

Literature: Insightful Picks

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March 2013
Volume 118, Number 3
ISSN 0003-3022



ANESTHESIOLOGY
The Journal of the American Society of Anesthesiologists, Inc. • anesthesiology.org

Propofol Anesthesia Impairs the Maturation and Survival of Adult-born Hippocampal Neurons

Marine Krzisch, M.Sc.,* Sébastien Sultan, Ph.D.,† Julie Sandell, M.Sc.,* Kornél Demeter, Ph.D.,‡ Laszlo Vutskits, M.D., Ph.D.,§ Nicolas Toni, Ph.D.‖

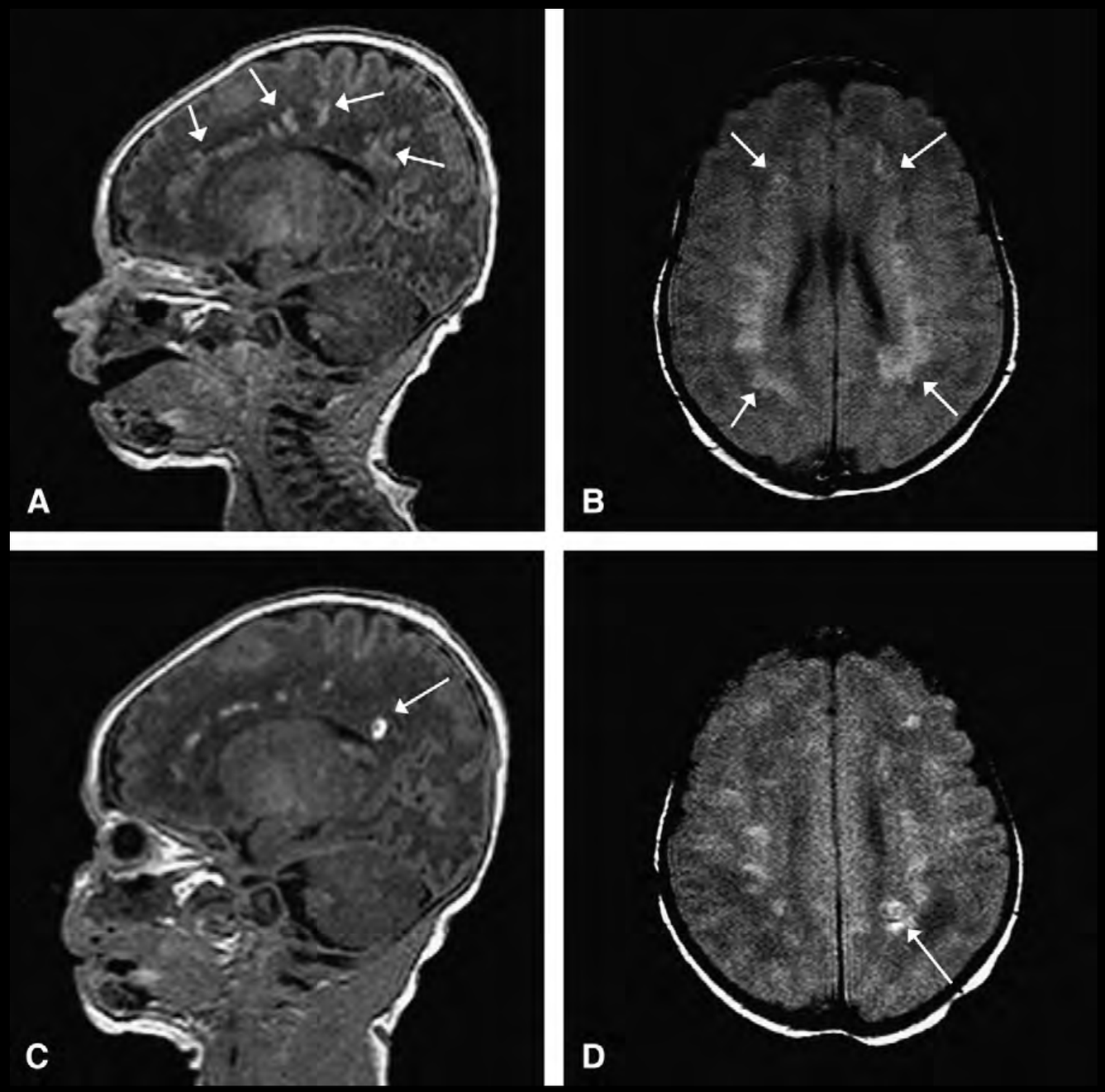
University of Lausanne and University of Geneva, Switzerland

55%

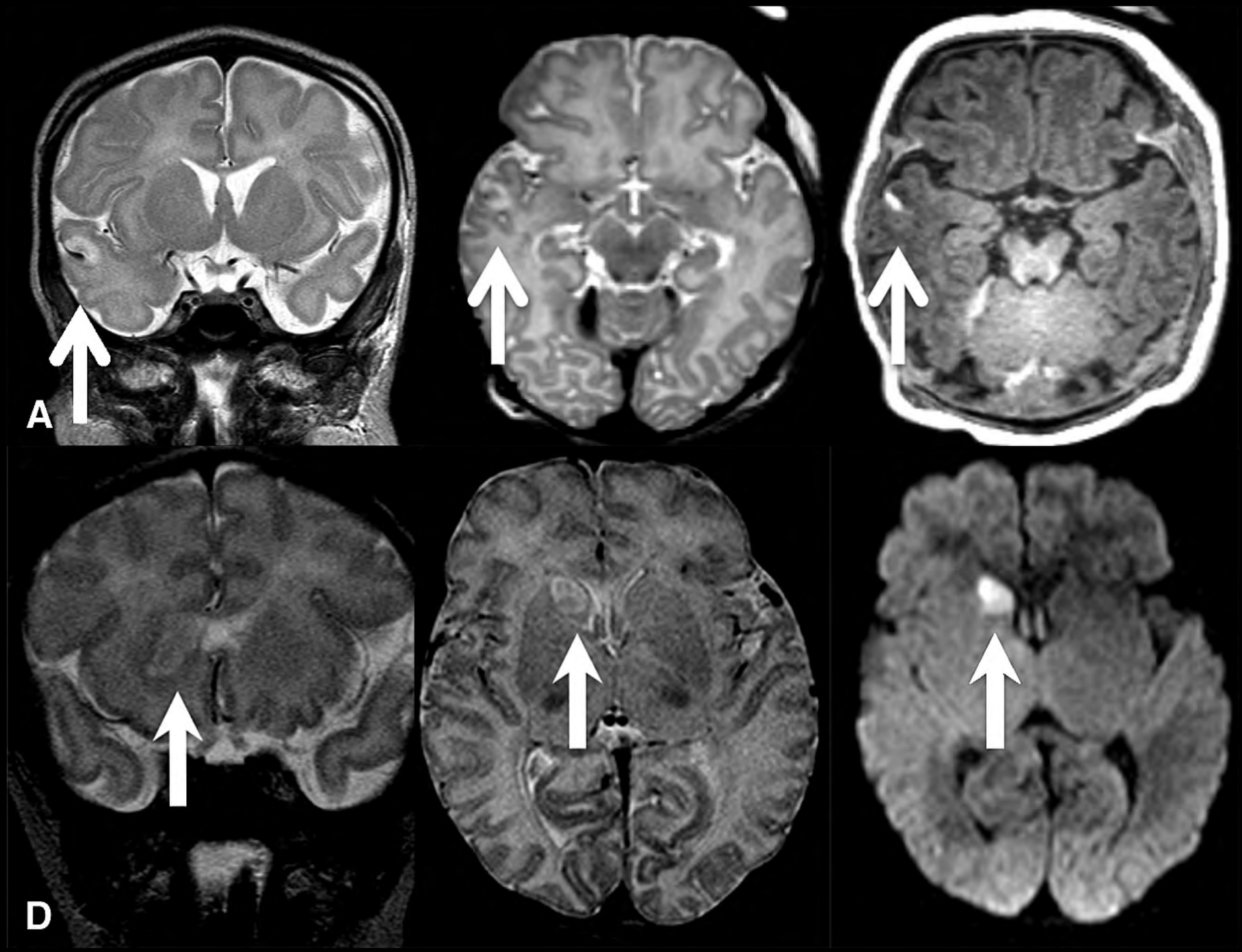


Hövels-Gürich HH et al., JTCVS 2002
Marino BS et al., Circulation 2012
Andropoulos DB et al., Ann Thorac Surg 2013

40%



Galli KK et al., JTCVS 2004
Dent CL et al., JTCVS 2005
Andropoulos DB et al., JTCVS 2013

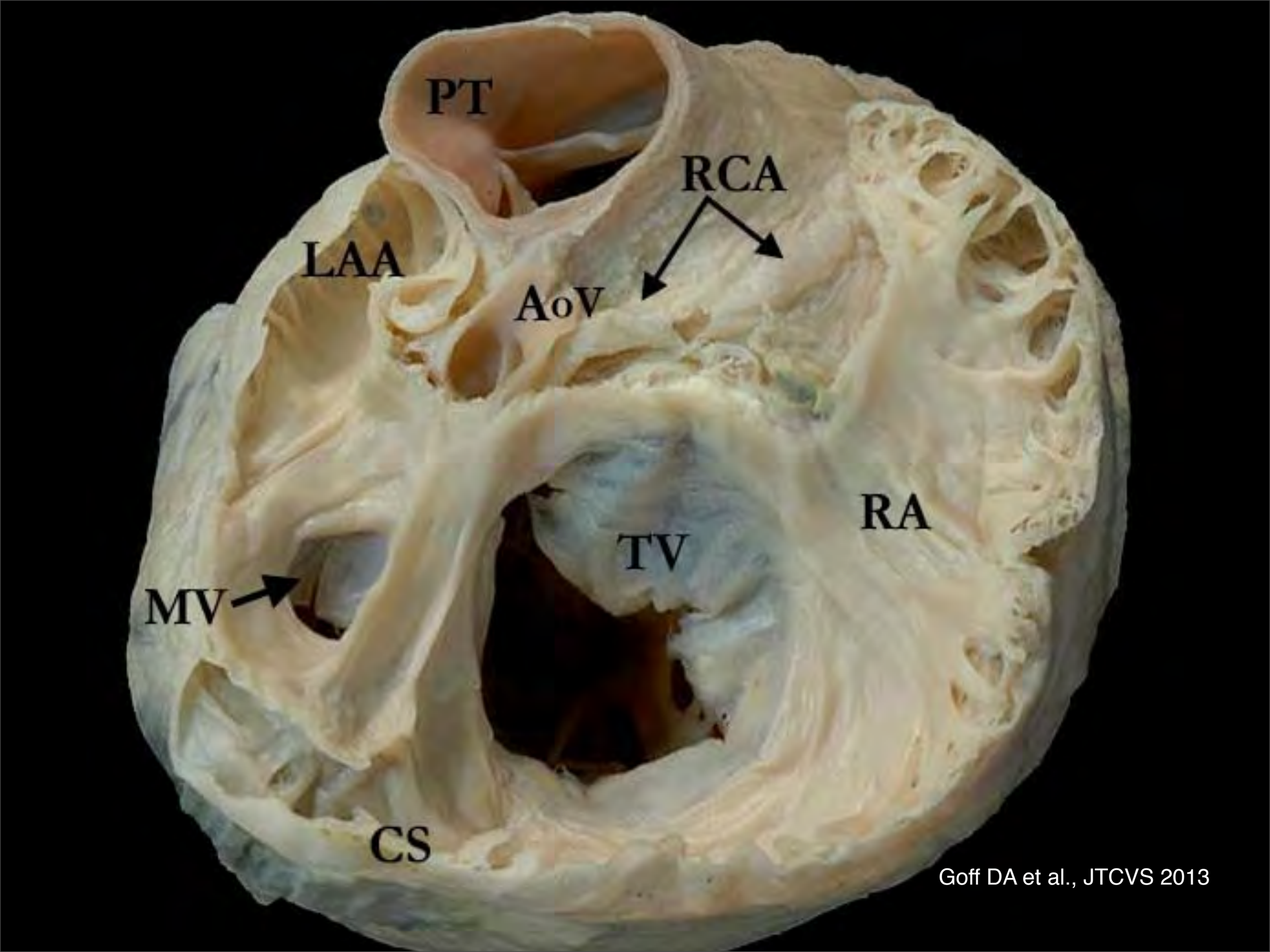


Goff DA et al., JTCVS 2013



Goff DA et al., JTCVS 2013

image source: wikimedia



Goff DA et al., JTCVS 2013



Goff DA et al., JTCVS 2013


Licht DJ et al., JTCVS 2004
image source: dailymail.co.uk



Dimitropoulos A et al., Neurology 2013

image source: de.academic.ru

Pediatric Anesthesia

Pediatric Anesthesia ISSN 1155-5645

ORIGINAL ARTICLE

The association between brain injury, perioperative anesthetic exposure, and 12-month neurodevelopmental outcomes after neonatal cardiac surgery: a retrospective cohort study

Dean B. Andropoulos[1,2,3], Hasan B. Ahmad[1,2,4], Taha Haq[1,2], Ken Brady[1,2,3], Stephen A. Stayer[1,2,3], Marcie R. Meador[1,2,3], Jill V. Hunter[5,6], Carlos Rivera[2,7], Robert G. Voigt[2,8], Marie Turcich[2,8], Cathy Q. He[1,2], Lara S. Shekerdemian[2,9], Heather A. Dickerson[2,10], Charles D. Fraser[11,12], E. Dean McKenzie[11,12], Jeffrey S. Heinle[11,12] & R. Blaine Easley[1,2,3]

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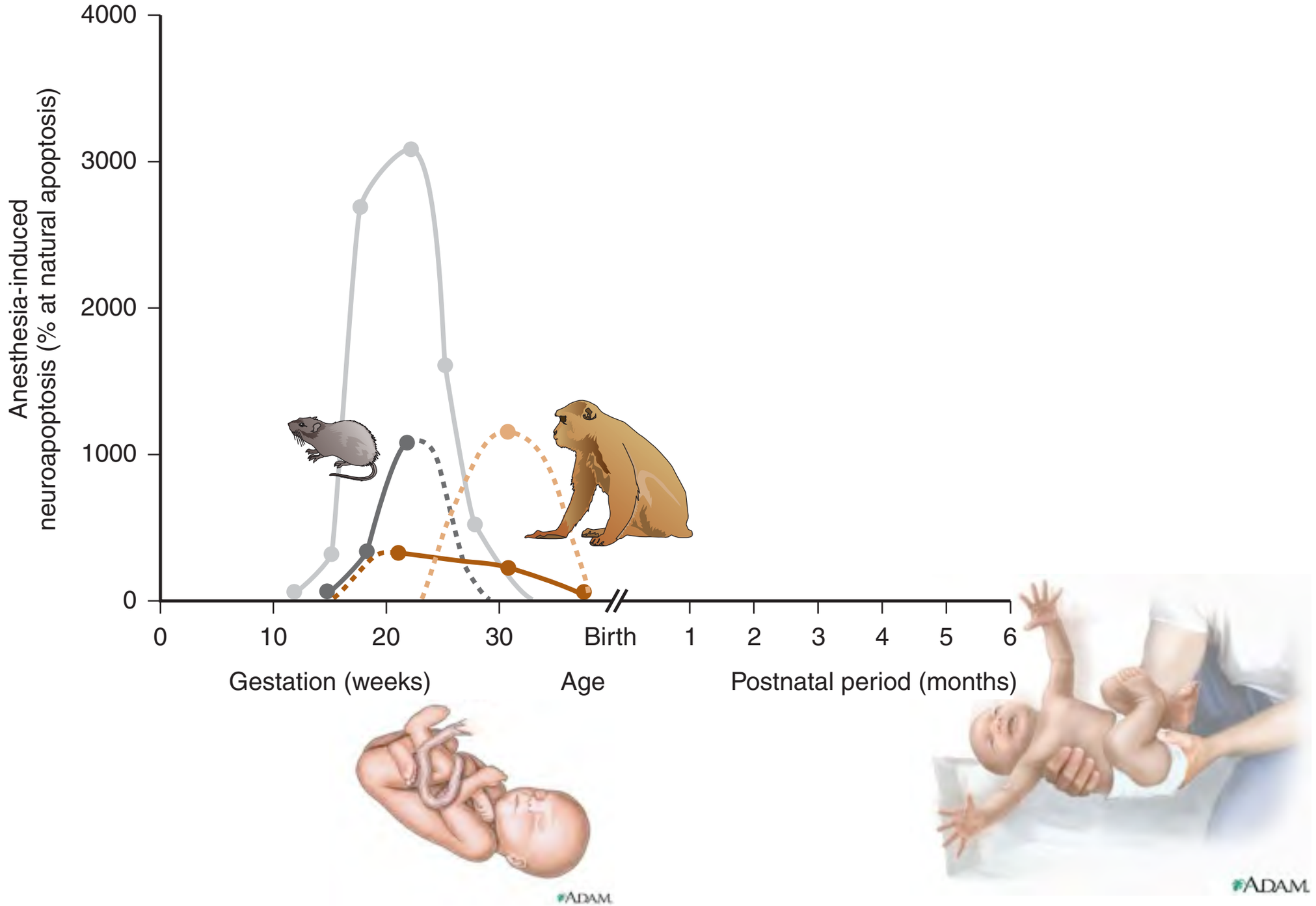



PROPOFOL
INJECTABLE EMULSION, 1%
For IV Administration
1 g/100 mL
(10 mg/mL)
CONTAINS BENZYL ALCOHOL
Sterile, nonpyrogenic
SHAKE WELL BEFORE USE
Rx ONLY
Patent Pending
VIAL HANGER LA
PROPOFOL
INJECTABLE EMULSION, 1%
For IV Administration
500 mg/50 mL
(10 mg/mL)
CONTAINS BENZYL ALCOHOL
Sterile, nonpyrogenic
SHAKE WELL BEFORE USE
Rx ONLY
VIAL HANGER LABEL - SIZ
PROPOFOL
INJECTABLE EMULSION, 1%
For IV Administration
200 mg/20 mL
(10 mg/mL)
CONTAINS BENZYL ALCOHOL
Sterile, nonpyrogenic
SHAKE WELL BEFORE USE
Rx ONLY


0
Vol %
VANBON Mic 200
Sevoflurane



Developmental Equivalency



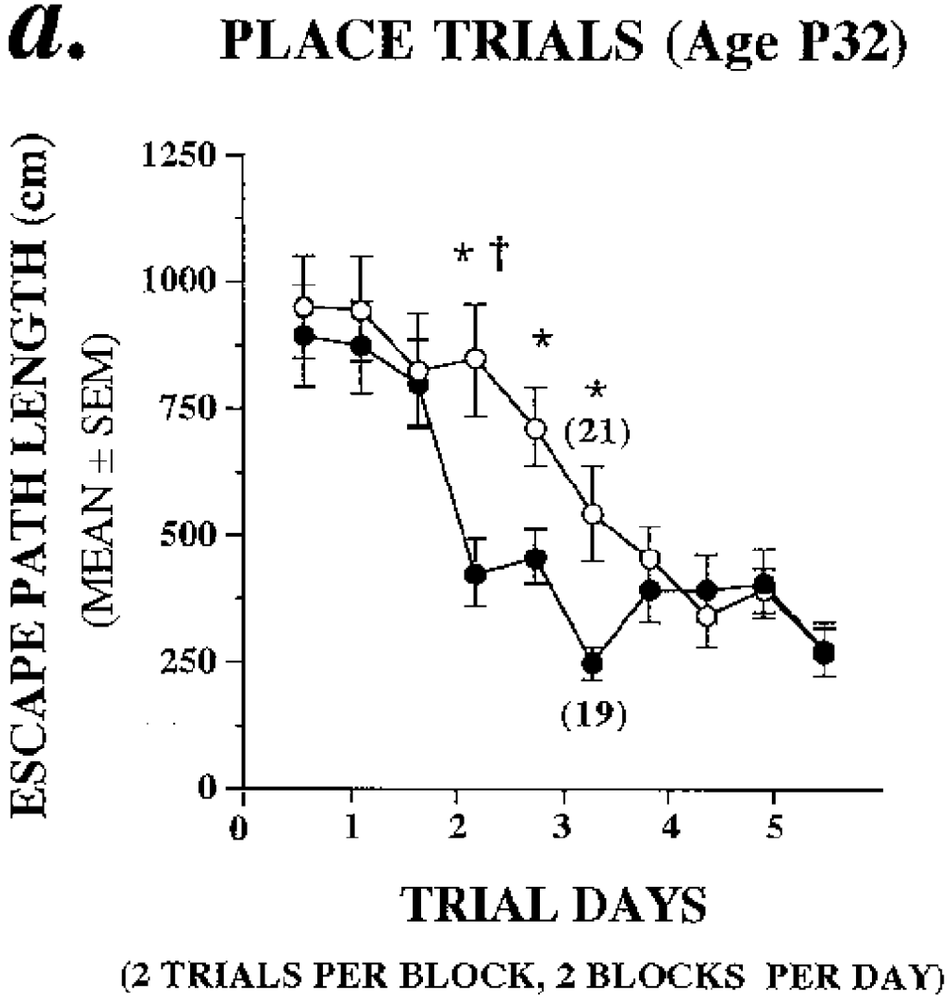
modified from Loepke AW & Davidson AJ:
Chapter 23: Surgery, Anesthesia, and the Immature Brain.
in Coté et al., A Practice of Anesthesia for Infants and Children, 5th Ed.

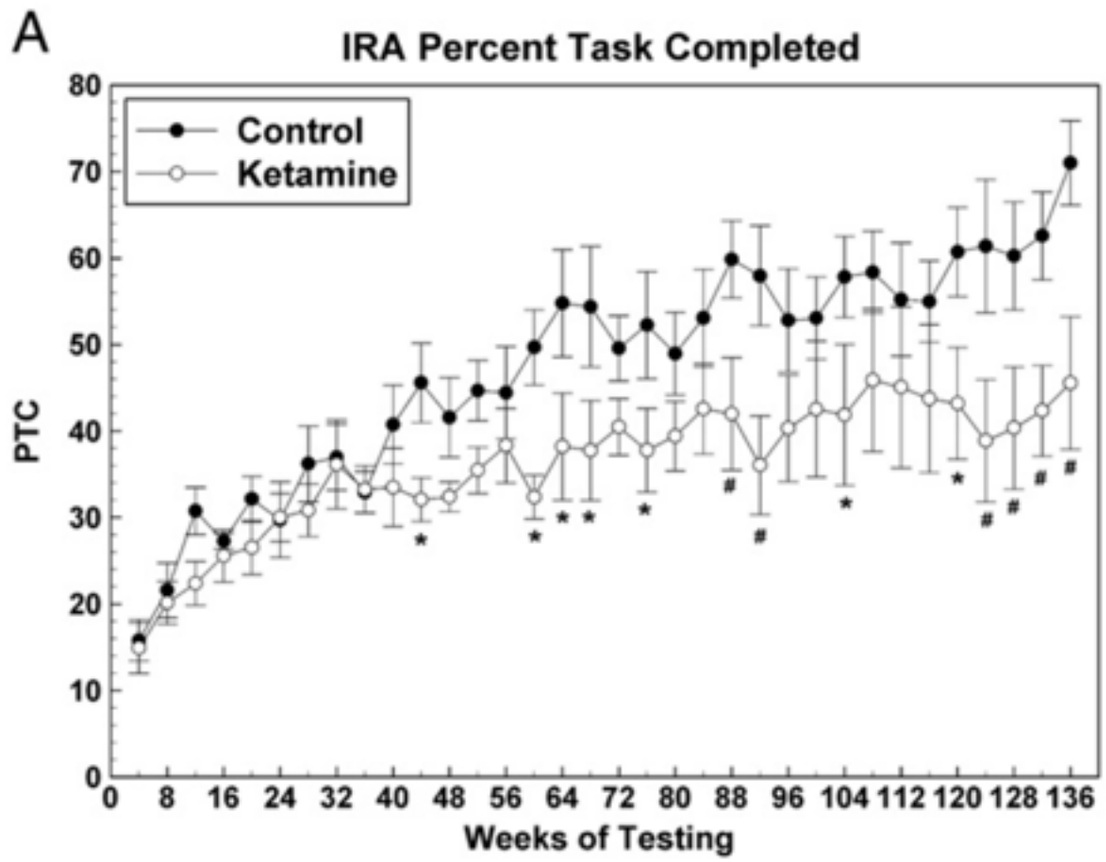


Anesthesia is Associated with Learning Impairment



Long-term Learning Impairment





Jevtovic-Todorovic et al., J Neurosci 2003

Paule et al., Neurotoxicol Teratol 2011

Diminished Academic Performance



Epidemiological Studies

Anesthetic	Surgery	Abnormalities	Assessment	Reference
Halothane, N_2O, and/or ketamine	any	(+) 2 exposures >2 h	school records	Wilder et al., 2009
not specified	inguinal hernia repair	+	developmental/ behavioral disorders	DiMaggio et al., 2009
not specified	any	(+) 2 exposures	developmental/ behavioral disorders	DiMaggio et al., 2011
Halothane, N_2O, and/or ketamine	any	(+) 2 exposures	school records	Flick et al., 2011
not specified	any	+	language, cognitive, vocabulary tests	Ing et al., 2013

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University of Lausanne and University of Geneva, Switzerland

Experiments:

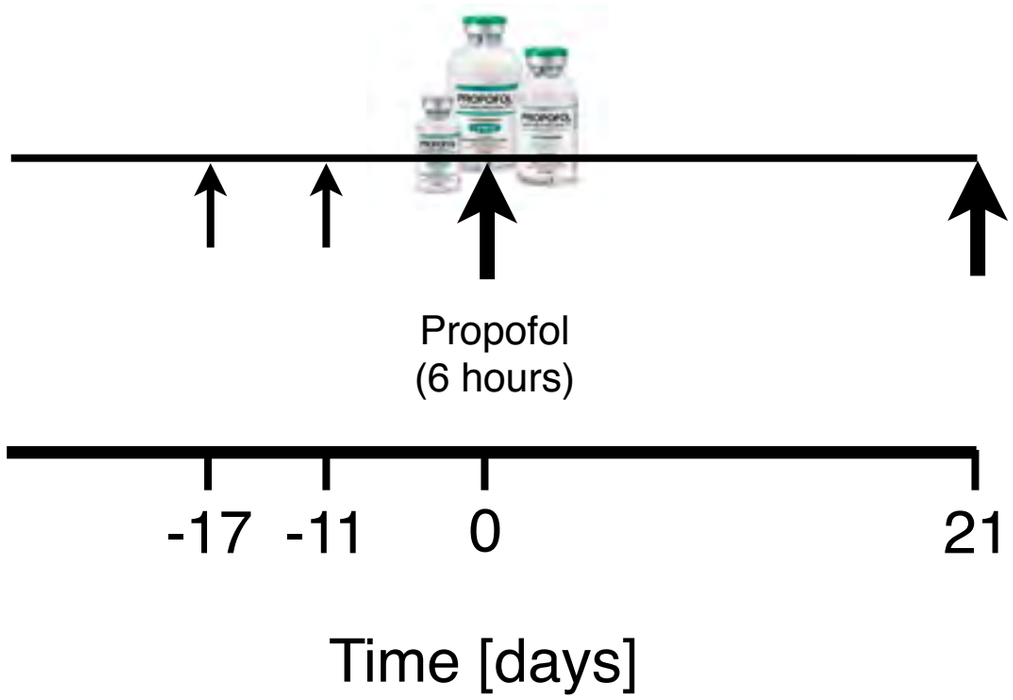
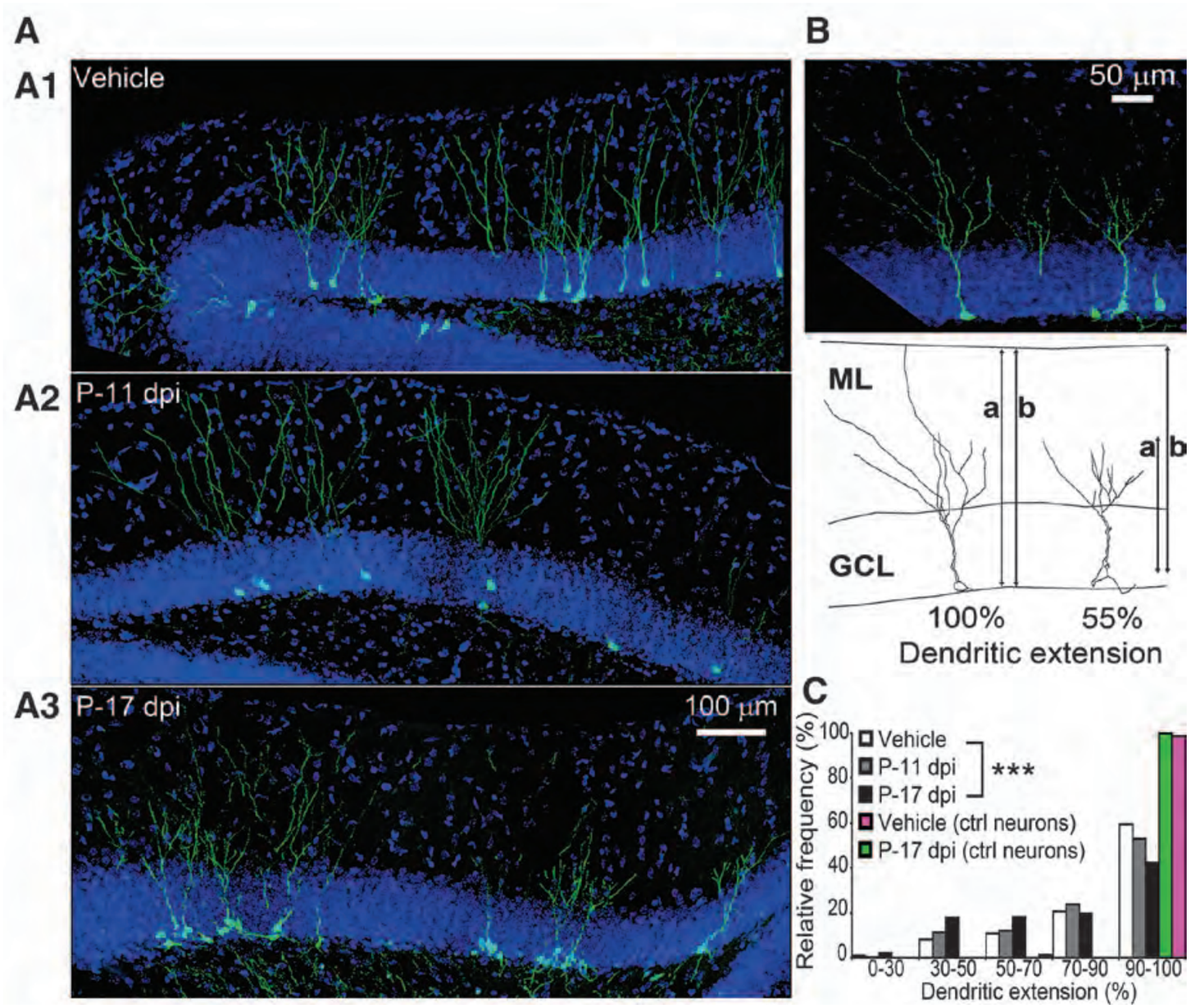


Table 1. Blood Physiologic Parameters Remain within Normal Range during Anesthesia

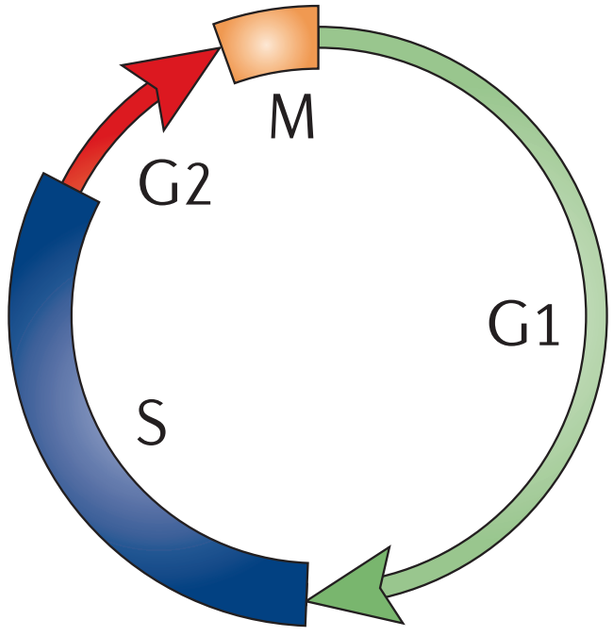
	Control	Propofol
pH	7.35 ± 0.04	7.35 ± 0.04
pCO_2 (kPa)	6.76 ± 0.4	6.55 ± 0.6
Glucose (mg dl^{-1})	9.75 ± 0.6	9.48 ± 1
Hemoglobin (g dl^{-1})	10.1 ± 0.6	9.8 ± 0.6

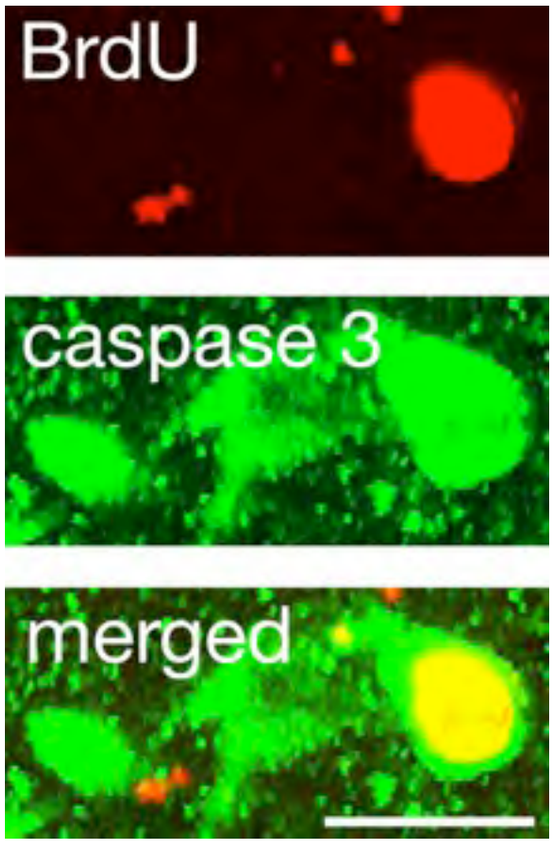
Shortened Dendrites in Neurons Born 17 Days Prior to Anesthesia



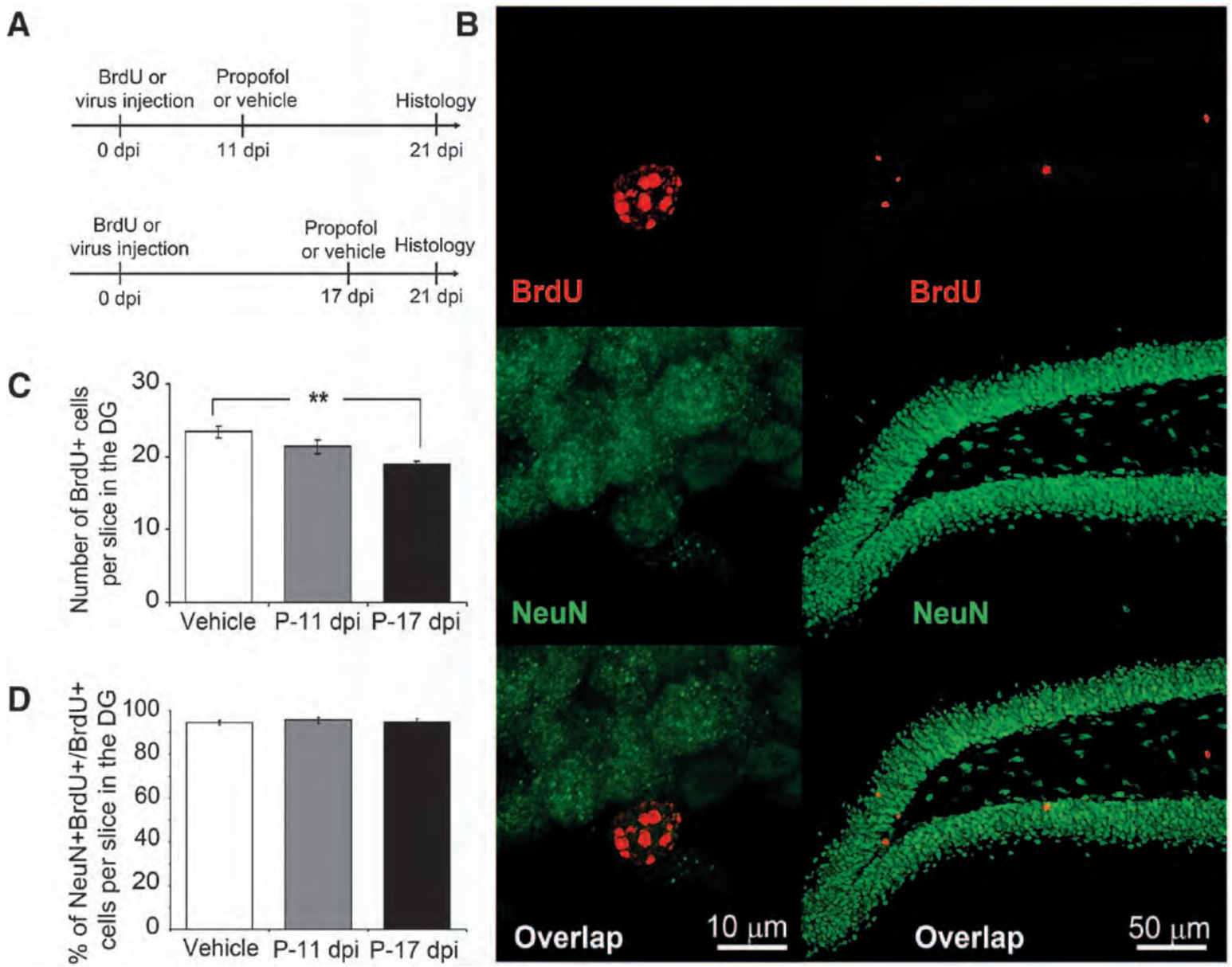
Krzisch et al., Anesthesiology 2013

Birthdating Neurons



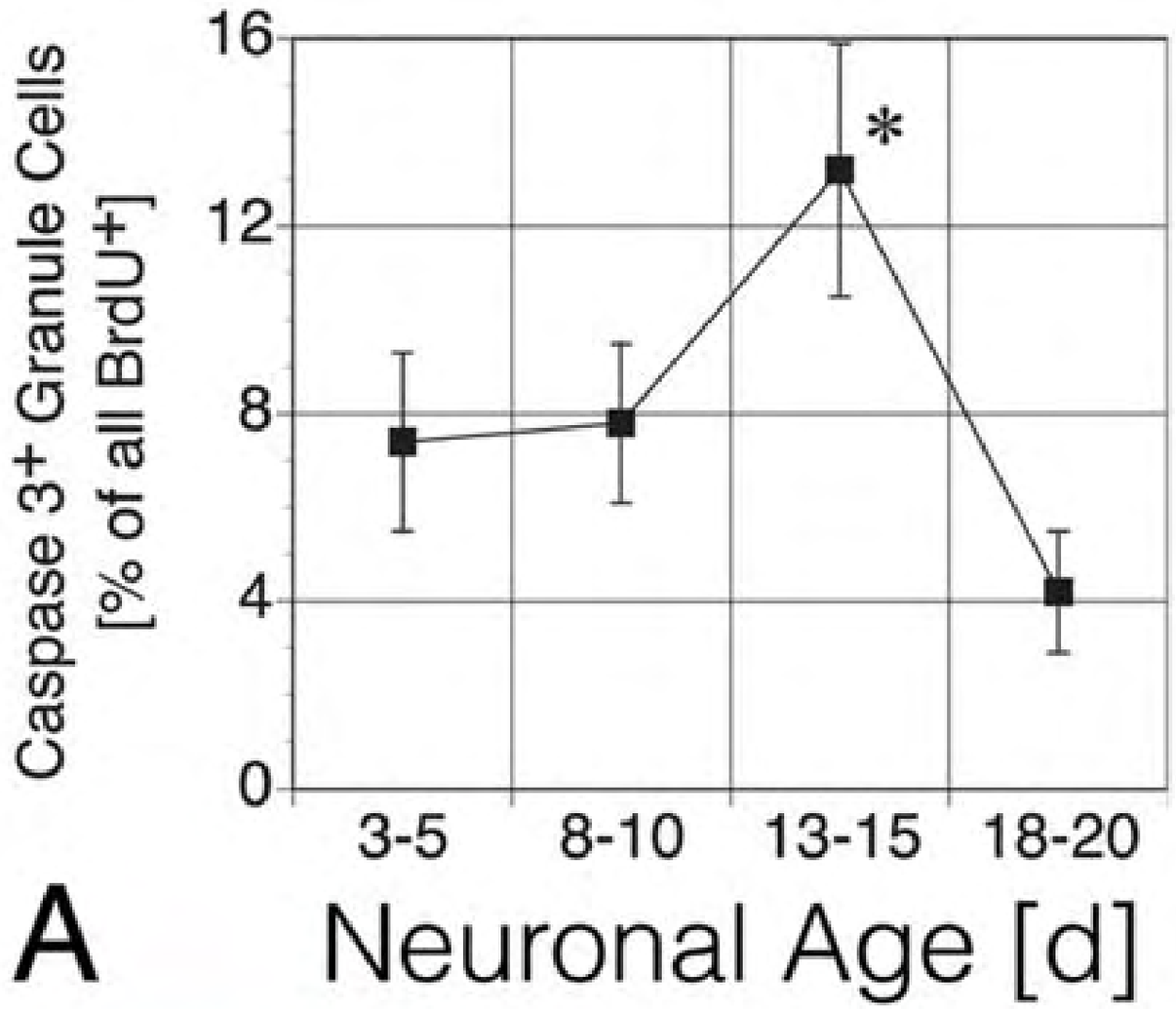


Decreased Survival of Neurons Born 17 Days Prior to Anesthesia



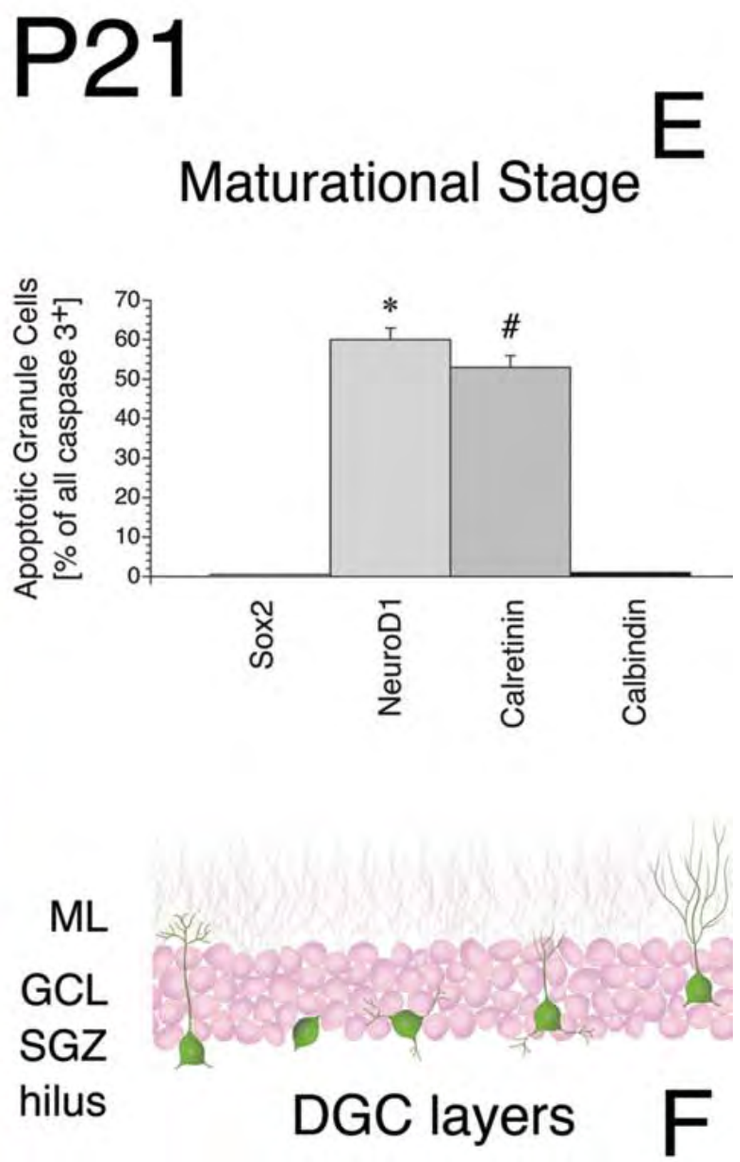
Krzisch et al., Anesthesiology 2013

Cell Death to Isoflurane is Neuronal Age-Dependent



Hofacer et al., Ann Neurol 2013

Immature Neurons Are Vulnerable During Isoflurane Anesthesia



Hofacer et al., Ann Neurol 2013



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Hövels-Gürich HH et al., JTCVS 2002
Marino BS et al., Circulation 2012
Andropoulos DB et al., Ann Thorac Surg 2013

