



Hyperthermic **I**ntra **P**eritoneal **C**hemotherapy:

**Does the anaesthesiological
strategy differ from other
extensive abdominal strategies?**

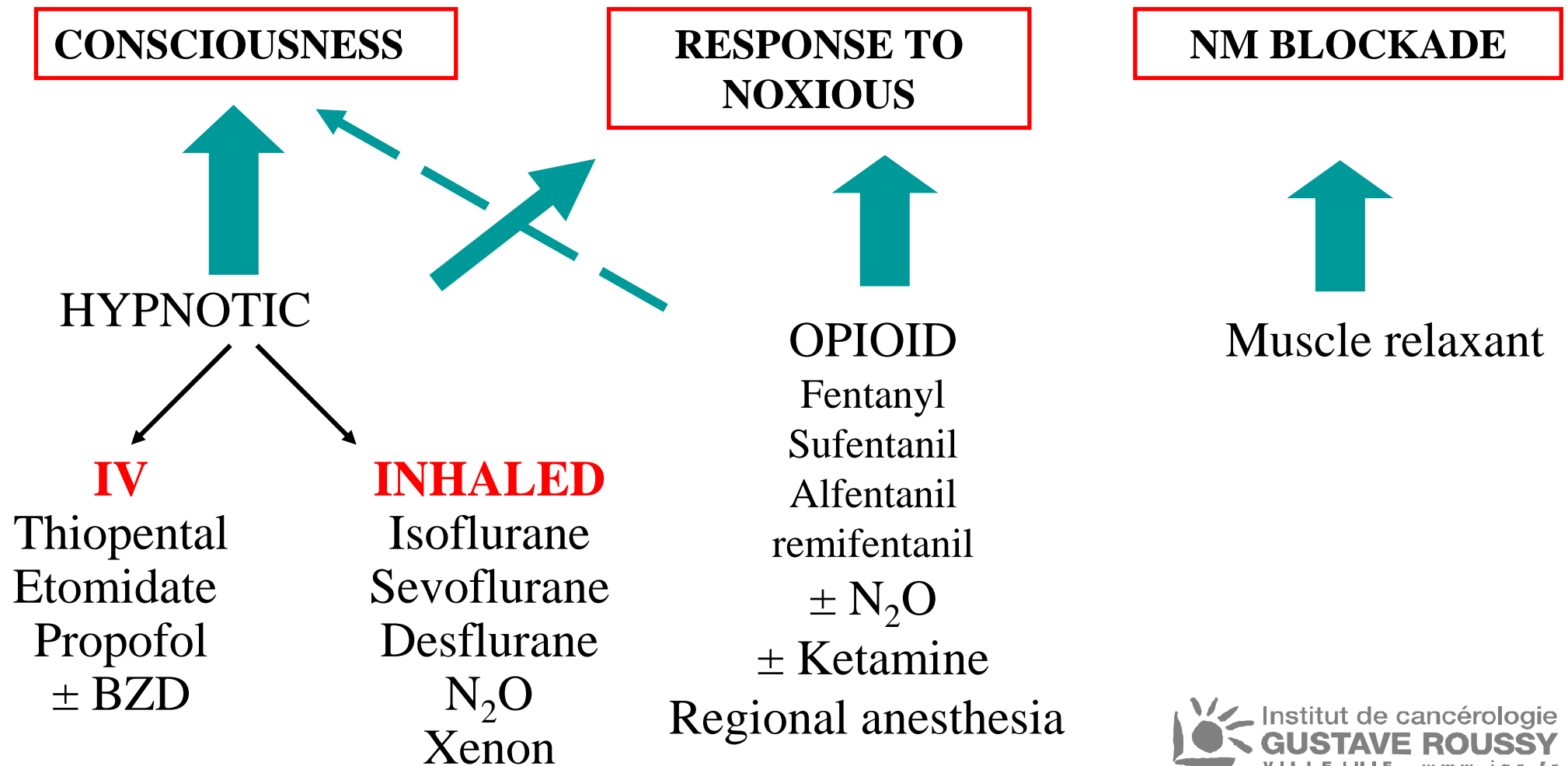
Dr V. Billard,

Département d'anesthésie

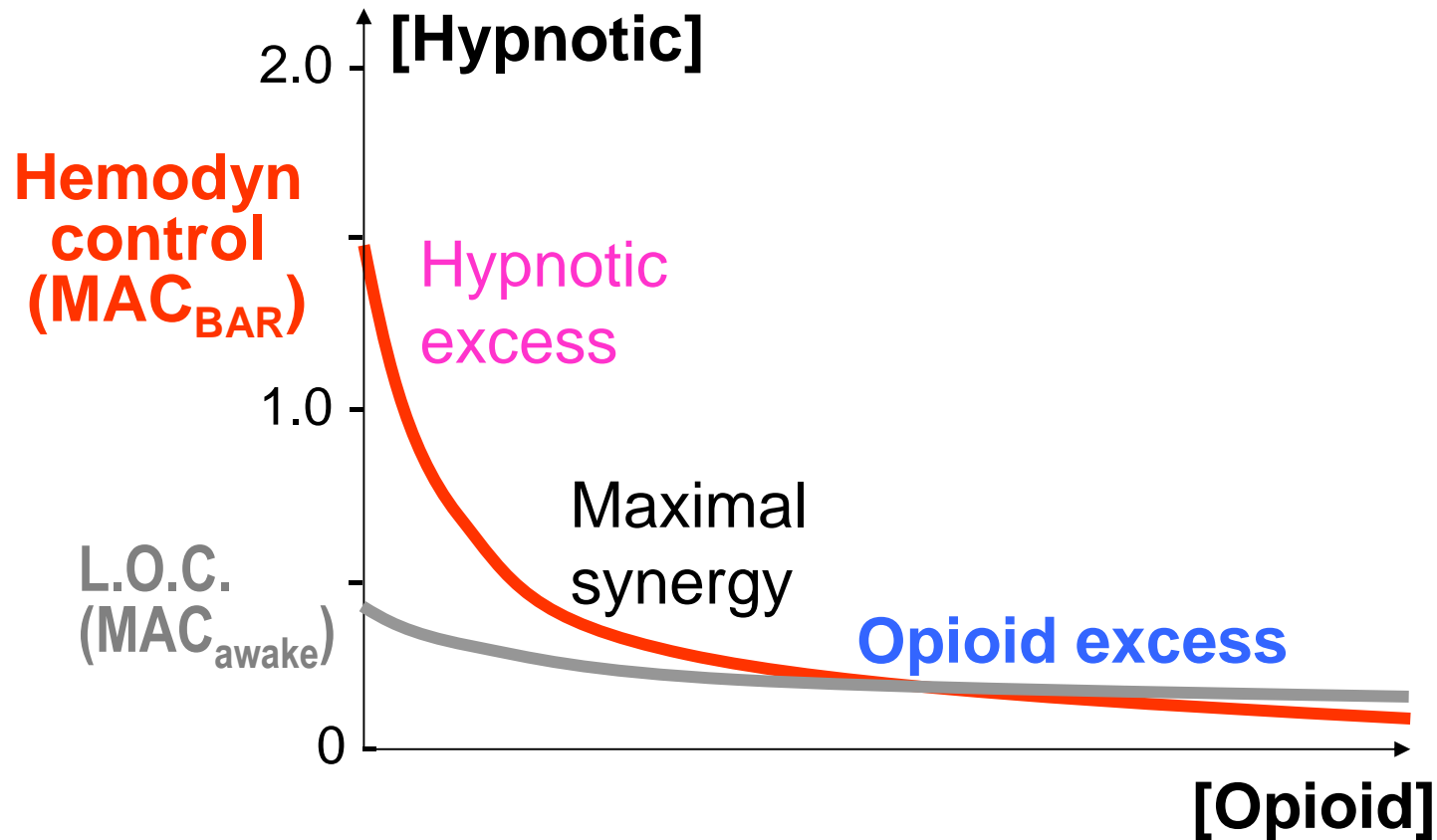
Preoperative assessment

- Eligibility
 - Good general status, age < 65 years,
 - No extra-abdominal extension, no evidence of bowel obstruction, no abundant ascites
 - No bulky clinical or radiological carcinomatosis
 - No rapid progression under IV chemotherapy
- Conditions influencing pre or intraoperative management
 - Denutrition? Bowel sub-occlusion? Preop renal failure?
- Associated disease → ASA physical status and anesthetic risk
 - ASA 1 : normally healthy patient
 - ASA 2 : patient with mild systemic disease
 - ASA 3 : patient with severe systemic disease that is not incapacitating
 - ASA 4 : patient with an incapacitating systemic disease that is a constant threat to life
 - ASA 5 : moribund patient who is expected to survive for 24 hours with or without operation
- Preparation
 - Patient information : Analgesia, transfusion, complications
 - Anesthetic strategy

General anesthesia: which drug for which effect?



Strategies in the hypnotic-opioid balance



From Katoh, Anesthesiology 1998



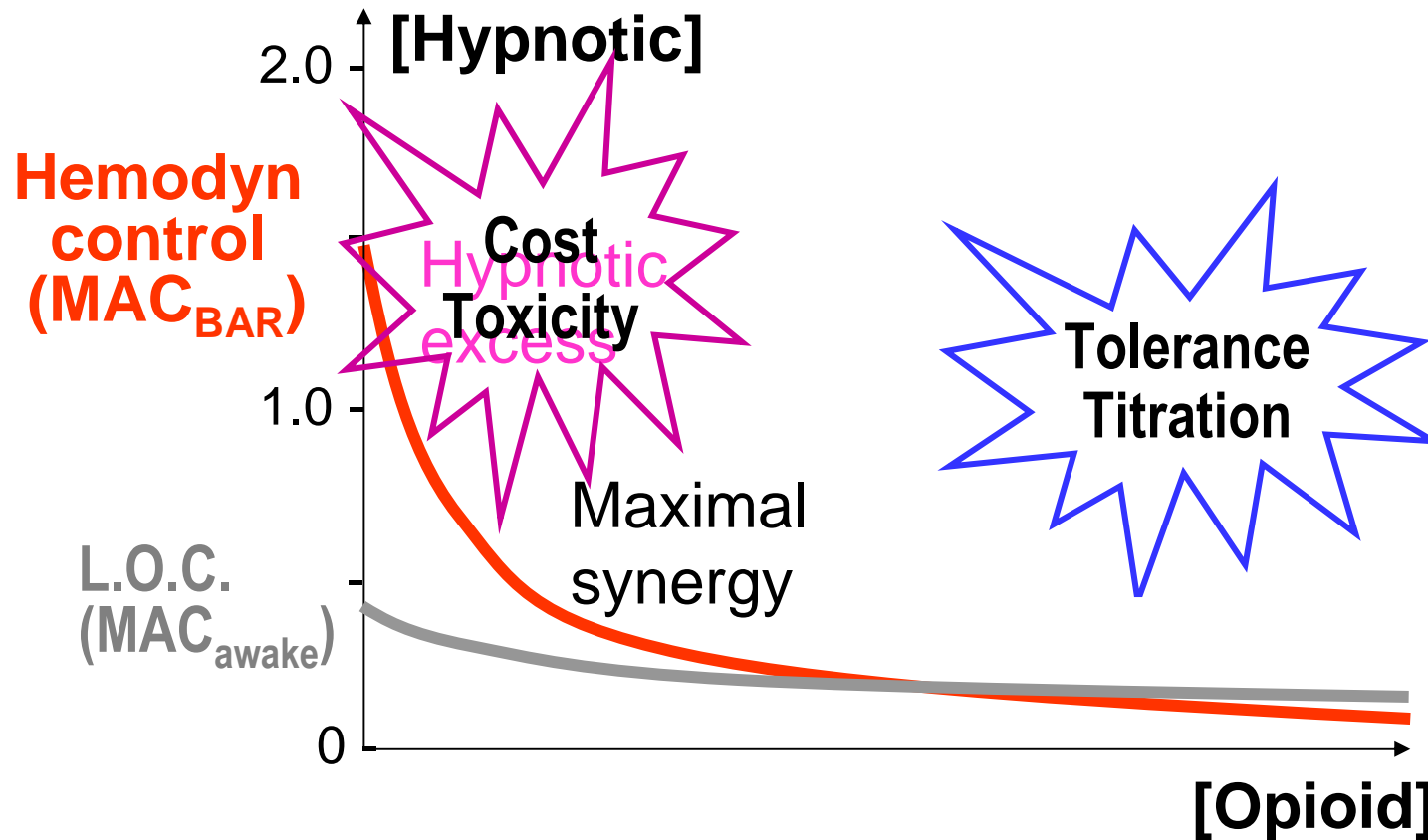
Cytoreduction phase

- Intra-abdominal surgery
- Long duration
- \pm bleeding
- Bleeding depends on
 - Histology, extension, R0
 - Temperature
 - - 1°C \Rightarrow
 - + 16% blood loss
 - + 22% transfusion risk

	Shime Anesth Analg 1994	Schmidt Anaesth 2008	IGR, CHIP IV
Patients	9 gastric 1 colon 1 lymphoma	N = 78	24 pseudom, 26 colorectal, 2 mesoth, 8 others
Blood loss	1170 \pm 782	600 [200 - 9000]	836 \pm 806 [50 - 4500]

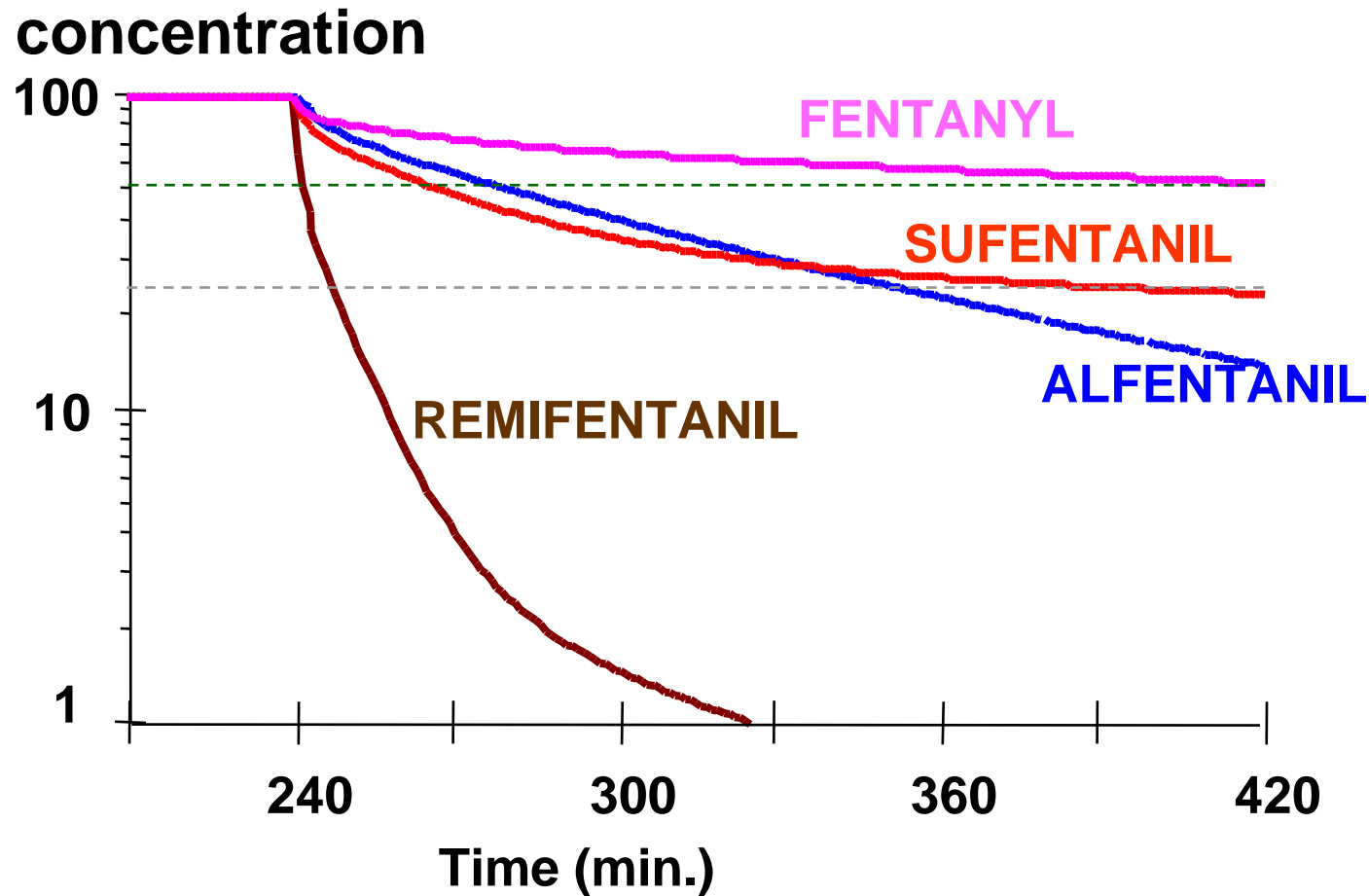
(Rajagopalan Anesthesiol 2008)

Strategies in the hypnotic-opioid balance



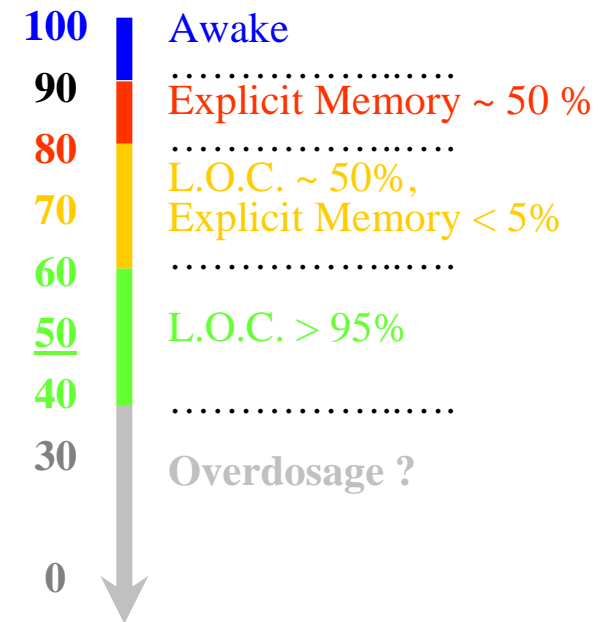
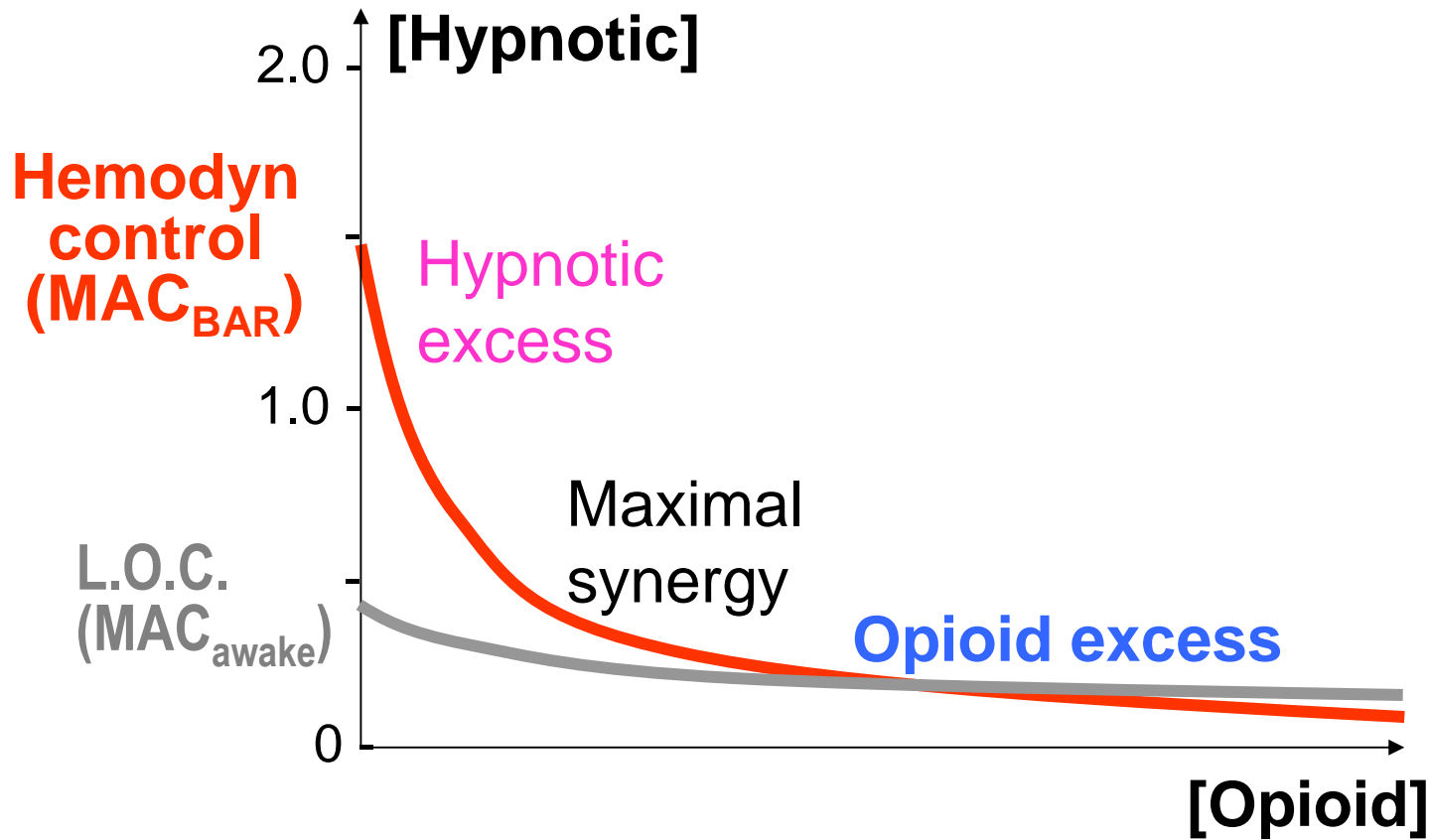
From Katoh, Anesthesiology 1998

Recovery from opioid effect



Billard & Jacqmin, Cah Anesthesiol 2001

Strategy in the hypnotic-opioid balance



From Katoh, Anesthesiology 1998



HIPEC
=
Heating
+ abdomen filling
+ chemotherapy

Is central hyperthermia dangerous?

- CNS damages?
(Sminia, *Int J Hyperthermia* 1994)
 - Oedema, hemiparesis, necrosis ...
 - Max tolerated dose = 42-42.5 for 40-60 min or 43° for 10-30 min
- Peripheral neuropathy?
(Haveman, *In J Hyperthermia* 2004)
 - 1 to 4 %, sensory ± motor
 - slowly reversible
- Renal or hepatic toxicity?
 - rare without shock (Kerner *In J Hyperth* 2003)
 - Avoid fleet phospho soda preparation (Bernet, Lyon 2008)
- Hemodynamic changes?

Hyperthermia-induced hemodynamic changes

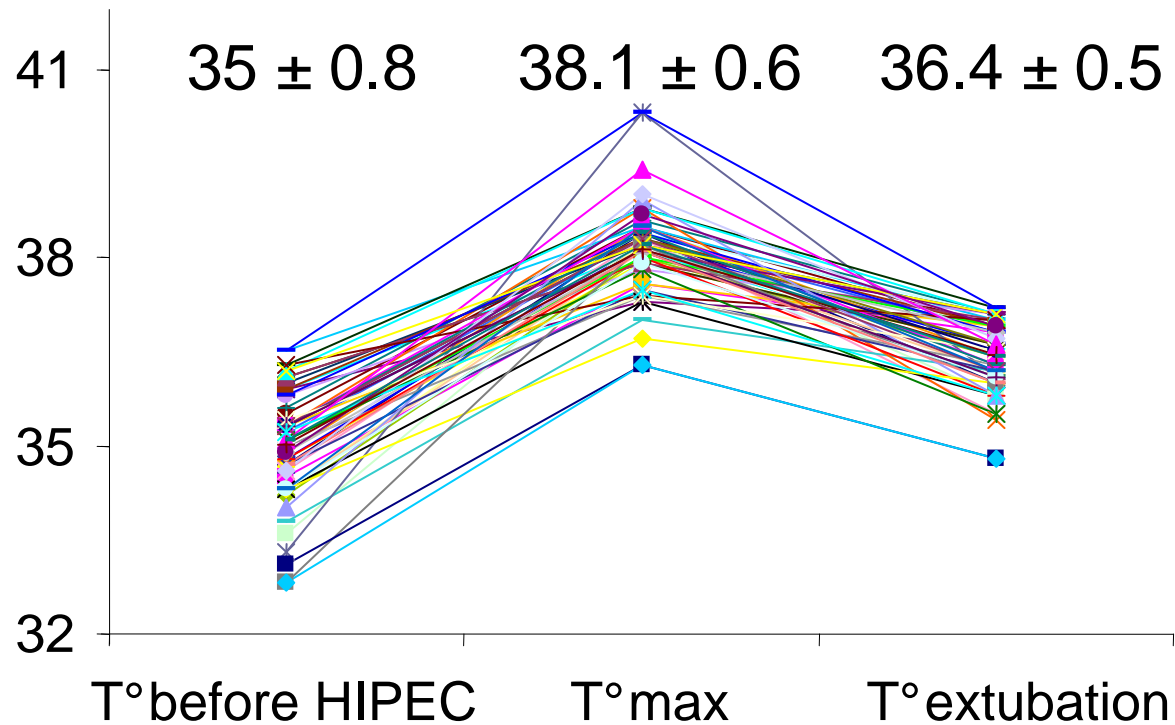
Reference	HR	BP	C.O.	SVR
Shime 1994	↗	↘	↗	↘↘
Kanakoudis 1996	↗	→	→	
Berry 1997	↗	↘	↗	↘↘
Esquivel 2000	↗	→	↗	↘
Kerner 2003	↗↗	↘	↗↗	↘↘
Cafiero 2006		→	↗	↗↘
Caillaud-Sergent 2008	↗	↗	↗	↗

Technique	Anesthesia
Expander	Isofl.+ epidural
Closed	Propo, sufenta
WBH	? ± esmolol
Coliseum	?
WBH	Propo, remifenta
Closed	sevo-remi, dopa -furo
Closed	

(-) ↗ (-) ↗ (+) ↗
 Esmolol Fluid load Epidural
 Opioid Vasoconstr. Hypnotic
 Fluid load Closed abd. Hypovolemia

Temperature control?
 Hyperthermia duration?

Temperature changes with open abdomen coliseum technique

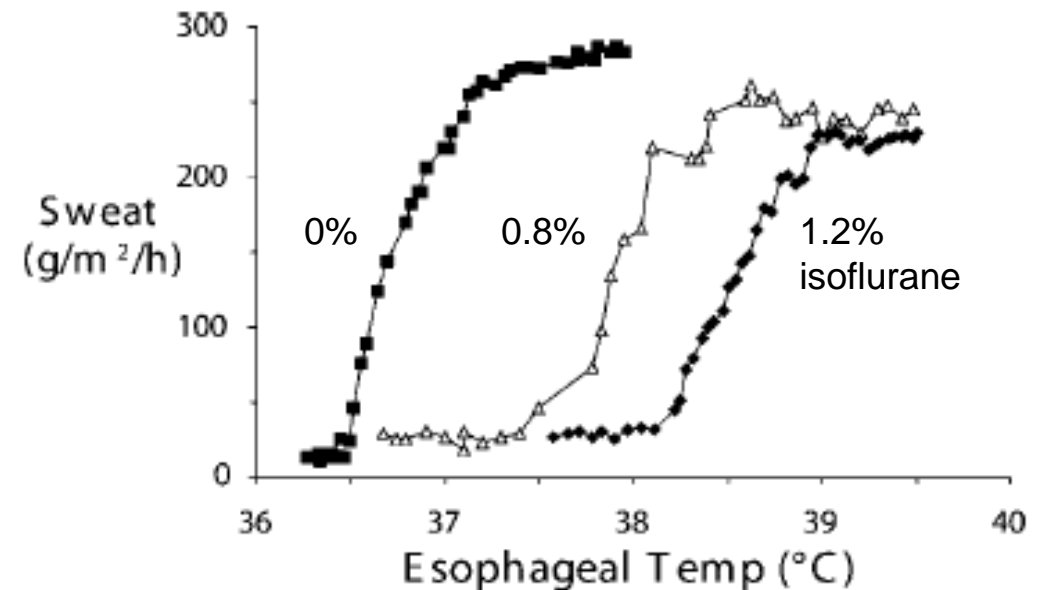
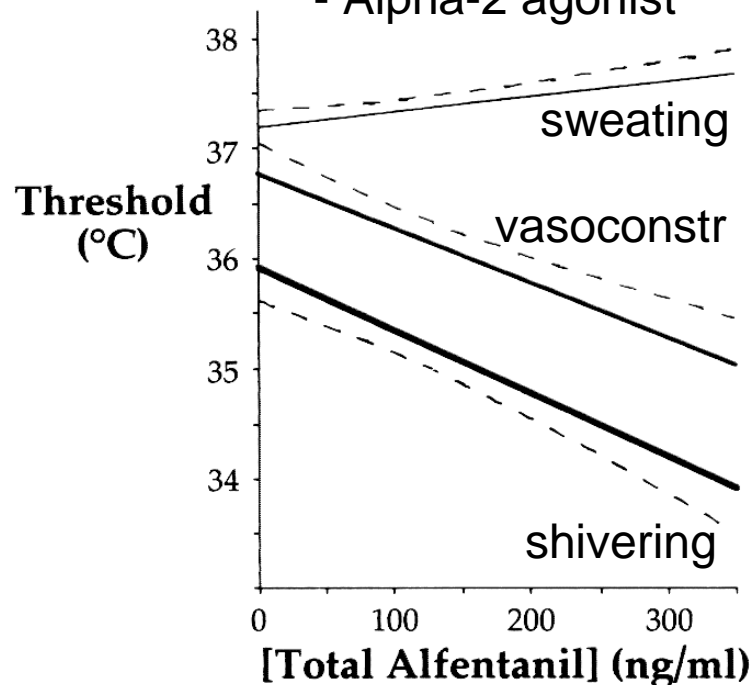


Influence of anesthetic drug concentrations on sweating threshold?

Little influence
- BZD

Slight influence
- Opioids
- Propofol
- Alpha-2 agonist

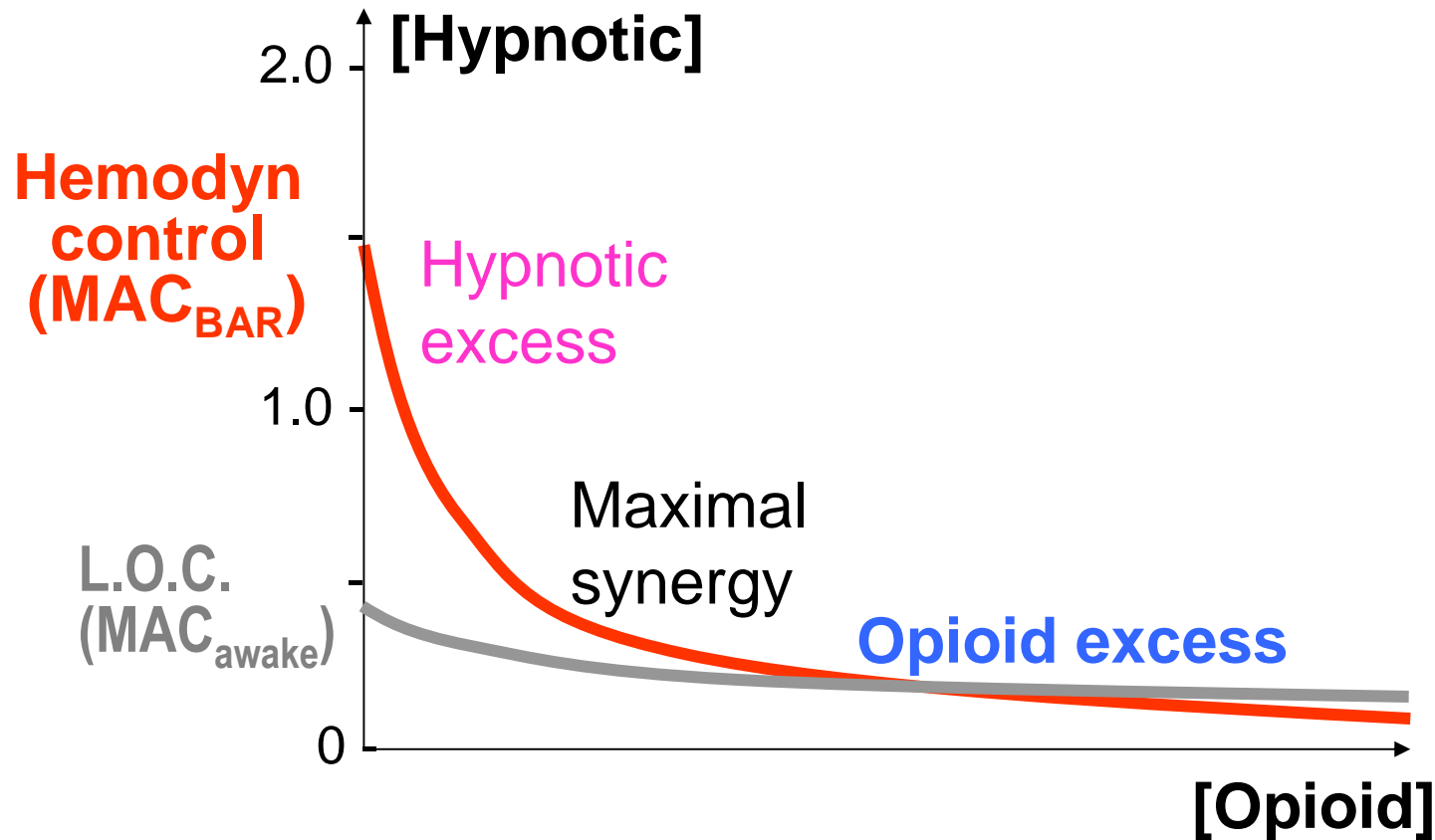
Marked influence
- Volatile



Kurz, Anesthesiol 1995
Matsukawa, Anesthesiology 1995

Sessler, Anesthesiology 2008

Strategy in the hypnotic-opioid balance



From Katoh, Anesthesiology 1998

Fluid load

- Issues
 - Intraoperative hemodynamics and homeostasis
 - Preventing renal toxicity of chemotherapy
- Criteria
 - Blood pressure (*Deja Chest 2005, WBH*)
 - Diuresis (*Kerner Int J Hyperthermia 2003, WBH*)
 - Blood cells to maintain hemoglobin

 - Invasive monitoring (*Shime Anesth Analg 1994, Deja 2005*)
 - C.V.P. (*Schmidt Anaesthesia 2003*)
 - Intra Thoracic Blood Volume Index (*Deja 2005*)
 - Esophageal Doppler (*Esquivel Ann Surg Onc 2000, Cafiero Minerva 2006*)
- Results
 - ~ 7 L [2 – 15] or 6 - 15 ml/kg/h
 - 2/3 cristalloids, 1/3 colloids
 - Pcw vs ITBVI : Cristalloids * 2, norepinephrine / 3 (*Deja 2005*)
- Influence on outcome ?

HIPEC-induced metabolic disorders

Max disorder	De Somer <i>Perit Dial Int 2008</i>	IGR <i>SFAR 2006</i>	Suggested treatment
Glucose (mmol/L)	22.4 ± 4.9	25.3 ± 4.9	Repeated controls ± insulin Change solvent ?
pH	7.33 ± 0.05	7.24 ± 0.06	Hyperventilation ± Bicarb.iv Control hyperglycemia Limit NaCl infusion
Lactate (mmol/L)	3.2 ± 1.1	4.3 ± 2.1	
Chlore (mmol/L)	-	114 ± 4.4	
Sodium (mmol/L)	127 ± 4	130 ± 3.7	Compensate loss in dialysate
Albumine (g/L)	-	18 ± 6	Compensate loss ?

Post-operative analgesia

- Multimodal (*Kehlet & col. Anesth Analg. 1993*)
 - Paracétamol, Tramadol, Nefopam + ...
- IV or epidural?
 - Epidural → better pain relief than iv morphine (*Liu, Anesth Analg 2007*)
 - Improved oxygenation & ventilation (*Gupta Anesthesiology 2006*)
 - ↓ resp. events, ↓ myoc. ischemia, ↓ bowel recovery (*RPC SFAR 2006*)
- Different side effects
 - Morphine → PONV
 - Epidural → Urine retention, motor block, pruritus, hypotension
 - Epidural needs normal coagulation for insertion and removal
- Long term outcome (*Biki Anesthesiology 2008*)
 - Epidural → opioid sparing effects
 - Opioids inhibit NK cells
 - GA + epidural in prostatectomy : -57% recurrence !

Conclusion : Anaesthetic strategy

- Cytoreduction phase
 - Non specific strategy
 - Anticipating HIPEC and recovery
- HIPEC
 - Temperature control
 - Hemodynamic control
 - Metabolic disorders diagnosis / treatment
- Intra / postoperative analgesia
 - Titration
 - Long term effects