L'induzione e gli anestetici iniettabili

Dr Francesco Staffieri DVM, PhD
D.E.T.O. Sezione Cliniche Veterinarie e Produzioni Animali
Università degli Studi di Bari "Aldo Moro"
francesco.staffieri@uniba.it

Le Fasi dell’anestesia

Visita Preanestetica

Premedicazione

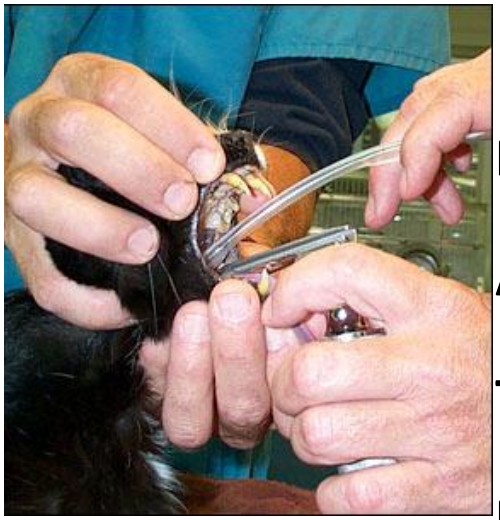
Induzione

Mantenimento

Risveglio

Cure Postoperatorie

Induzione



Rapido passaggio dallo stato di coscienza all'incoscienza

Assunzione RAPIDA della GIUSTA quantità di anestetico

Tra i momenti più CRITICI dell'anestesia

Può influenzare il prosieguo dell'anestesia

Induzione

Gassosa in maschera

Maggior stress dell'animale

Richiede una buona sedazione

Maggiore contaminazione ambientale

Non si effettua di routine

Talvolta nei pazienti molto depressi

Meno stressante

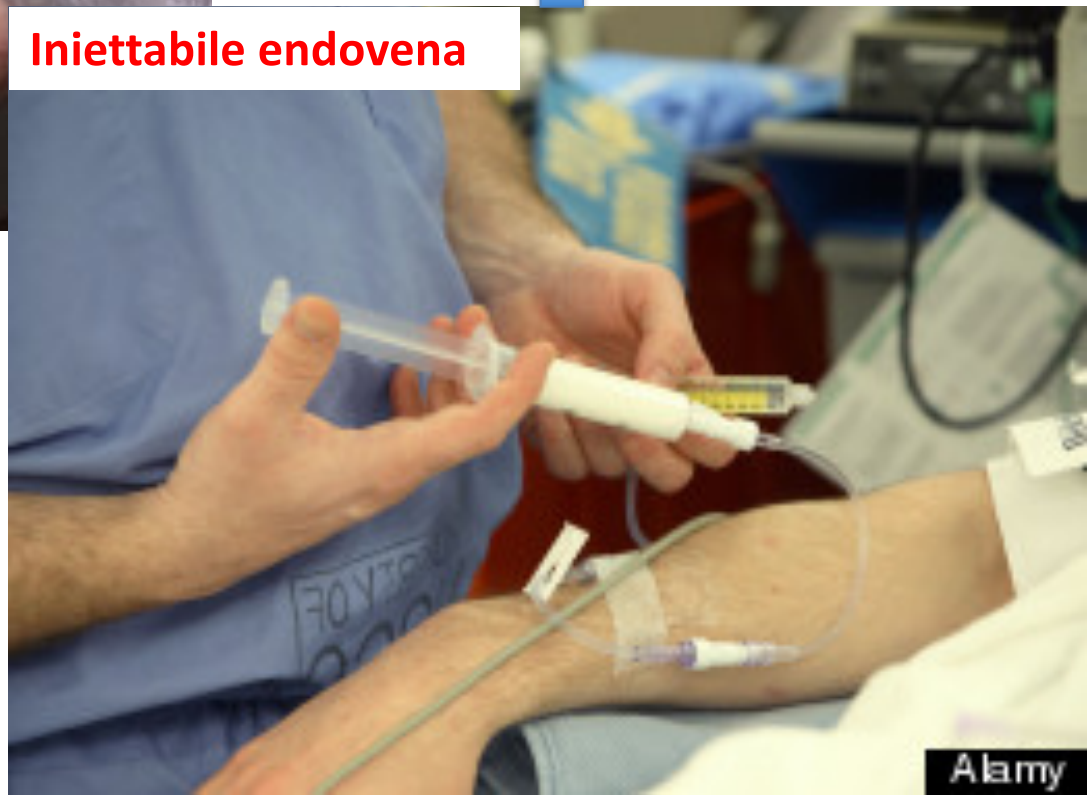
Dose modulabile

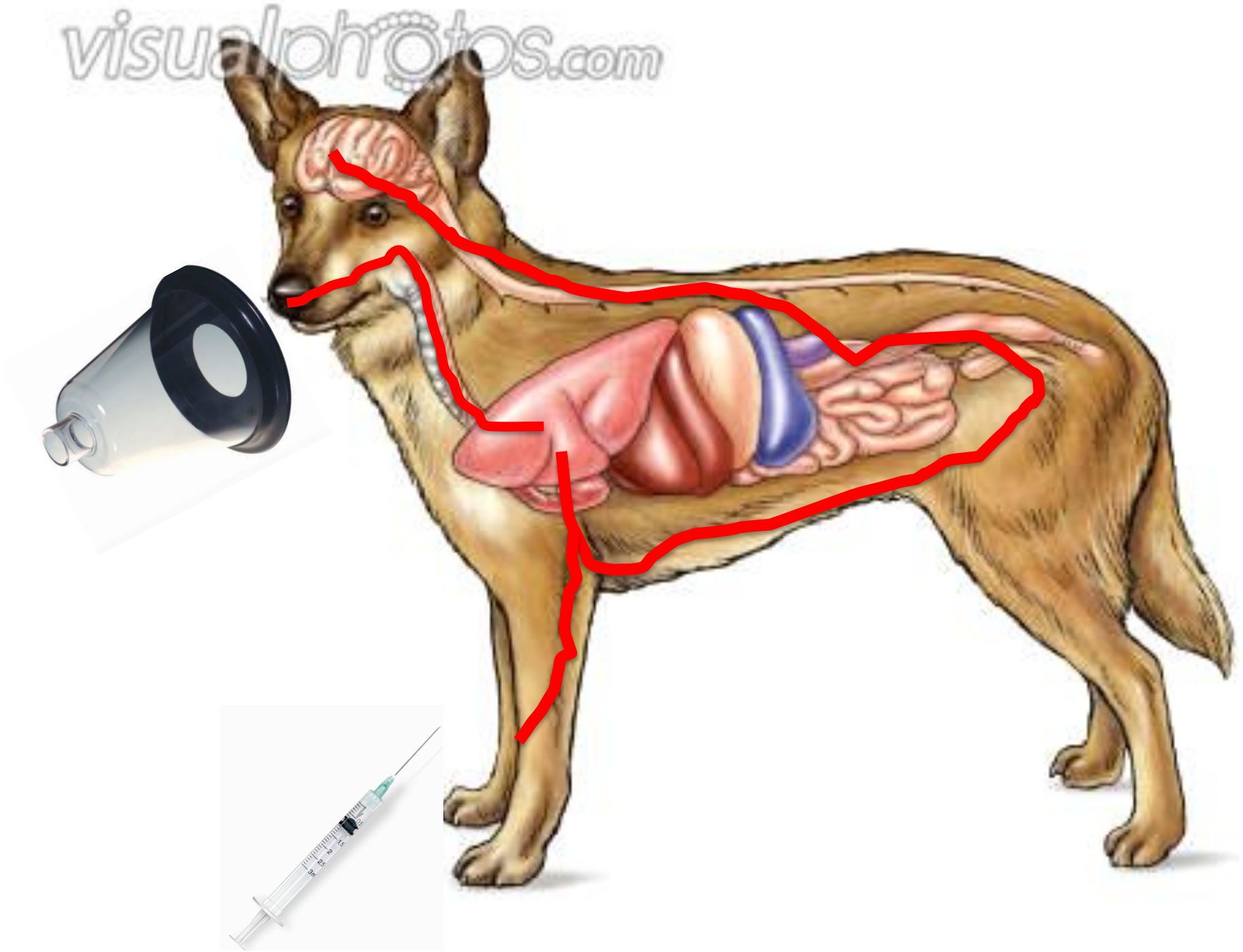
Effetto prevedibile

Ottimo con i farmaci a rapida azione

Assenza contaminazione

Iniettabile endovena




visualohrotos.com

AGENTI ANESTETICI INIETTABILI

Agenti a rapido meccanismo d'azione

Tiopentale Sodico

Ketamina

Propofol

Alfaxolone

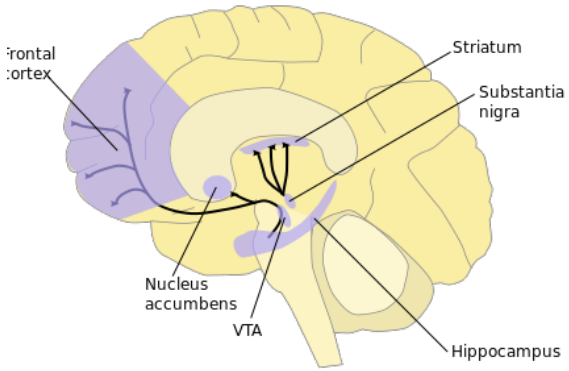
Tiopentale Sodico

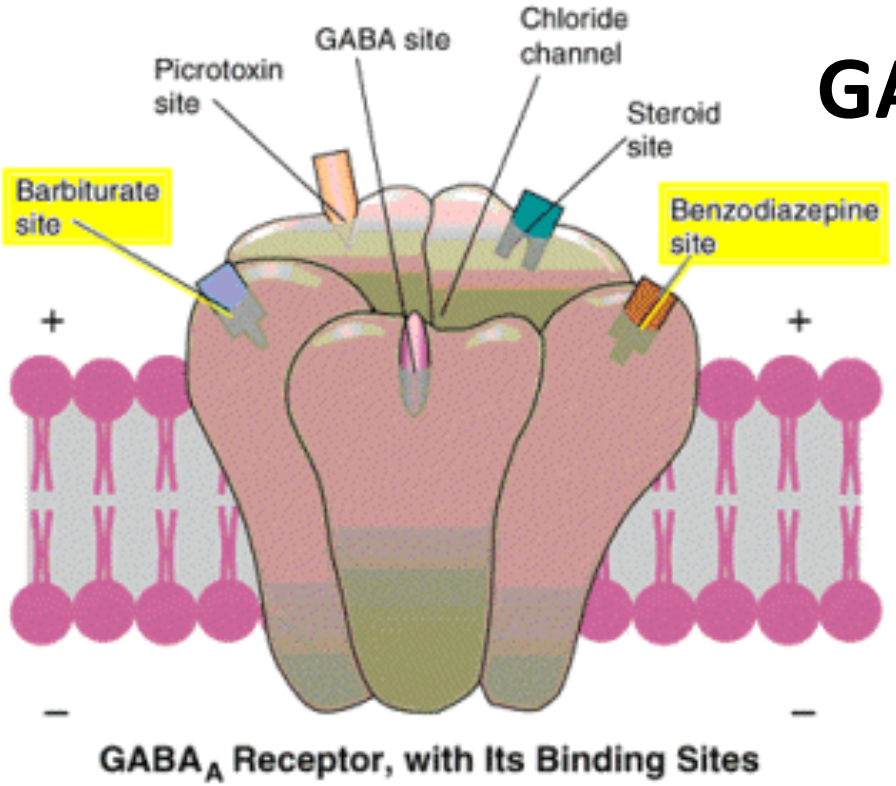
Gabaergici

Durata d'azione	**Lunga:**	**Induz.:**	**10-20 min.**
		Risveglio:	**6-12 ore**
	Breve:	**Induz.:**	**30-60 sec.**
		Risveglio:	**1-3 ore**
	Ultrabreve:	**Induz.:**	**30-60 sec**
		Risveglio:	**10-20 min**

TIOPENTALE (1937)

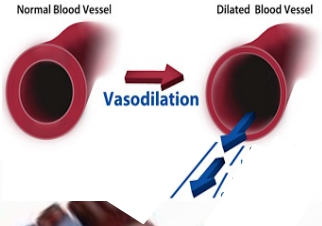
GABAERGICO

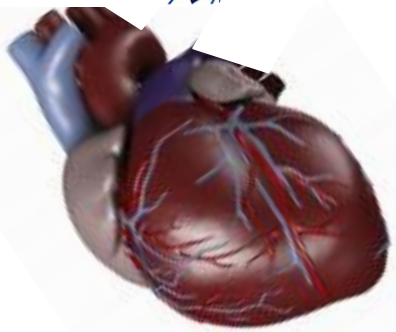




GABA$_A$ Receptor, with Its Binding Sites

- ✓Deprime il SNC con un grado differente in funzione della dose
- ✓Anticonvulsivante
- ✓No Analgesico
- ✓Riduce pressione intracranica ed intraoculare





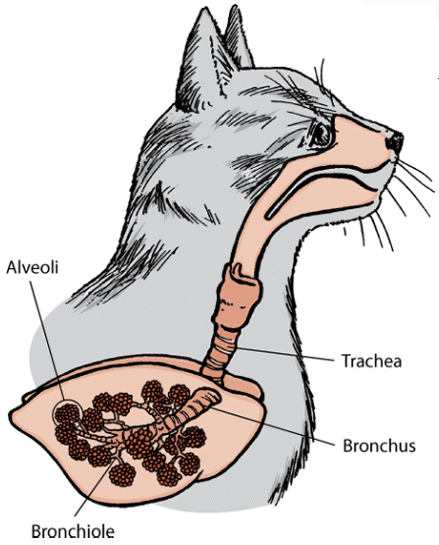
✓Ipotensione per caduta delle resistenze periferiche

✓Depressione miocardica per un'azione diretta

✓Aritmogenico

Dose

Velocità



✓Depressione respiratoria

Depressione centri respiratori

Riduzione sensibilità CO_2

Dose: 5 – 10 mg/kg

Eccitazione induzione/risveglio
Splenomegalia
Metabolismo Epatico

Altri effetti

Miorilassante
Attraversa la placenta

Fattori che possono alterare la risposta ai barbiturici

✓**Peso corporeo:** Magri → Risveglio

Grassi → Induzione

✓**Età** Neonati

Anziani

✓**Acido\Base** Acidosi ↑ disponibilità

Alcalosi ↓ disponibilità

✓**Proteine plasmatiche**

✓**Shock\Ipovolemia**

✓**Disfunzioni epatiche**

✓**Ipotermia** ↑

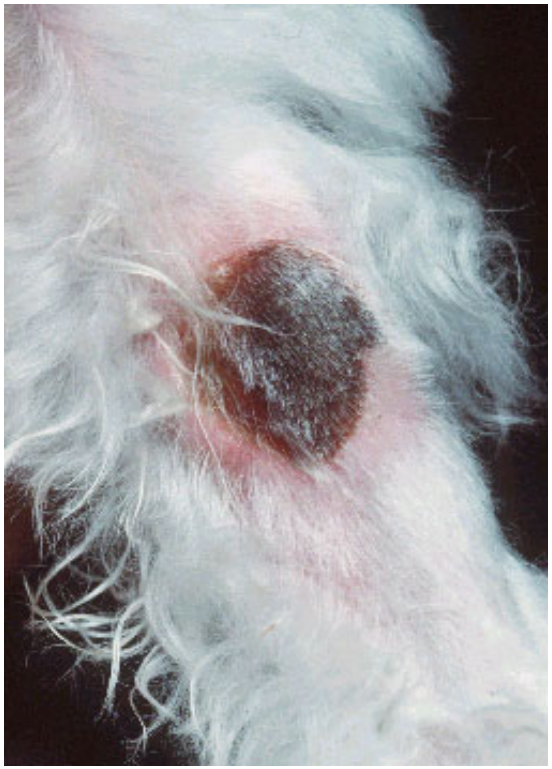
✓**Uremia** ↑

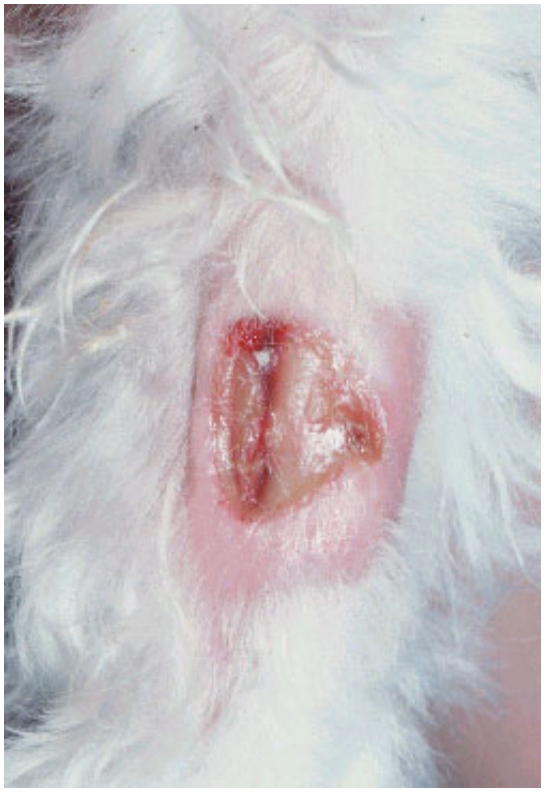
✓**Pazienti eccitati o paurosi**

✓**Effetto glucosio!** ↑

✓**Effetto accumulo**

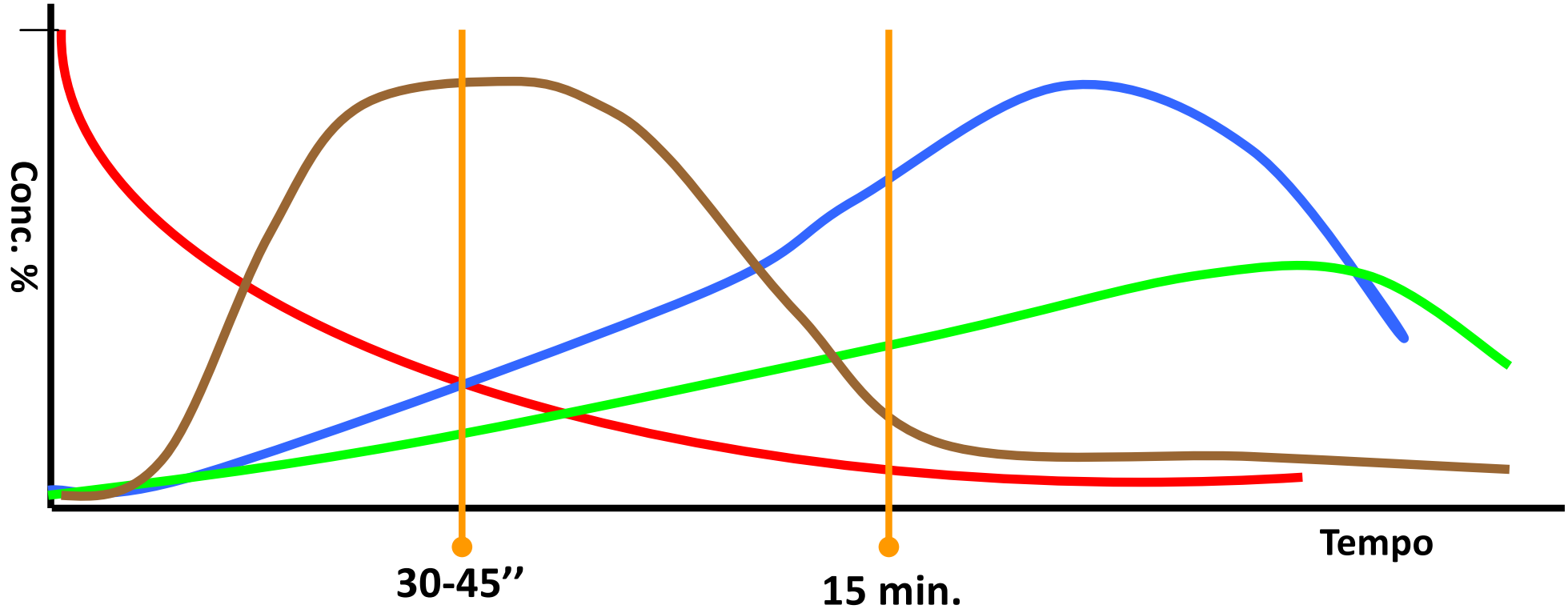
Somministrazione perivascolare





Infiltrazione di soluzione fisiologica e lidocaina

Meccanismo di ridistribuzione



Sangue (vasi)

Comp. ricchissimo di vasi: cervello, cuore, polmoni, fegato (75% G.C.)

Comp. ricco di vasi: Muscolli striati e cute (20%G.C.)

Comp. povero di vasi: tessuto adiposo (5% G.C.)

Comp. poverissimo di vasi: ossa, cartil. tendini.

Ketamina

Soluzione acquosa al 10% (100 mg/ml)
Passa rapidamente la barriera emato-encefalica
Miscela racemica
R(-) e S(+) 2 – 4 volte + potente e - psicoattiva
Somministrazione IM, SC, IV, transmucosale (brucia!!!)

ONSET: relativamente lento (1 – 2 minuti)

RISVEGLIO: dopo 1 dose ridistribuzione e metabolismo

Dopo dosi ripetute da metabolismo ed eliminazione

METABOLISMO: Epatico (no nel gatto)

Produzione di Norketamina (1/4 di attività)

Eliminata nelle urine

Nel gatto quasi completamente escreto nelle urine

Attenzione ai gatti con problemi urinari

CANE = 2 – 5 mg/kg IV-IM-SC
Gatto = 2 – 10 mg/kg IV-IM-SC

+

Alfa 2 agonisti
Benzodiazepine
Oppioidi

Ketamina

Acep. 0,04 mg/kg
Keta. 5 mg/kg
Atr. 0,02 mg/kg

Anestesia dissociata:

Anestesia leggera (incoscienza?)

Catatonia/catalessia

Rigidità muscolare/Ipertono/movimenti spontanei

Modesta analgesia somatica

Ipersensibilità ai suoni

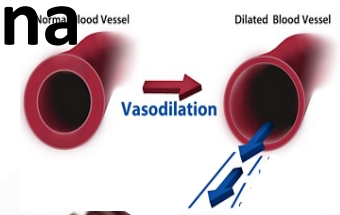
Riflessi dei nervi craniali mantenuti e aumentati

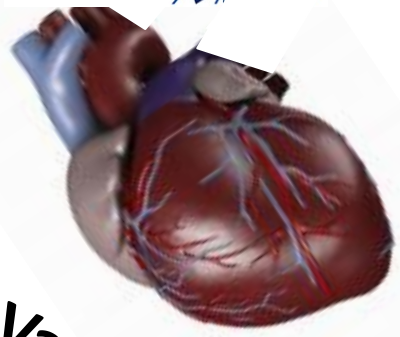
Nistagmo

Disconnessione dall'ambiente

Ketamina

Stimola il sistema nervoso simpatico





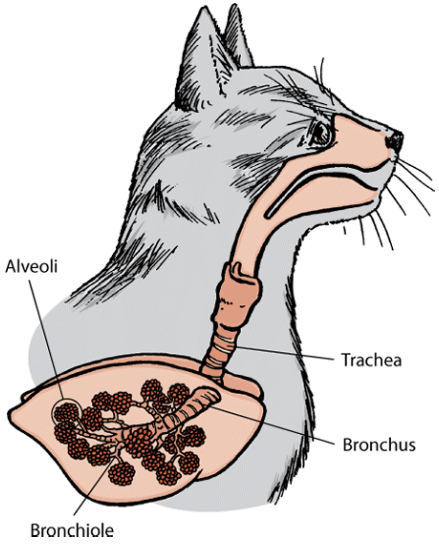
Aumento contrattilità miocardica

Aumento della Frequenza cardiaca

Vasocostrizione periferica

Aumento della pressione arteriosa

Vasodilatatore e miorilassante diretto!!!!



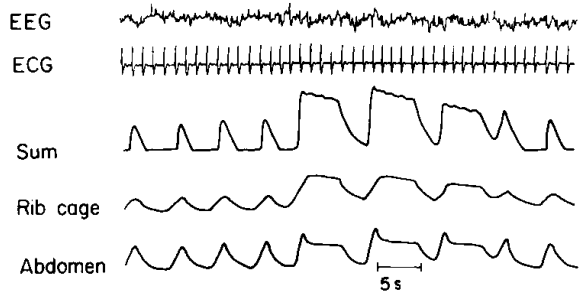
Depressione Respiratoria Minima/Assente

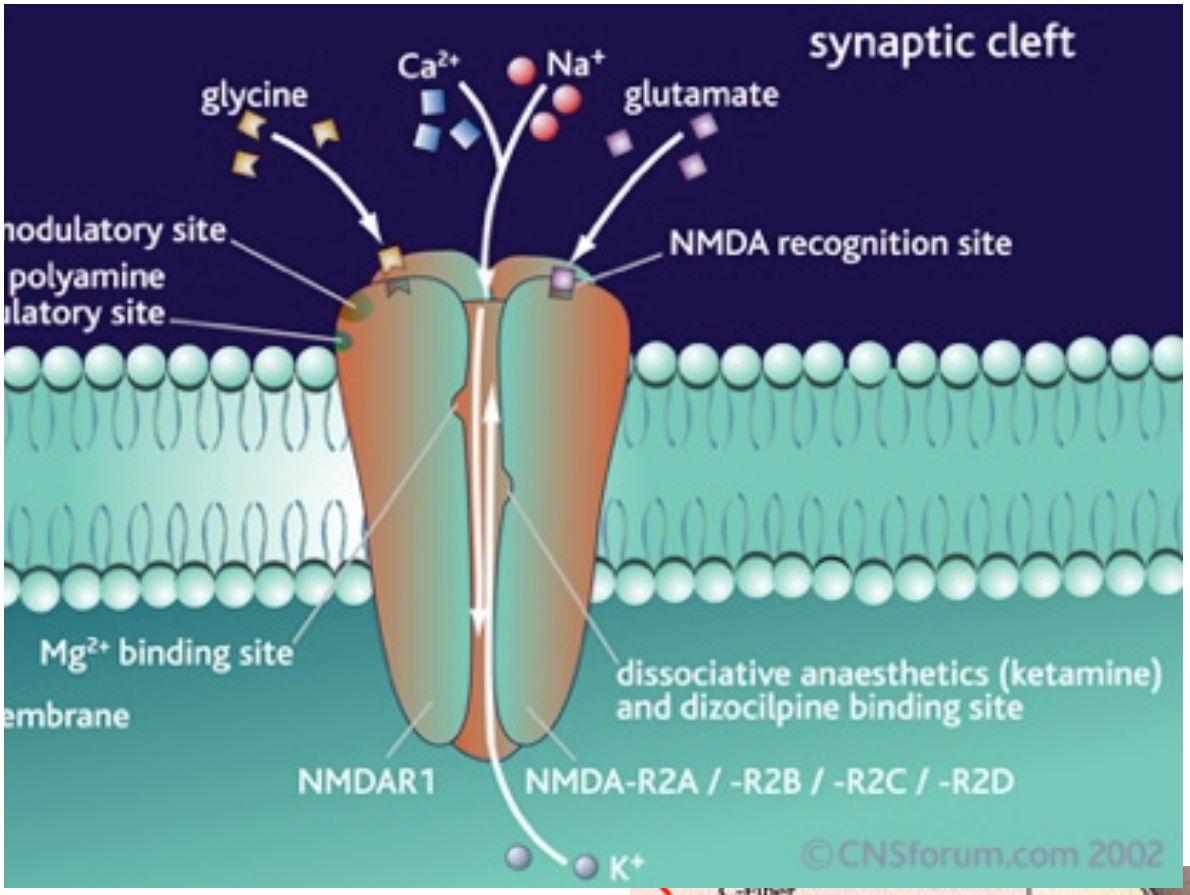
Respiro irregolare

Respiro apneustico

Mantiene la competenze delle vie aeree

Aumenta le secrezioni bronchiali



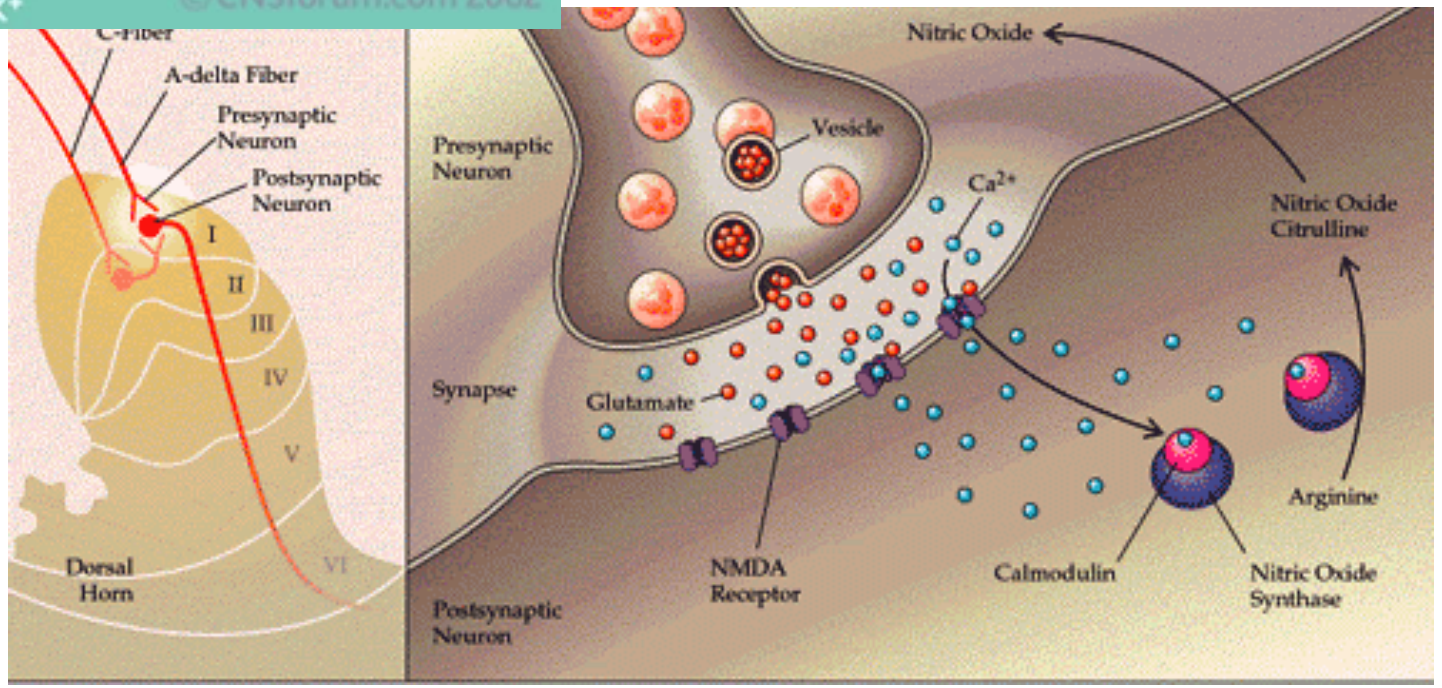


Antagonista Recettori NMDA

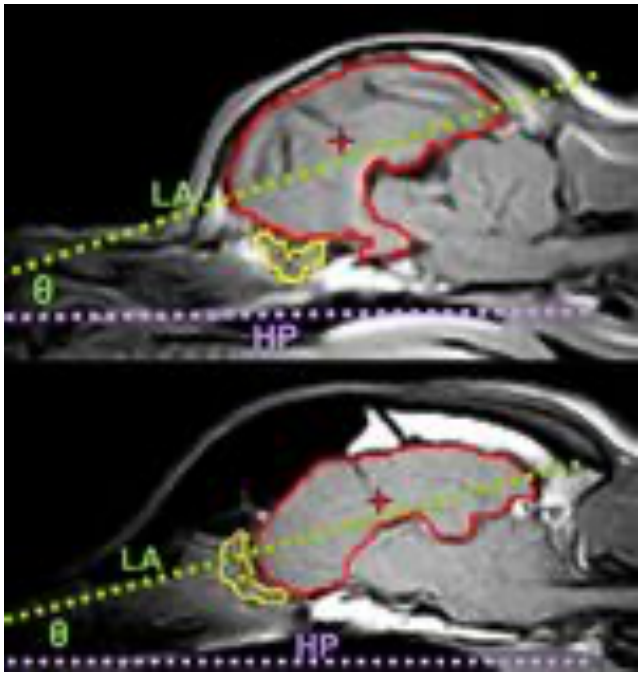
Dolore Somatico

Dolore Cronico

Non è sufficiente Come unico analgesico!!!



Ketamina



Aumenta la pressione intracranica

Aumenta la pressione intraoculare

Azione neuroprotettiva?

Anticonvulsivante?

Antagonista non-competitivo NMDA

Azione sui recettori GABAa (anticonvulsivanti?)

Azione sui recettori colinergici nicotinici e muscarinici

Azione sui recettori monoaminergici

ZOLETIL

Associazione di Tiletamina e Zolazepam a concetrazioni fisse

6-13 mg/kg IM

8-15 mg/kg IM

20-40 min.

Dosi supplementari dimezzate

Attenzione accumulo

ATTENZIONE

- ✓**Crisi convulsive**
- ✓**Trauma cranico**
- ✓**Effetto accumulo**
- ✓**Cardiopatici gravi**
- ✓**Risveglio con allucinazioni, atassia, vocalizzazioni**

ZBD/ZBDex

- Zoletil 100 (polvere)
- 2,5 ml Butorfanolo 10 mg/kg
- 2,5 ml Mede/Dexmede

ZD/ZDex

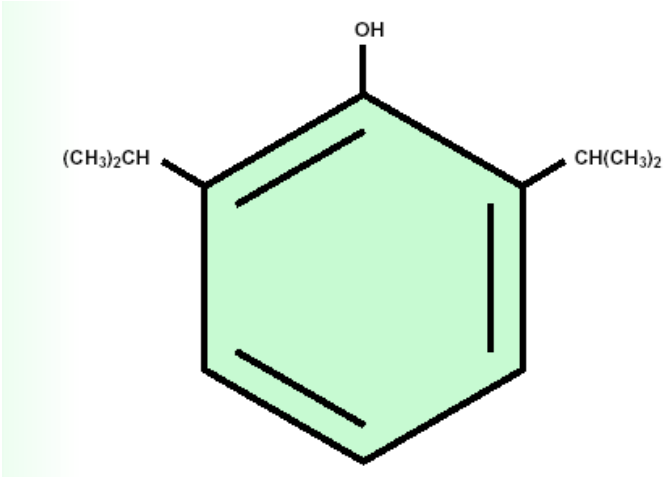
- Zoletil 100 (polvere)
- 2,5 ml Mede/Dexmede
- 2,5 ml acqua iniettabile

ZMD/ZMDex

- Zoletil 100 (polvere)
- 2,5 ml Metadone 10 mg/kg
- 2,5 ml Mede/Dexmede

Level of sedation required	TTDex or TTD (ml/kg IM)	TTDex or TTD (ml/kg IV)
Premedication (mild–moderate sedation)	0.01 ml/kg	0.005 ml/kg
Chemical restraint (profound sedation)	0.02 ml/kg	0.01 ml/kg
Surgical plane of anesthesia	0.03–0.035 ml/kg	0.0175 ml/kg
Surgical plane of anesthesia for more aggressive animals or more painful surgery	0.04 ml/kg	0.02 ml/kg

Propofol



+

2-6 di-isopropilfenolo

1983 Europa
1984 USA

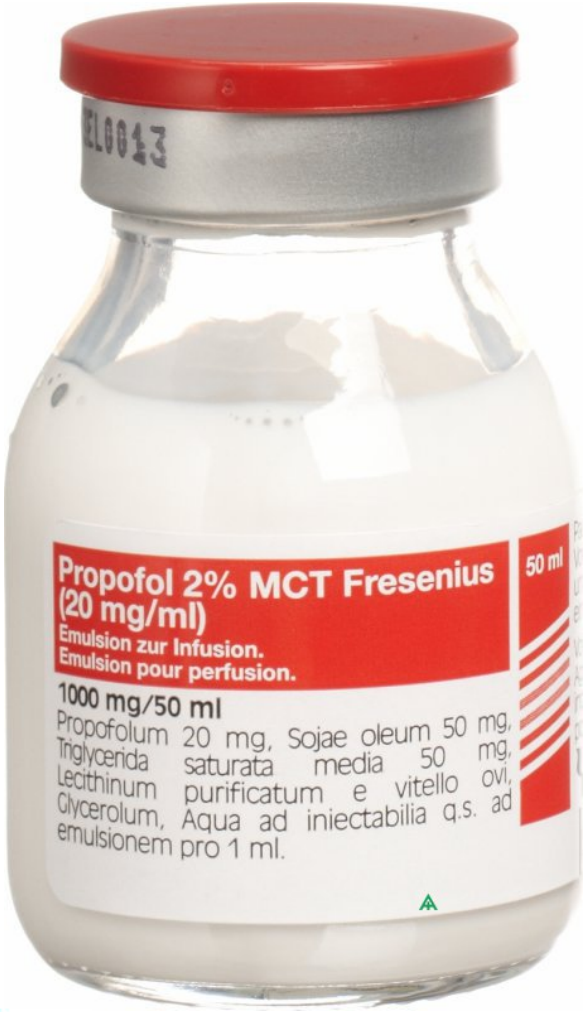
Olio di soia, glicerolo e fosfatidi purificati di uova.

Diiso PRopylhenol Intra Venous Anaesthetic

DiPrIVAn

Propofol

Propofol 1%



Propofol 2%

Propofol

Conservabilità

Supporta la crescita batterica

Tecnica sterile

Eliminare le fiale aperte da + di 24 ore

Conservanti:
1996 EDTA
1999 sodium metabisulfi

CASE REPORT

Lethal septic shock after dental scaling in a healthy dog due to *Ochrobactrum anthropi*-contaminated propofol

P. Franci, G. Dotto, A. Cattai and D. Pasotto

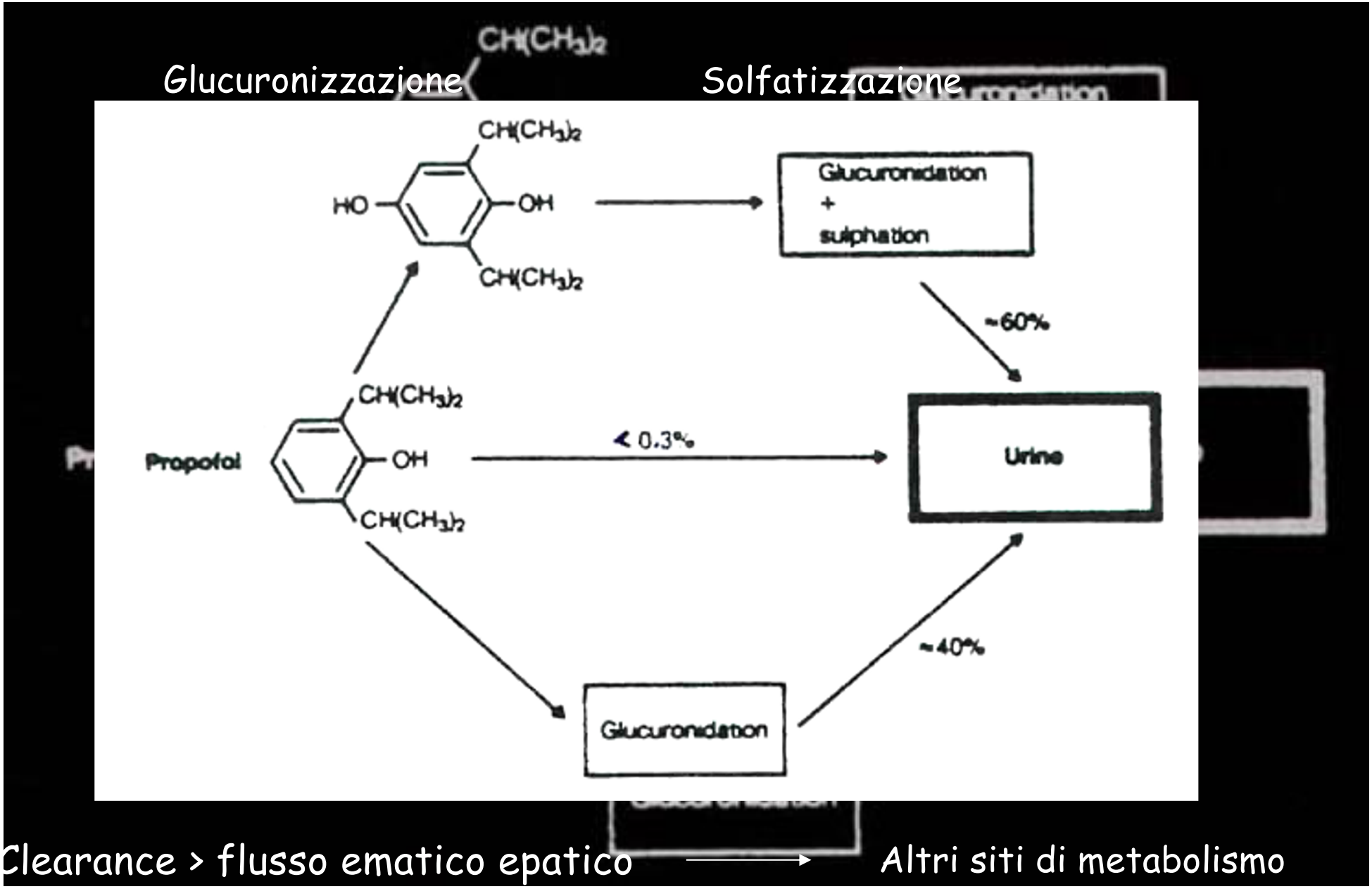
Department of Animal Medicine, Production and Health, University of Padua, Viale dell'Università, 16 - 35020, Legnaro (Padua), Italy

Journal of Small Animal Practice (2014)
DOI: 10.1111/jsap.12284

Accepted: 31 August 2014

Propofol

Metabolismo



Propofol

Metabolismo Gatti

LIPPINCOTT WILLIAMS & WILKINS

Pharmacogenetics

- This journal has ceased publication.
- Articles are no longer accepted for this title.
- Succeeded by: Pharmacogentics and Genomics (ISSN: 1744-6872)

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Volume 10(4), June 2000, pp 355-369

Molecular genetic basis for deficient acetaminophen glucuronidation by cats: UGT1A6 is a pseudogene, and evidence for reduced diversity of expressed hepatic UGT1A isoforms

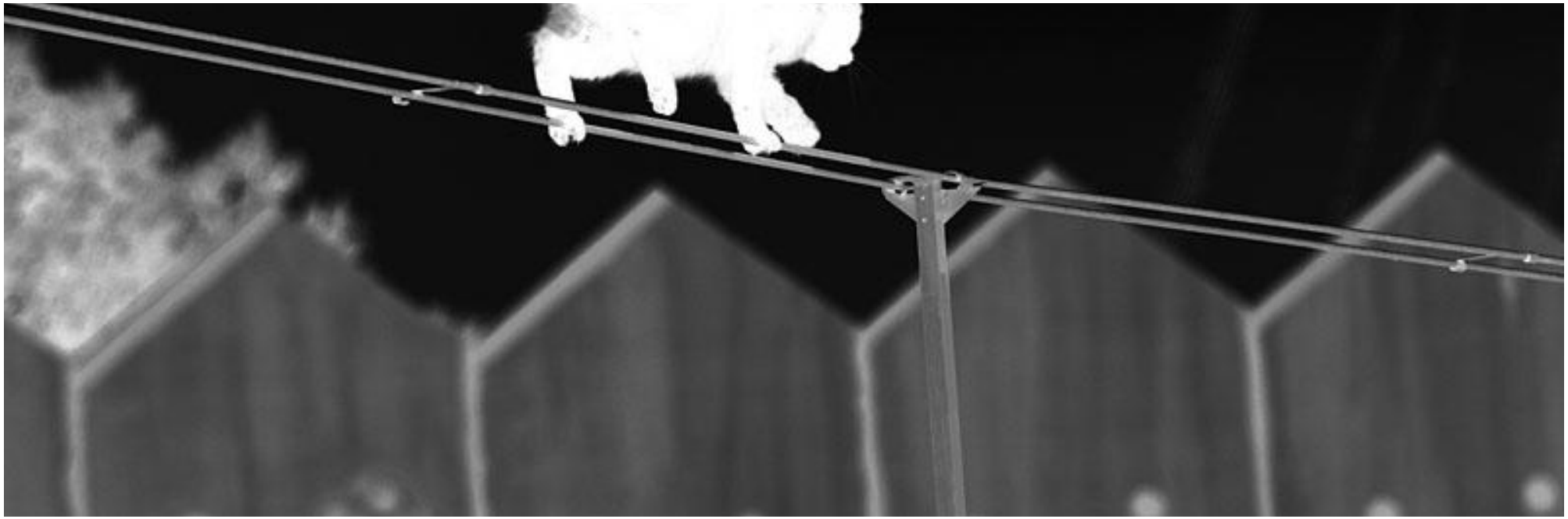
[Original Article]

Court, Michael H.[a,b]; Greenblatt, David J.[a]

[a]Department of Pharmacology and Experimental Therapeutics, Tufts University School of Medicine, Boston, Massachusetts and [b]Department of Clinical Sciences, Tufts University School of Veterinary Medicine, North Grafton, Massachusetts, USA

Received 18 September 1999; accepted 8 November 1999

Correspondence to Michael H. Court, Department of Pharmacology and Experimental Therapeutics, Tufts University, 136 Harrison Avenue, Boston MA 02111, USA; Tel: +1 617 636 2741; fax: +1 617 636 6738; e-mail: mcourt01@emerald.tufts.edu



Propofol

Metabolismo Gatti

Vet Surg. 1995 May-Jun;24(3):277-82

The effects of consecutive day propofol anesthesia on feline red blood cells.

Andress JL, Day TK, Day D.
Mississippi State University, College of Veterinary Medicine, Mississippi State 39762-9825, USA.

Propofol 6 mg/kg IV + 0,2-0,3 mg/kg/min x 30 minx 7 gg
- In 2ª giornata >> tempi di risveglio
- 5/6 malessere generalizzato in 5°-6° e 7° gg
- In 3ª giornata >> Corpi di Heinz

Propofol 6 mg/kg iv x 3gg
- 10 cani e 10 gatti
- No > sign tempi risveglio
- No > clinicamente sign CH

JOURNAL of the American Animal Hospital Association

Repetitive Propofol Administration in Dogs and Cats

A bolus of propofol was administered to 10 dogs (6 mg/kg intravenously [IV]) and 10 cats (10 mg/kg IV) on three consecutive days. The occurrence of apnea, heart and respiratory rates, blood pressure, time to movement, and changes in a complete blood count and biochemical profile were recorded. Apnea was not seen in the dogs but was seen in three cats. Slight increases in the number of Heinz bodies were seen in six cats, but the increases were not considered clinically significant. No apparent cumulative adverse effects were seen from a bolus of bisulfite-containing propofol, administered on three consecutive days. J Am Anim Hosp Assoc 2004:40:255-260.

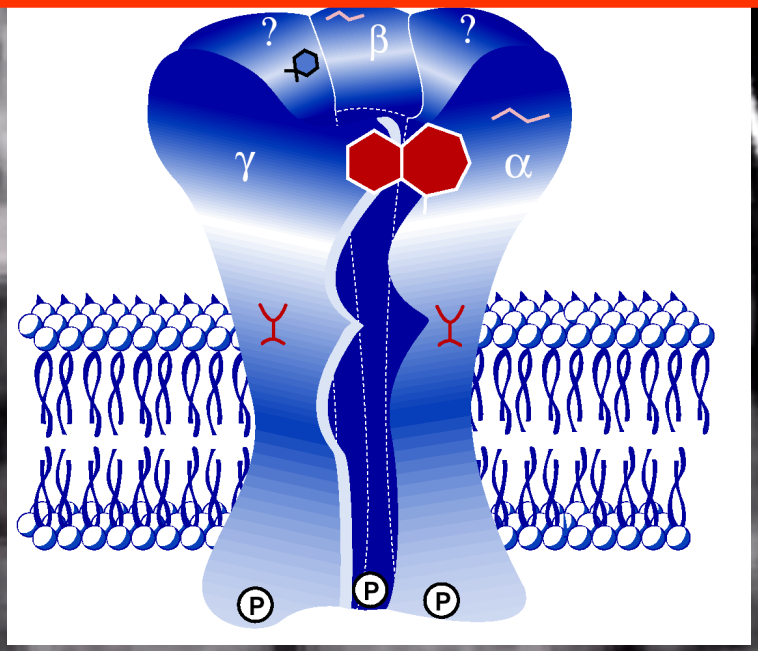
July/August 2004, Vol. 40

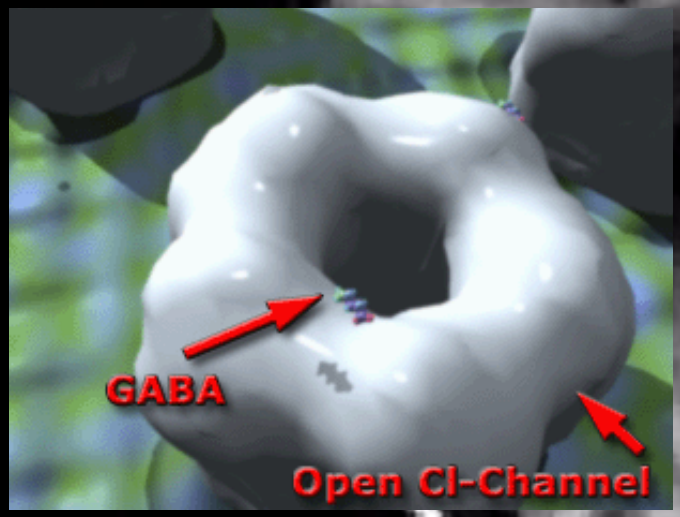
SNC

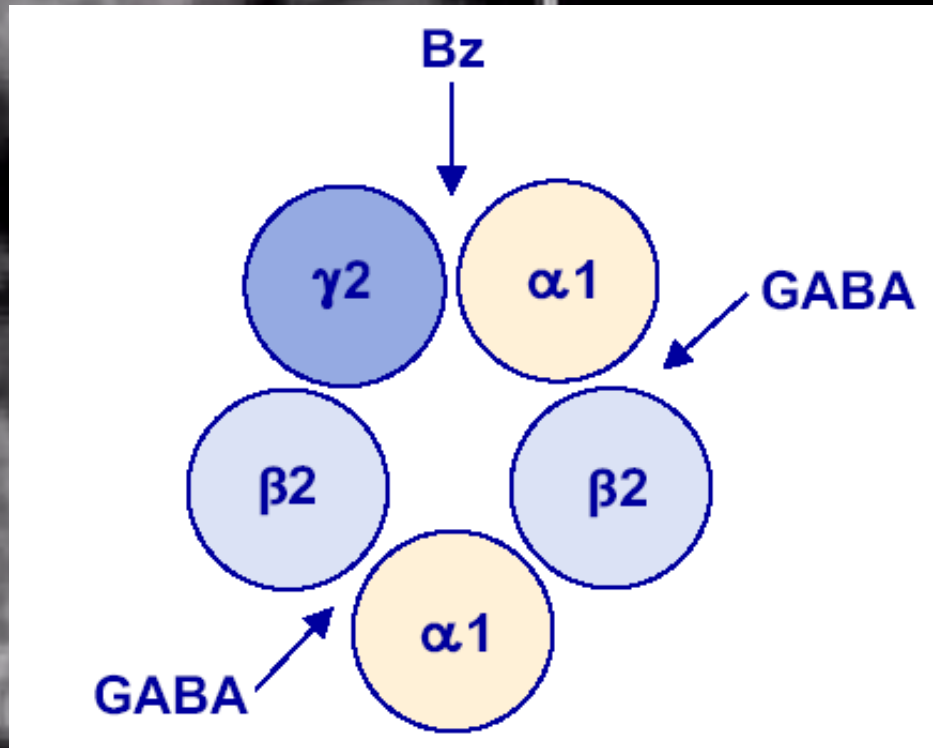
Azione Ipnotica

Azione Gabaergica
Sub β rec. $GABA_A$

Ippocampo
<< Acetilcolina







SNC

Senso di benessere

↑ Dopamina

Anesthesiology. 1992 Nov;77(5):1037-8. Links

Sexual illusions and propofol sedation.

•Kent EA,
•Bacon DR,
•Harrison P,
•Lema MJ.
State University of New York, Buffalo.

Anaesthesia, 1997, **52**, pages 750–755

Dreams, images and emotions associated with propofol anaesthesia

B. Brandner,[1] M. Blagrove,[2] G. McCallum[1] and L. M. Bromley[1]

1 Academic Department of Anaesthetics, University College London School of Medicine, Room 103, The Middlesex Hospital, Mortimer Street, London W1N 8AA, UK
2 Department of Psychology, Singleton Park, University of Wales, Swansea SA2 8PP, UK

In conclusion we found that patients anaesthetised with propofol had more dreams than those anaesthetised with thiopentone. The incidence of dreams where the content could be recalled was also higher with propofol. Patients who received propofol were less nauseated, less sick and were happier than those who were given thiopentone.

SNC-convulsioni

Il propofol ha un'attività anticonvulsivante, dimostrata in studi clinici e sperimentali nell'uomo e negli animali

- Trattamento dello stato epilettico nell'uomo e negli animali
- Per l'anestesia generale in corso di chirurgia epilettica
- Per l'anestesia generale in pazienti con problemi intracranici

Bassa incidenza di fenomeni eccitatori correlati all'uso del propofol nel 'uomo e negli animali

- Eziologia ancora non chiarita
- Probabilmente per un'azione a livello subcorticale

J Am Anim Hosp Assoc. 1996 Jul-Aug;32(4):365-8.

Excitatory movements in a dog following propofol anesthesia.

Smedile LE, Duke T, Taylor SM.

Department of Veterinary Internal Medicine, Western College of Veterinary Medicine, Saskatoon, Saskatchewan, Canada.

A two-year-old, neutered male Labrador retriever was anesthetized with intravenous propofol for bronchoscopy to remove a bronchial foreign body. The dog previously had been diagnosed with idiopathic epilepsy. During anesthetic recovery, the dog exhibited excitatory movements characterized by forelimb extensor rigidity, opisthotonos, generalized tremors, paddling, horizontal nystagmus, and facial twitching. Intravenous administration of pentobarbital temporarily stopped the motor activity. The excitatory movements persisted for 20 hours. The dog went on to recover completely, although he remained an epileptic, having one brief, generalized grand mal seizure every three-to-four months.

App. Respiratorio

Depressione respiratoria - Apnea

Dose
Velocità di infusione
Farmaci concomitanti

Potenzia la vasocostrizione ipossica polmonare

App. Respiratorio

Broncodilatazione

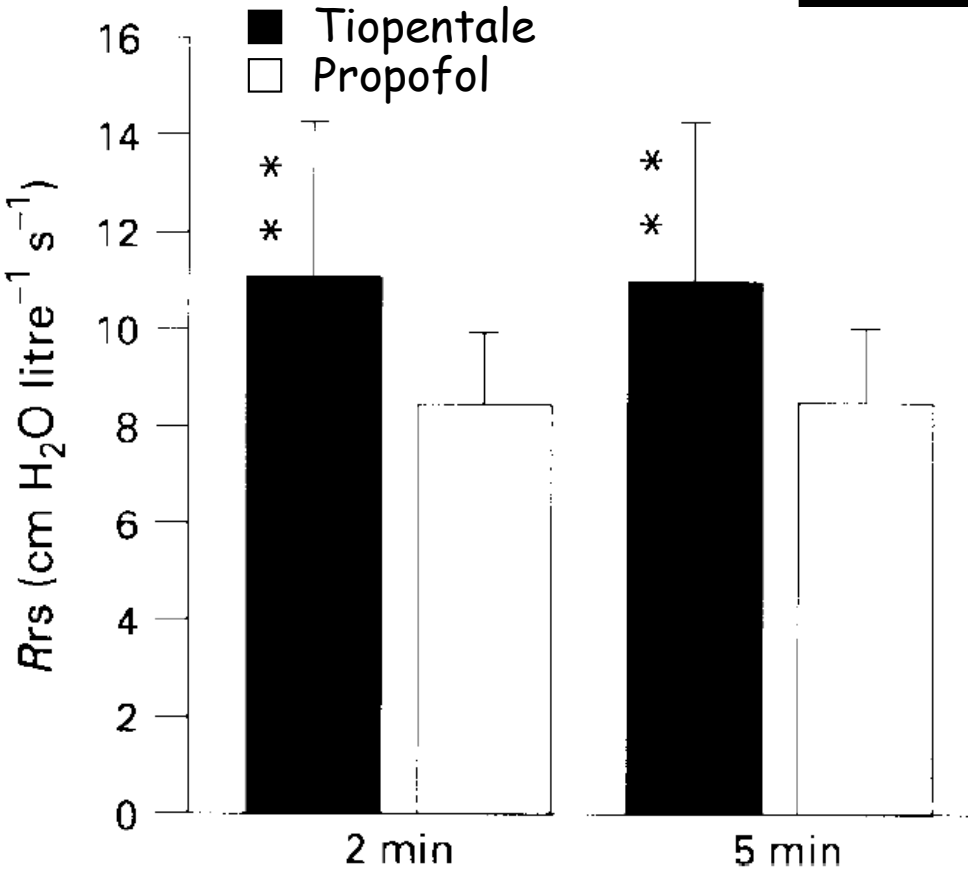
British Journal of Anaesthesia 1996; 77: 735–738

Comparative effects of thiopentone and propofol on respiratory resistance after tracheal intubation

R. S. C. WU, K. C. WU, D. C. W. SUM AND M.

Azione anticolinergica

Azione miorilassante locale
< Ca^{2+} intracellulare



App. Respiratorio

Prime vie aeree

Anesthesiology 2003; 99:596–602
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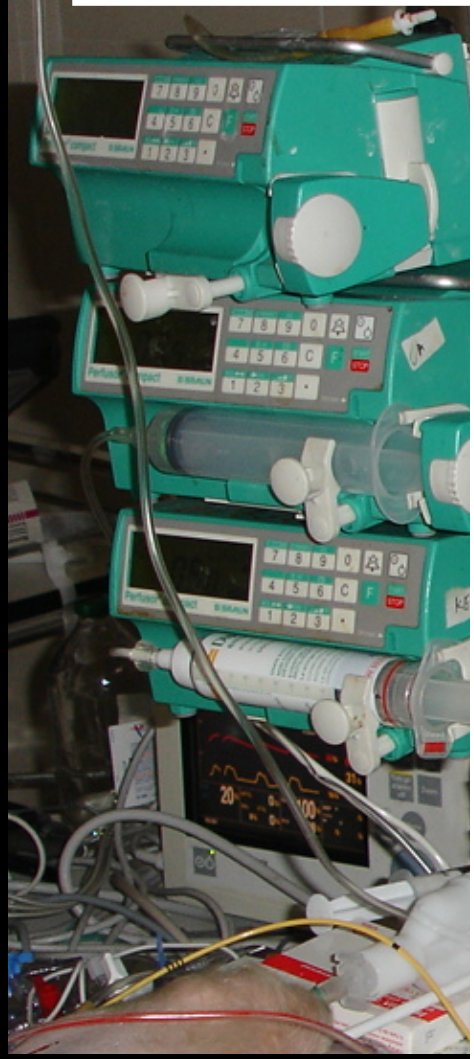
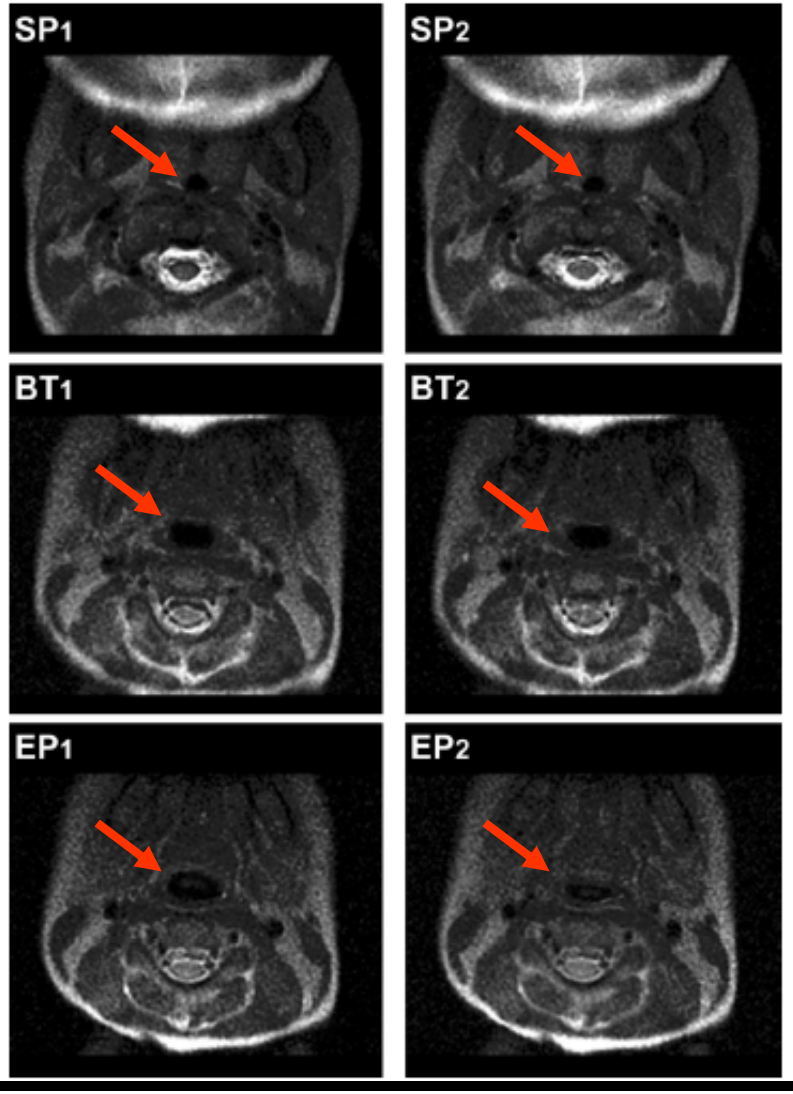
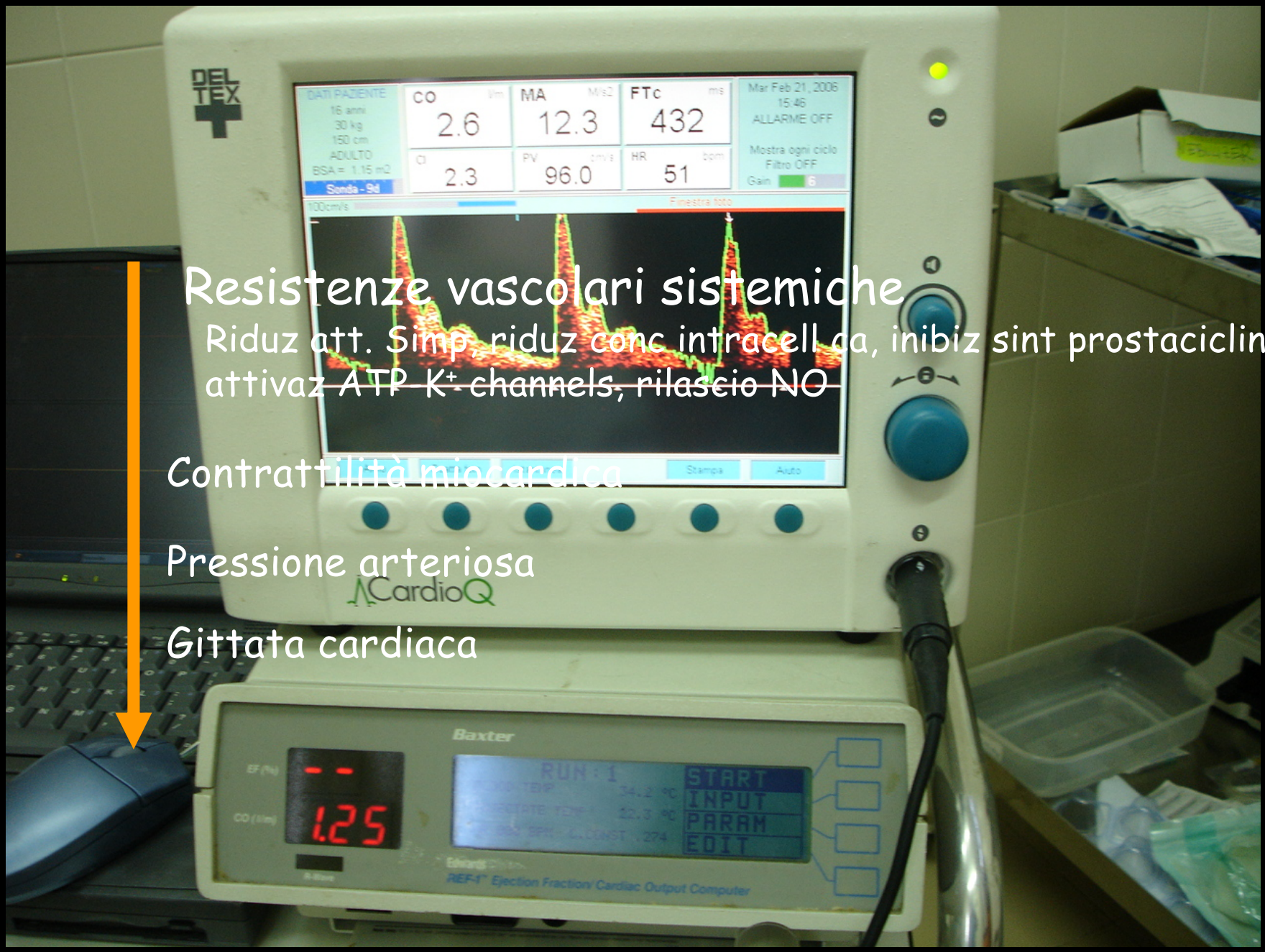
Effect of Increasing Depth of Propofol Anesthesia on Upper Airway Configuration in Children

Russell G. Evans, M.B.B.S., F.R.C.A., Mark W. Crawford, M.B.B.S., F.R.C.P.C.,† Michael D. Noseworthy, Ph.D.,‡ Shi-Joon Yoo, M.D., F.R.C.P.C.§*





App. Cardiocircolatorio



Resistenze vascolari sistemiche

Riduz att. Simp, riduz conc intracell ca, inibiz sint prostacicline, attivaz ~~ATP-K+ channels, rilascio NO~~

Contrattilità miocardica

Pressione arteriosa

Gittata cardiaca

Alfaxolone

Steroide Neuroattivo

Attività gabaergica

Per l'induzione e per il mantenimento

Somministrazione IV e IM

Depressione cardiovascolare e respiratoria

Alti volumi per somm IM

Non contiene sost. Preservative antimicrobiche

Da eliminare dopo 6 ore dall'apertura

Latenza 60 secondi

Durata 15 – 30 minuti

[redacted]

ALFAXAN Induction Dose Guidelines: CATS

Preanesthetic	Average ALFAXAN induction dose and range (mg/kg)	Number of cats
No preanesthetic	4.0 (2.2 – 9.7)	33
Opioid + phenothiazine	3.2 (1.1 – 10.8)	96
Benzodiazepine + phenothiazine	3.6 (1.5 – 7.1)	23
Benzodiazepine + opioid + phenothiazine	2.3 (1.2 – 5.0)	26
$Alpha_2$-adrenergic agonist with/without phenothiazine	3.6 (1.1 – 5.0)	15
$Alpha_2$-adrenergic agonist + phenothiazine with/without benzodiazepine or opioid	2.9 (1.0 – 3.9)	11

[redacted]

ALFAXAN Maintenance Dose Guidelines: CATS

Dose and Duration	Preanesthetized cats	Unpreanesthetized cats
Maintenance anesthesia doses	1.1 – 1.3 mg/kg	1.4 – 1.5 mg/kg
Mean duration of anesthesia	7 – 8 minutes	3 – 5 minutes

[redacted]

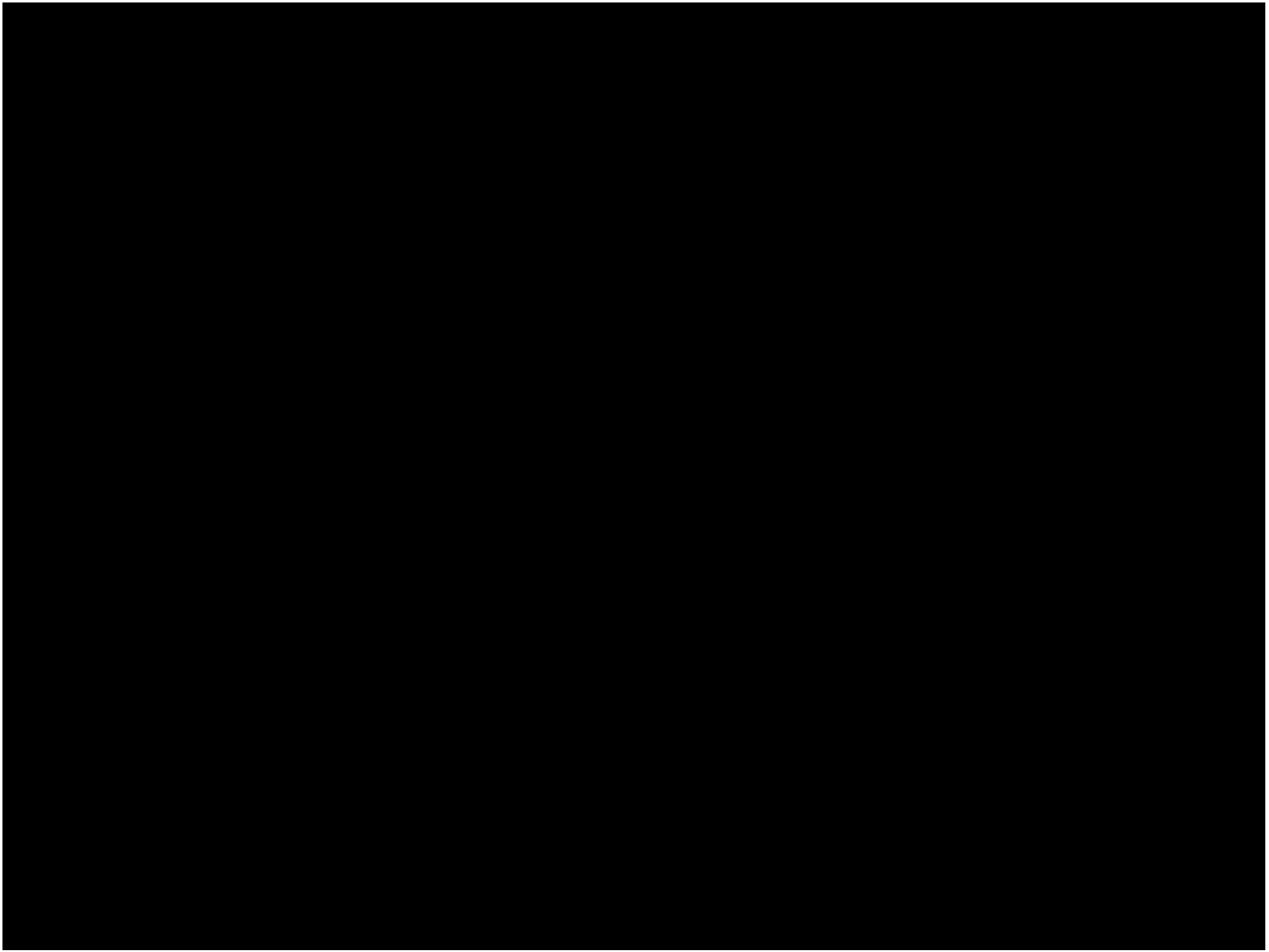
ALFAXAN Induction Dose Guidelines: DOGS

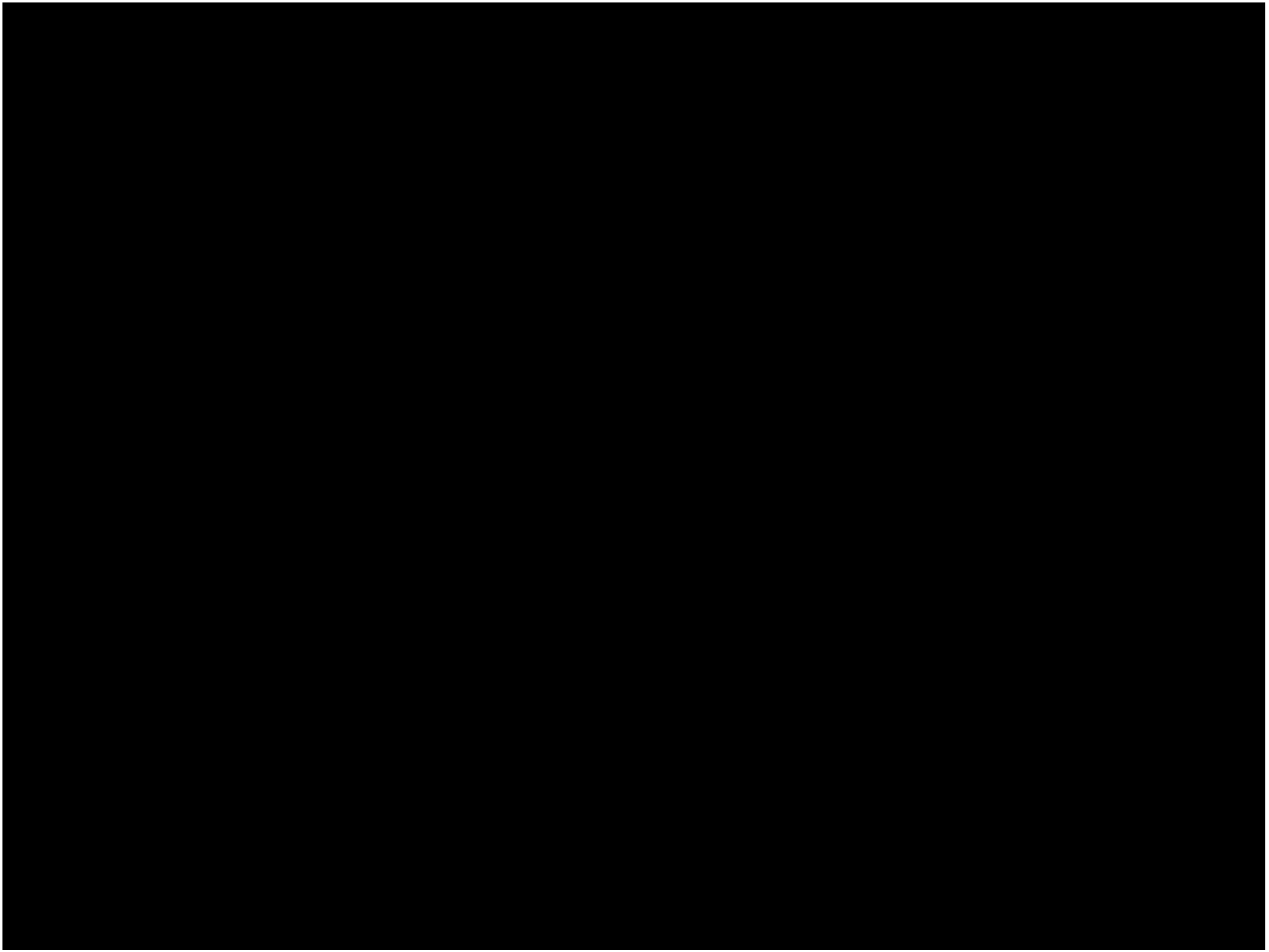
Preanesthetic	Average ALFAXAN induction dose and range (mg/kg)	Number of dogs
No preanesthetic	2.2 (1.5 - 4.5)	17
Benzodiazepine + opioid + acepromazine	1.7 (0.9 - 3.5)	39
Opioid + acepromazine	1.6 (0.6 - 3.5)	80
Alpha$_2$-agonist	1.1 (0.21 - 2.00)	9

ALFAXAN Maintenance Dose Guidelines: DOGS

	Preanesthetized dogs	Unpreanesthetized dogs
Maintenance anesthesia doses	1.2 – 1.4 mg/kg	1.5 – 2.2 mg/kg
Mean duration of anesthesia	6 – 8 minutes	6 – 8 minutes


Metadone (0,35mg/kg) + Dexmedetomidina (1,7µg/kg) + Alfaxalone (1mg/kg)
Meta. 0,2ml (10mg/ml) + Dexmed. 0,1ml (0,1mg/ml) + Alfax. 0,6ml (10mg/ml)





SNC

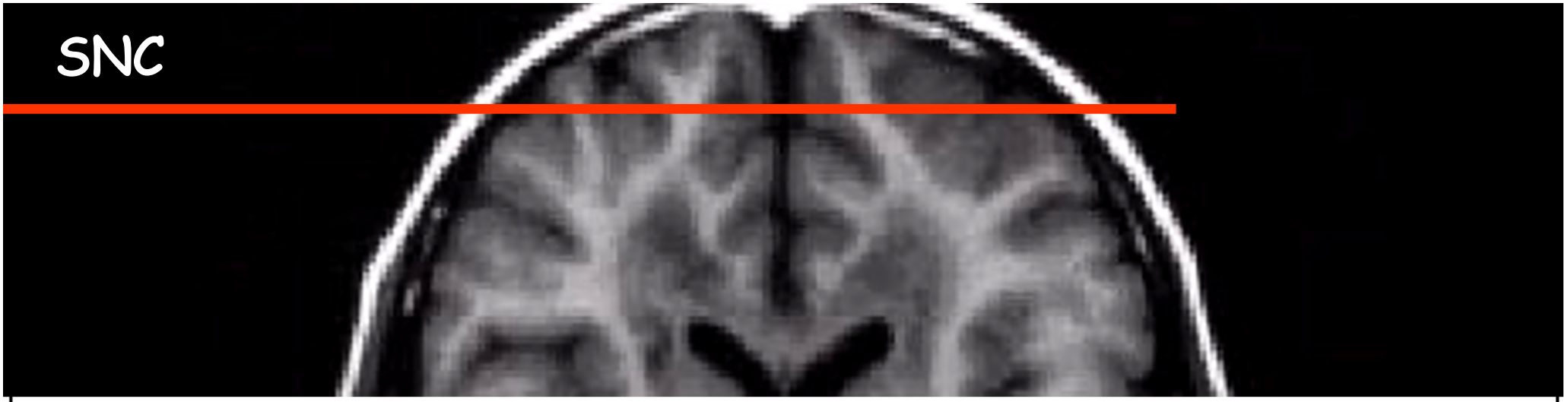
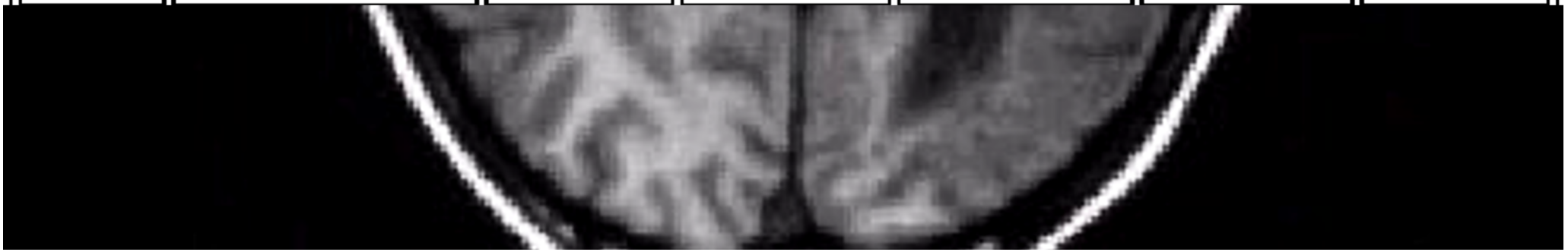


Table 1. Comparative Central Nervous Effects of Injectable Anesthetic Agents						
	Blood-Brain Equilibration (minutes)	Cerebral Blood Flow	Cerebral Metabolism	Cerebral Perfusion Pressure	Intracranial Pressure	Seizure Threshold in Epileptic Patient
Thiopental	1	--*	--	0 to -	--	++
Etomidate	1	--	--	0	--	-†
Propofol	3	--	--	--	--	-†
Ketamine	1	++	+	+	+	-†



App. Respiratorio

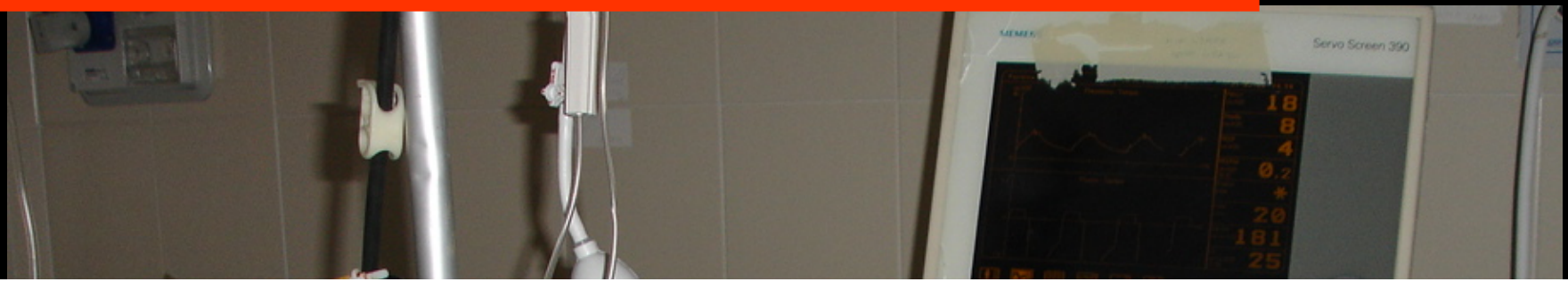
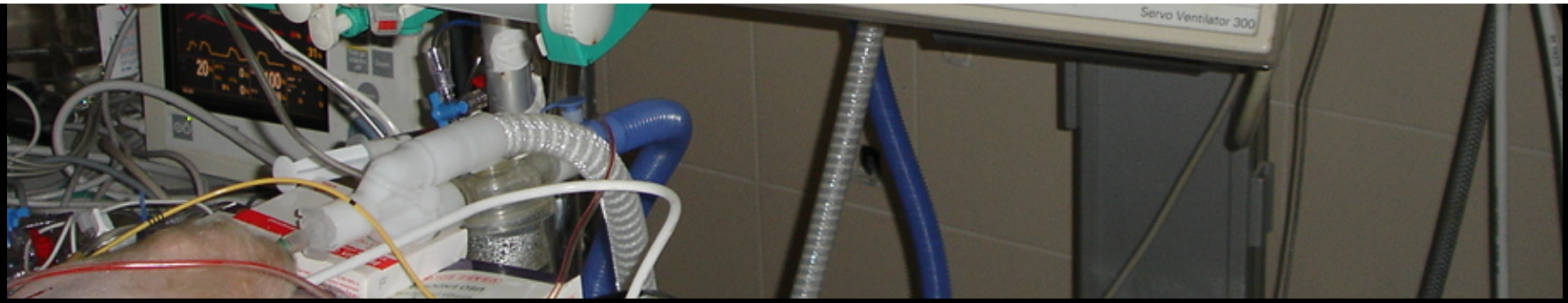


Table 3. Comparative Respiratory Effects of Injectable Anesthetic Agents

	Respiratory Depression	Response to Carbon Dioxide	Hypoxic Pulmonary Vaso-constriction	Respiratory Tract Responses	Bronchomotor Tone	Ciliary Function
Thiopental	++*	--	0	+	+	-
Etomidate	0	-	0	-	0	-
Propofol	++	--	+	--	-	0
Ketamine	+	-	0	+	-	-



App. Cardiocircolatorio

Table 2. Comparative Cardiovascular Effects of Injectable Anesthetic Agents in Healthy Dogs

	Cardiac output	Heart Rate	Arterial Blood Pressure	Systemic Vascular Resistance	Arrhythmic Threshold
Thiopental	0 to -*	+	0 to +	0	--
Etomidate	0	0	0	0	0
Propofol	0 to -	0 to -	0 to -	0 to -	-
Ketamine	0 to +	++	0 to +	0 to +	-