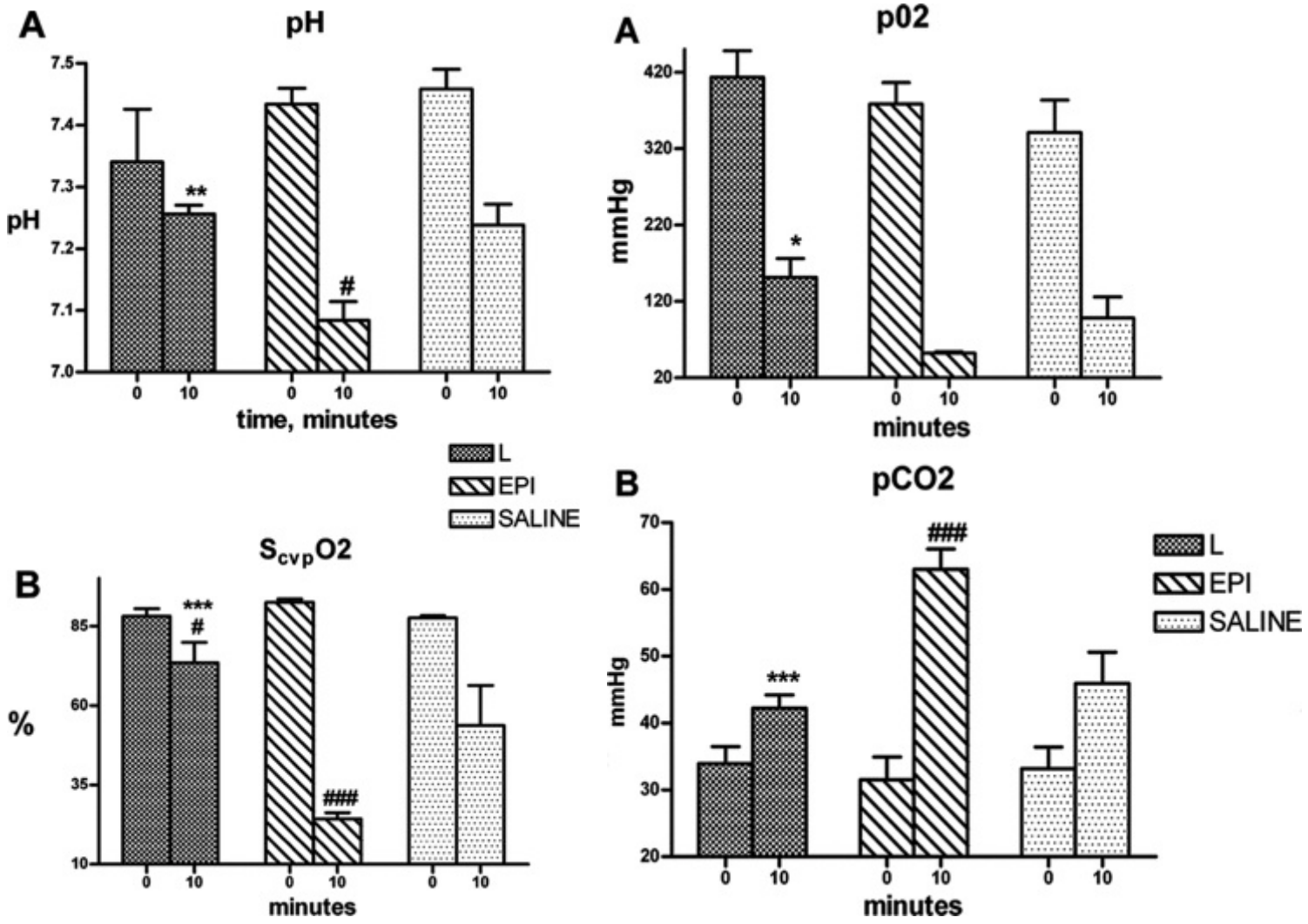


30mcg/kg

Anesthesiology 2008; 111:498–505

Intoxication aux Anesthesiques locaux

Lipides vs adrénaline vs salé : Etude animale (rats) 20 mg/kg bupivacaine bolus



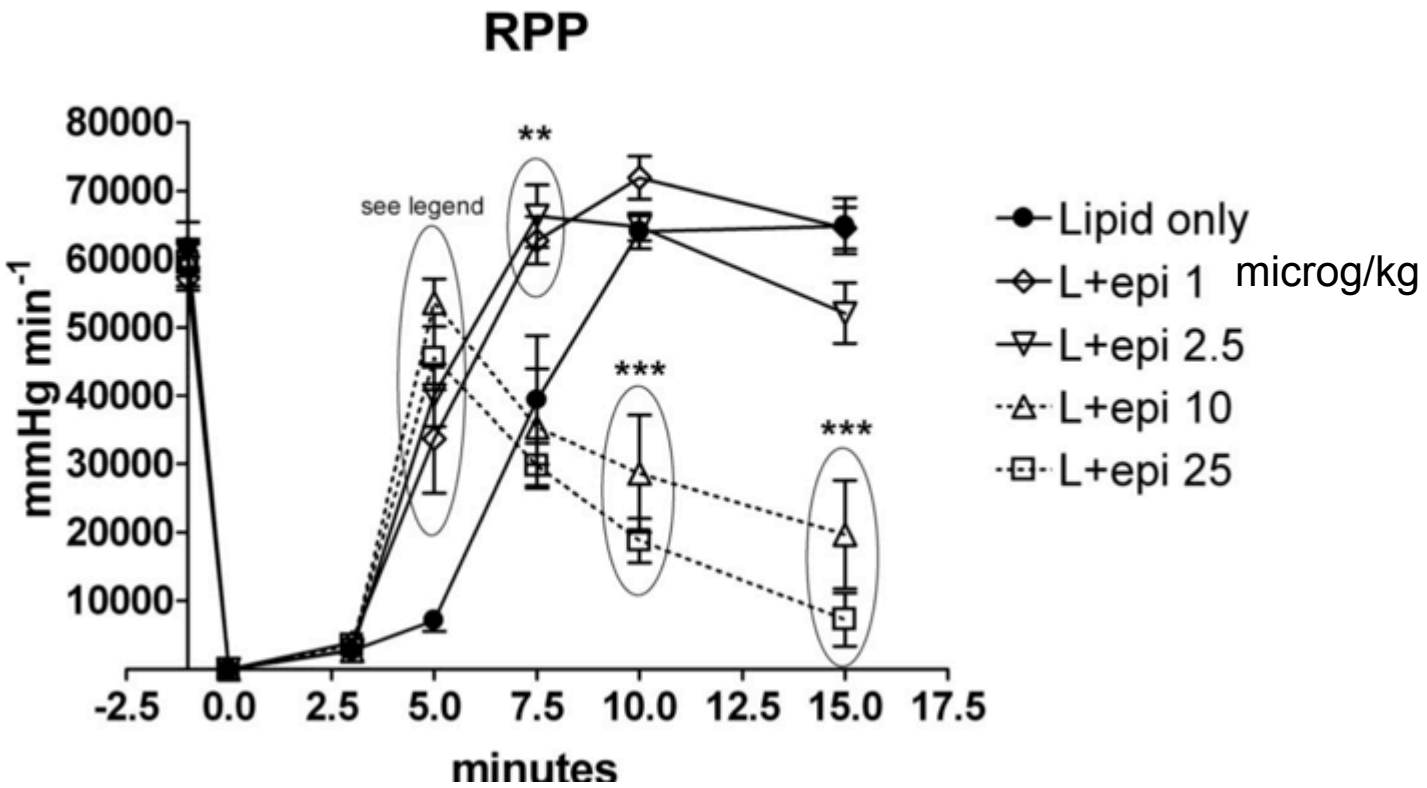
* Vs epi

\# Vs salé

D'après. Weinberg G et Di Gregorio G Refresher Course

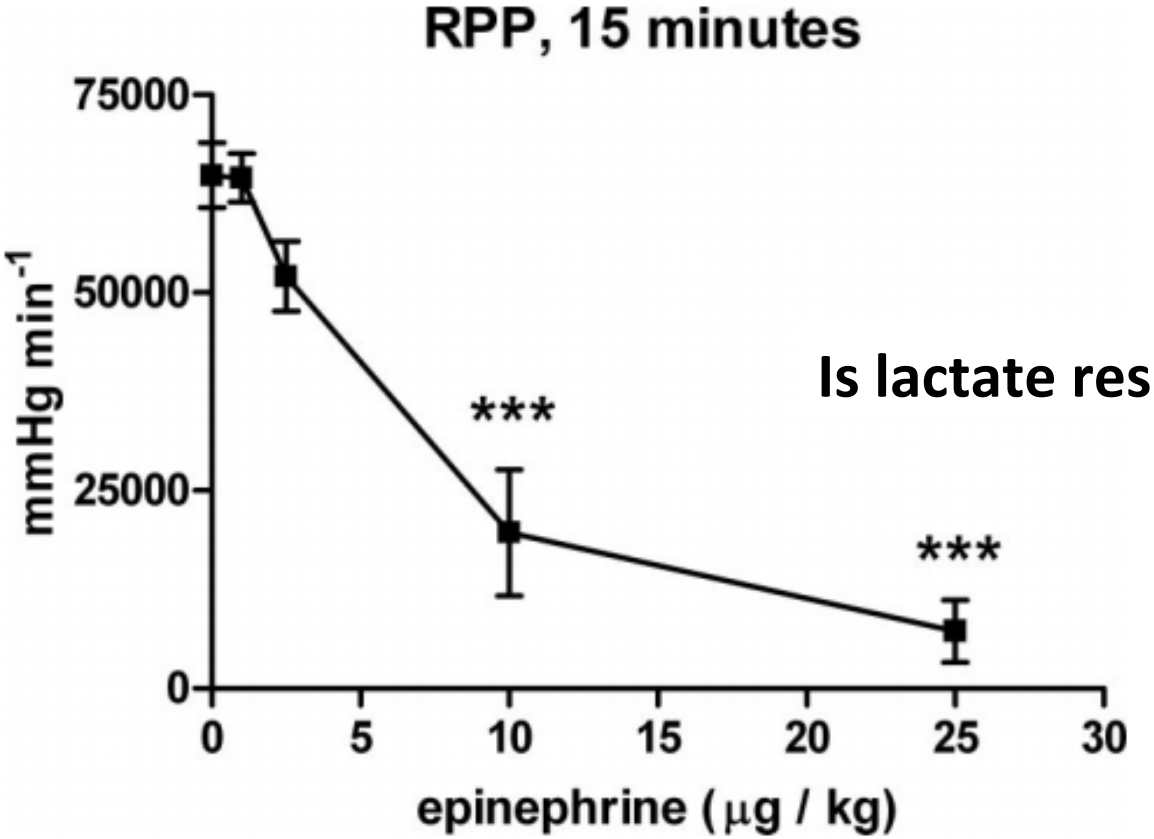
Interactions Adrénaline - ELI

Eviter les Concentrations élevées d'Adrénaline



Hiller DB, Anesthesiology 2009; 111:498–505

Epinephrine impairs lipid resuscitation from bupivacaine overdose: a threshold effect



Is lactate responsible?

Weinberg GL et al. Anesthesiology 2009

Intoxication aux Anesthesiques locaux

Les lipides n'agissent pas seuls : La réanimation doit être poursuivie

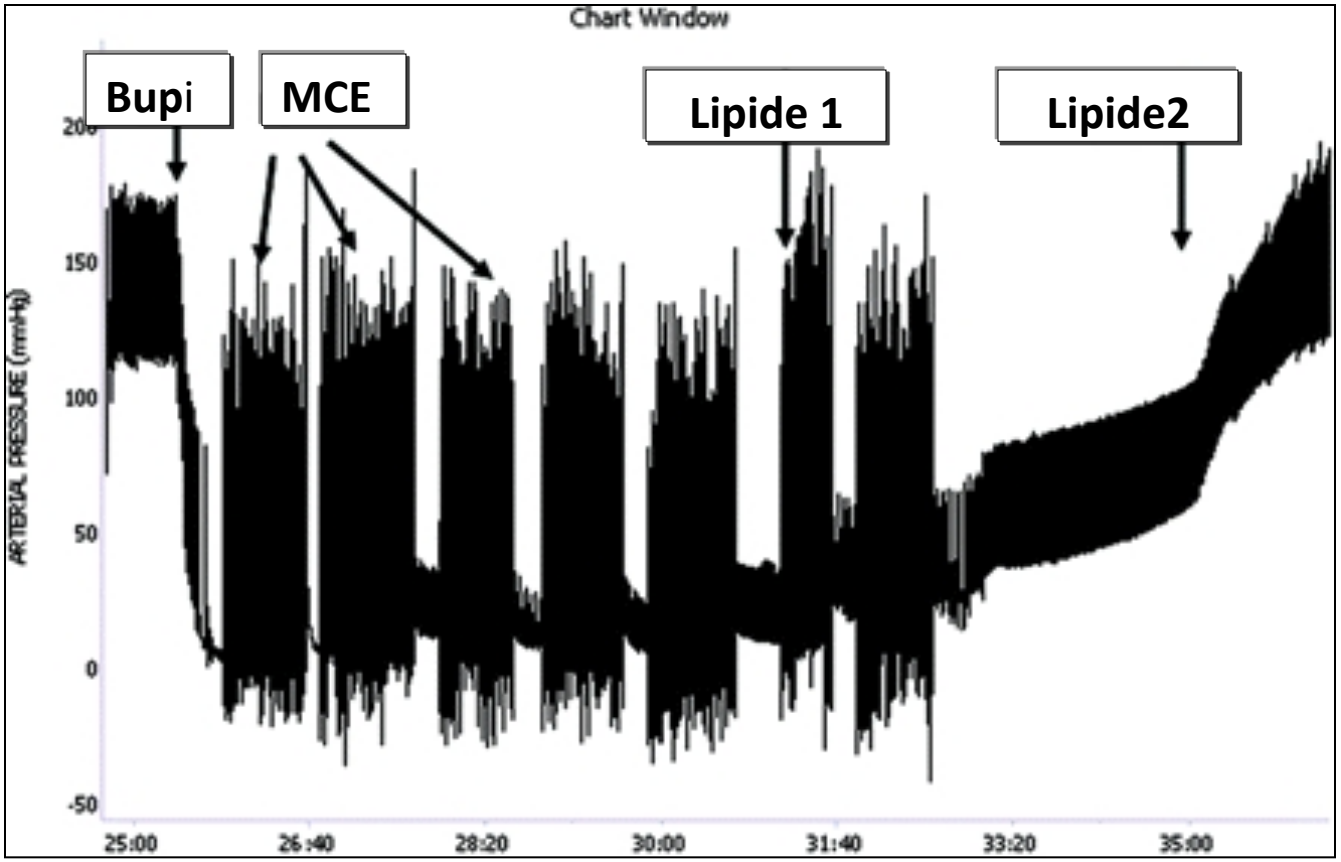
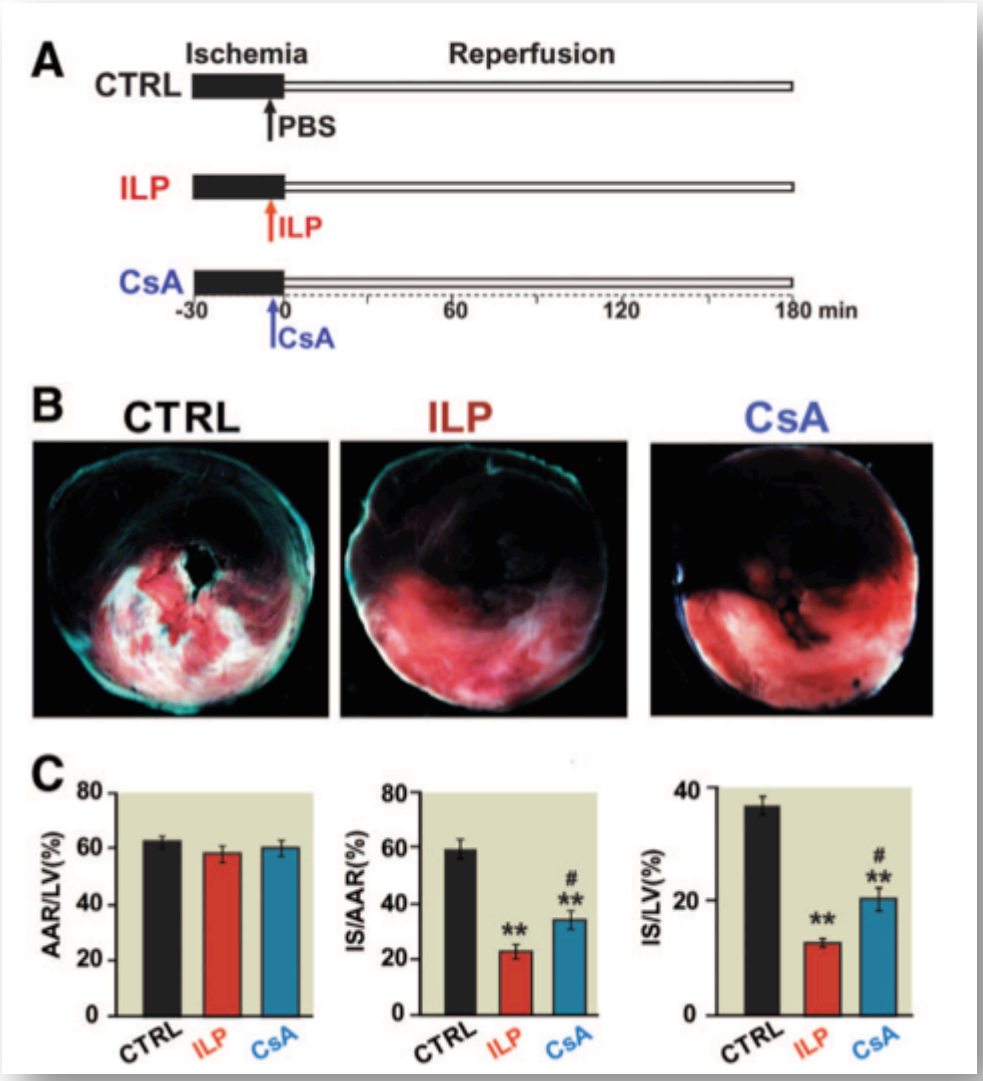


Figure 1. Hemodynamic response to lipid infusion. The arterial pressure trace of a rat is shown over approximately 12 min. B, IV injection of 20 mg/kg bupivacaine over 20 s. R, resuscitation by closed chest compression. L, infusion of 30% soybean oil emulsion, 5 mL/kg, over 10 s. Recovery of hemodynamic profile occurs after second lipid bolus, L2.

« Given the evidence of benefit, and the lack of apparent risk, it seems prudent to stock lipid emulsions in settings where overdoses are treated (…) to avoid wasting precious time at a critical moment in patient care. Future case reports and animal studies will help to evaluate the timing, dose, and clinical utility of lipid resuscitation »

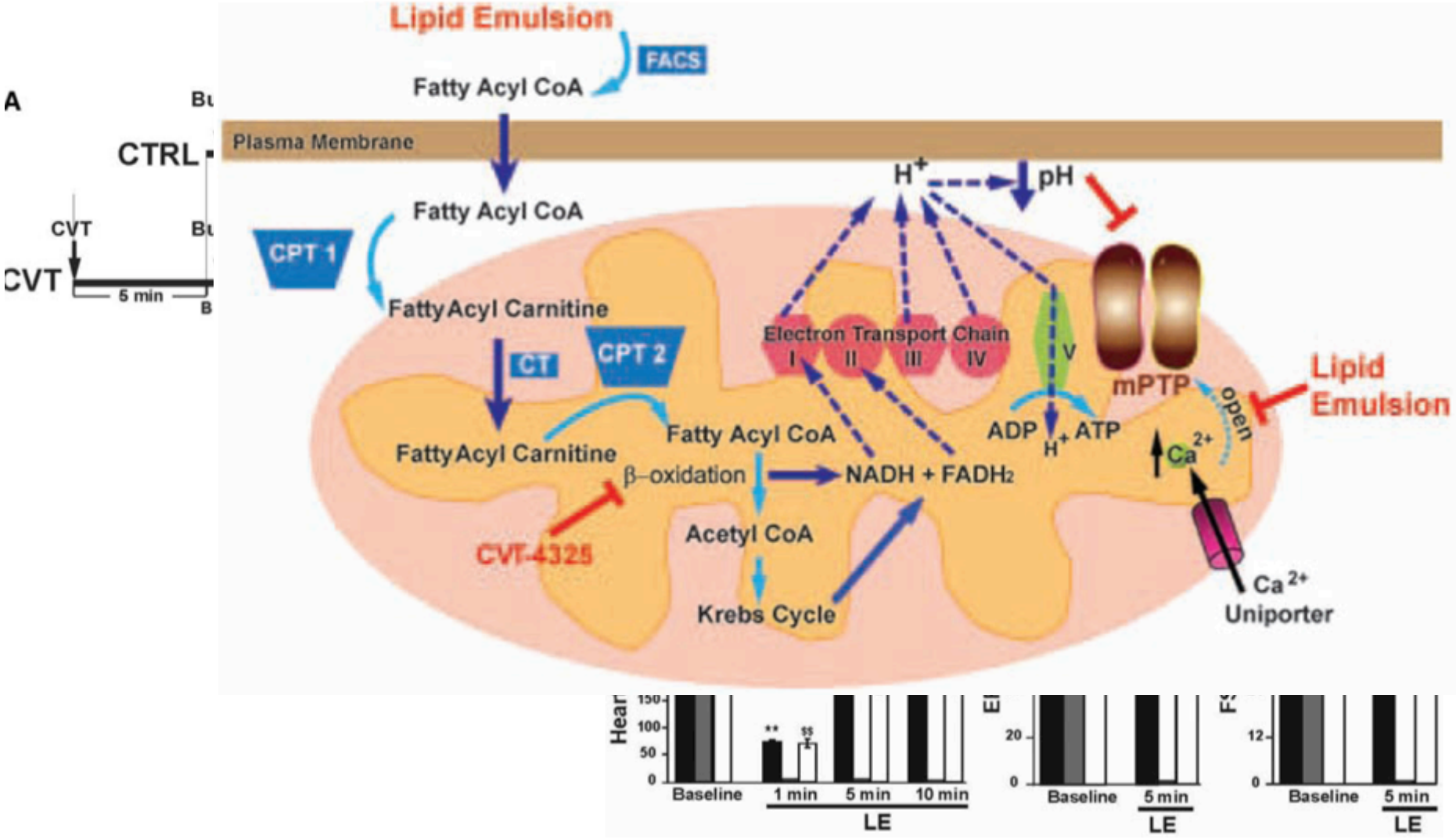
ELI et lésions d'Ischémie Reperfusion



Intralipid is more effective than cyclosporine-A in reducing myocardial infarct size and improving cardiac functional recovery after ischemia-reperfusion

Li J, Anesthesiology 2012; 117:836–546

Rôle du Métabolisme Lipidique

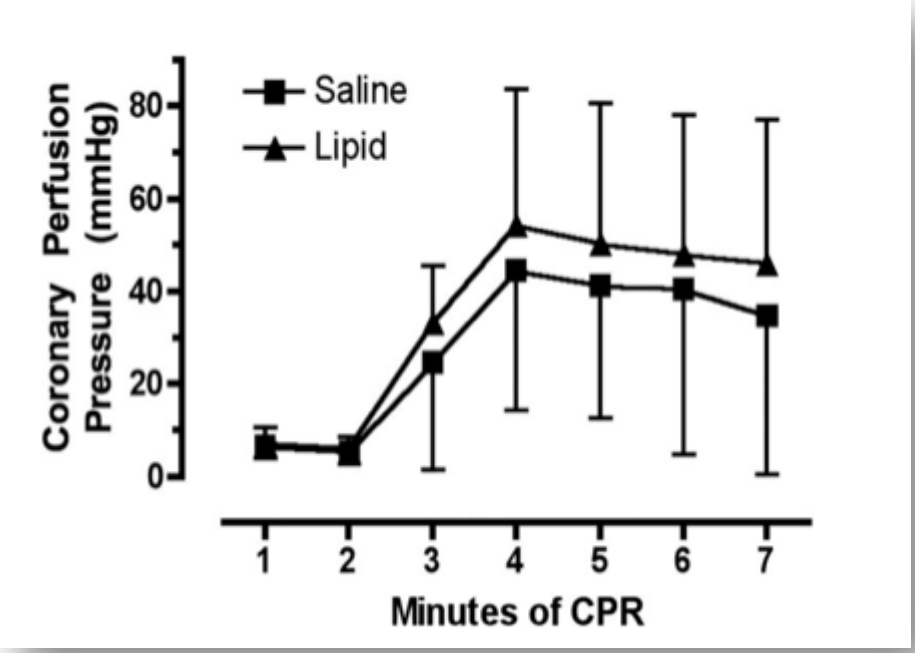


Partownavid P, Crit Care Med 2012; 40: 2431-7

Les échecs des ELI

Acidose Sévère (pH=7,25)

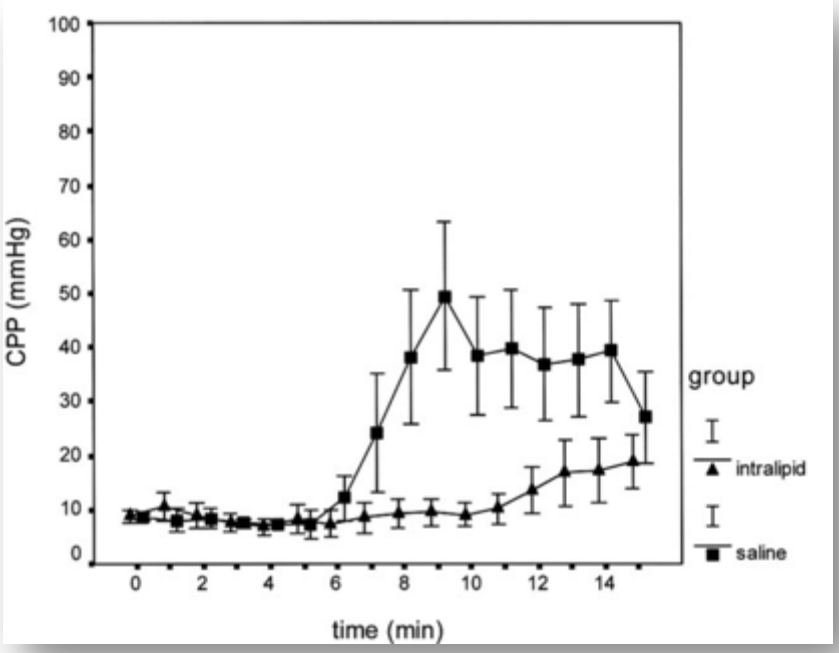
ELI 5 min après ACR



Hicks SD, Anesthesiology 2009; 111:138–46

Hypoxie Sévère

ELI 2 min après ACR Hypoxique



Harvey M, Anesth Analg 2009; 108:1163–8

Risques liés aux ELI

il est justifié de ne pas dépasser la dose maximale de 10ml/kg au cours des 30 premières minutes

- Adrénaline et ELI
  - majorer la vasoconstriction et de l'hyperlactatémie
- ELI et surdosage en Cordarone
  - Coloration cutanée rouge
- Dosages Biologiques
  - élévation des triglycérides durant 48H
  - élévation de l'amylase et des ASAT
- Lésions histologiques
  - **Poumons**
    - infiltration de neutrophiles et microhémorragies intra-alvéolaires
  - **Foie**
    - stéatose micro vasculaire

Hiller DB, Reg Anesth Pain Med 2010; 35:140–4

Safety of high volume lipid emulsion infusion in rats

DL50 = 67.72 (SE, 10.69) ml/kg

Hiller DB et al. RAPM 2010

Méthode de Dixon

- ✖ Animaux morts dans les 48 h après l'injection
- ● Animaux vivants dans les 48 h après l'injection

les preuves dans la littératures sont fortes et il est impensable de ne pas le faire

- Des cas cliniques
- Des expérimentations sur rats, cochons et chiens
- Des recommandations de sociétés savantes
- Des articles signés dans 60% des cas par G Weinberg…
- Pas d'étude randomisée, en aveugle

2015: LAST ET ELI

- *les ELI font aujourd'hui partie des recommandations à suivre lors d'un surdosage systémique en anesthésique local.*
- *Les ELI ne doivent pas être substituées aux autres moyens de réanimation, mais sont un élément supplémentaire.*
- *Des études expérimentales complémentaires et un registre de cas cliniques permettront probablement de mieux caractériser l'interaction ELI-AL.*