









## ◆ THIS MONTH IN ANESTHESIOLOGY

9A

## ◆ EDITORIAL VIEWS



- |                                                                                                                                                                     |                                                                                                 |      |
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|                                                                                    | <b>Why Is Karolinska on the Cover of an American Journal?</b>                                   | 1257 |
|                                                                                                                                                                     | James C. Eisenach                                                                               |      |
|                                                                                    | <b>Advancing Medical Science and Practice in Anesthesiology: Karolinska</b>                     | 1258 |
|                                                                                                                                                                     | Lars I. Eriksson                                                                                |      |
|                                                                                    | <b>Predicting and Preventing Chronic Postsurgical Pain and Disability</b>                       | 1260 |
|                                                                                                                                                                     | Rikard K. Wicksell and Gunnar L. Olsson                                                         |      |
|                                                                                    | <b>Prone Positioning: Beyond Physiology</b>                                                     | 1262 |
|                                                                                                                                                                     | Luciano Gattinoni and Pietro Caironi                                                            |      |
|                                                                                    | <b>Spinal Cord Stimulation: Exploration of the Physiological Basis of a Widely Used Therapy</b> | 1265 |
|                                                                                                                                                                     | Benkt Linderöth and Björn A. Meyerson                                                           |      |
|   | <b>Toward Tailored Sedation with Halogenated Anesthetics in the Intensive Care Unit?</b>        | 1268 |
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## ■ PERIOPERATIVE MEDICINE

- |                                                                                       |                                                                                                                                                                                                                                                                                                            |      |
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|  ◆ | <b>The Human Carotid Body: Expression of Oxygen Sensing and Signaling Genes of Relevance for Anesthesia</b>                                                                                                                                                                                                | 1270 |
|                                                                                       | Malin Jonsson Fagerlund, Jessica Kåhlin, Anette Ebberöy, Gunnar Schulte, Souren Mkrtchian, and Lars I. Eriksson                                                                                                                                                                                            |      |
|                                                                                       | <i>The human carotid body expresses GABAergic, nicotinic, purinergic, and dopaminergic receptors and K<sup>+</sup> channels. The authors speculate on whether depression of the hypoxic ventilatory response to general anesthetics and neuromuscular blocking agents are mediated via these proteins.</i> |      |
|                                                                                       | <b>Neostigmine/Glycopyrrolate Administered after Recovery from Neuromuscular Block Increases Upper Airway Collapsibility by Decreasing Genioglossus Muscle Activity in Response to Negative Pharyngeal Pressure</b>                                                                                        | 1280 |
|                                                                                       | Frank Herbstreit, Daniela Zigran, Christof Ochterbeck, Jürgen Peters, and Matthias Eikermann                                                                                                                                                                                                               |      |
|                                                                                       | <i>Neostigmine with glycopyrrolate reversal after recovery from neuromuscular blockade increased upper airway collapsibility and could, in patients, have negative respiratory consequences.</i>                                                                                                           |      |

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- ◆ Refers to This Month in Anesthesiology
- ◆ Refers to Editorial Views
-  Karolinska Article

-  See Supplemental Digital Content
-  CME Article

**Sevoflurane-induced Preconditioning: Impact of Protocol and Aprotinin Administration on Infarct Size and Endothelial Nitric-Oxide Synthase Phosphorylation in the Rat Heart *In Vivo***

1289

Jan Fräßdorf, Ragnar Huhn, Nina C. Weber, Dirk Ebel, Nadja Wingert, Benedikt Preckel, Octavian Toma, Wolfgang Schlack, and Markus W. Hollmann

*Sevoflurane-induced preconditioning is mediated by endothelial nitric oxide synthase and the extent of cardioprotection depends on the amount of preconditioning cycles. The infarct size reduction is completely blocked by aprotinin.*

**Slowing of the Hippocampal  $\theta$  Rhythm Correlates with Anesthetic-induced Amnesia**

1299

Misha Perouansky, Vinuta Rau, Tim Ford, S. Irene Oh, Mark Perkins, Edmond I Eger II, and Robert A. Pearce

*Three inhalational anesthetics with different molecular activity profiles slowed  $\theta$  peak frequency in proportion to impairment of hippocampal-dependent memory.*

**Intraoperative Recruitment Maneuver Reverses Detrimental Pneumoperitoneum-induced Respiratory Effects in Healthy Weight and Obese Patients Undergoing Laparoscopy**

1310

Emmanuel Futier, Jean-Michel Constantin, Paolo Pelosi, Gerald Chanques, Fabrice Kwiatkoski, Samir Jaber, and Jean-Etienne Bazin

*Pneumoperitoneum promotes collapse of the dependent lung region in healthy weight and obese patients. A recruitment maneuver combined with 10 cm H<sub>2</sub>O of positive end-expiratory pressure improves end-expiratory lung volume, respiratory mechanics, and oxygenation during laparoscopy.*

**Lipid Emulsion Reverses Bupivacaine-induced Asystole in Isolated Rat Hearts: Concentration-Response and Time-Response Relationships**

1320

Ying Chen, Yun Xia, Le Liu, Tong Shi, Kejian Shi, Quanguang Wang, Limèi Chen, Thomas J. Papadimos, and Xuzhong Xu

*Cardiac function was measured in isolated rat hearts treated with lipid emulsion as used to reverse bupivacaine-induced asystole. Lipid concentration-response and time-response relationships are delineated.*

**Discrete Change in Volatile Anesthetic Sensitivity in Mice with Inactivated Tandem Pore Potassium Ion Channel TRESK**

1326

Yun Jeong Chae, Jianan Zhang, Paul Au, Marta Sabbadini, Guo-Xi Xie, and C. Spencer Yost

*The first characterization of genetically modified mice with a knockout of the tandem pore potassium ion channel TRESK, focusing on their sensitivity to volatile anesthetics.*

◆ **Prediction of Postoperative Pulmonary Complications in a Population-based Surgical Cohort**

1338

Jaume Canet, Lluís Gallart, Carmen Gomar, Guillem Paluzie, Jordi Vallès, Jordi Castillo, Sergi Sabaté, Valentin Mazo, Zahara Briones, and Joaquín Sanchis; on behalf of the ARISCAT Group

*The risk of postoperative pulmonary complications in a broad surgical population can be accurately predicted from seven easily observed variables. SUPPLEMENTAL DIGITAL CONTENT IS AVAILABLE IN THE TEXT*

● **Hypoxia Induces Late Preconditioning in the Rat Heart *In Vivo***

1351

Marc M. Berger, Ragnar Huhn, Gezina T. Oei, André Heinen, Andreas Winzer, Inge Bauer, Benedikt Preckel, Nina C. Weber, Wolfgang Schlack, and Markus W. Hollmann

*Hypoxic late preconditioning exerts cardioprotective effects in the rat in vivo. Cardioprotection cannot be enhanced by early preconditioning or modified anesthetic techniques. The cardioprotection of hypoxic late preconditioning is mediated by protein kinase C $\epsilon$ . SUPPLEMENTAL DIGITAL CONTENT IS AVAILABLE IN THE TEXT*

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## ■ CRITICAL CARE MEDICINE

- KA ♦ Positive End-expiratory Pressure Redistributes Regional Blood Flow and Ventilation Differently in Supine and Prone Humans** 1361  
 Johan Petersson, Malin Ax, Joana Frey, Alejandro Sánchez-Crespo, Sten G. E. Lindahl, and Margareta Mure  
*The study demonstrates that positive end-expiratory pressure shifts regional lung ventilation and blood flow differently between supine and prone postures. The results suggest that positive end-expiratory pressure should be reduced in prone patients.*
- KA Inhalation Anesthesia Increases V/Q Regional Heterogeneity during Spontaneous Breathing in Healthy Subjects** 1370  
 Sven Nyrén, Peter Radell, Margareta Mure, Johan Petersson, Hans Jacobsson, Sten G. E. Lindahl, and Alejandro Sánchez-Crespo  
*Regional ventilation and perfusion distribution were studied in spontaneously breathing healthy volunteers awake and during inhalation anesthesia using a scintigraphic technique. Intrapulmonary heterogeneity in ventilation-perfusion distribution was significantly greater during inhalation anesthesia.*
- Effects of Early Neuronal and Delayed Inducible Nitric Oxide Synthase Blockade on Cardiovascular, Renal, and Hepatic Function in Ovine Sepsis** 1376  
 Matthias Lange, Atsumori Hamahata, Daniel L. Traber, Yoshimitsu Nakano, Aimalohi Esechie, Collette Jonkam, Elbert B. Whorton, Sanna von Borzyskowski, Lillian D. Traber, and Perenlei Enkhbaatar  
*Multiple organ dysfunctions secondary to pulmonary sepsis in sheep can be attenuated by selective inhibition of neuronal nitric oxide synthase in the first hours of sepsis and subsequent specific blockade of inducible nitric oxide synthase.*
- Cerebral Arterial and Venous Contributions to Tissue Oxygenation Index Measured Using Spatially Resolved Spectroscopy in Newborn Lambs** 1385  
 Flora Y. Wong, Theodora Alexiou, Thilini Samarasinghe, Vojta Brodecky, and Adrian M. Walker  
*The study evaluated arterial and venous components of cerebral tissue oxygenation index measurements in the newborn lamb and investigated the impact of acute hypoxemia on the cerebral arterial to venous volume ratio and tissue oxygenation index.*

## ■ PAIN MEDICINE

- KA ♦ Spinal Cord Stimulation-induced Analgesia: Electrical Stimulation of Dorsal Column and Dorsal Roots Attenuates Dorsal Horn Neuronal Excitability in Neuropathic Rats** 1392  
 Yun Guan, Paul W. Wacnik, Fei Yang, Alene F. Carteret, Chih-Yang Chung, Richard A. Meyer, and Srinivasa N. Raja  
*Bipolar electrical-conditioning stimulation of the dorsal column or the lumbar dorsal roots attenuates dorsal horn neuronal hyperexcitability in neuropathic rats and inhibits short-term neuronal sensitization.*  
 SUPPLEMENTAL DIGITAL CONTENT IS AVAILABLE IN THE TEXT
- KA Identification of the Epidural Space with Optical Spectroscopy: An *In Vivo* Swine Study** 1406  
 James P. Rathmell, Adrien E. Desjardins, Marjolein van der Voort, Benno H.W. Hendriks, Rami Nachabe, Stefan Roggeveen, Drazenko Babic, Michael Söderman, Marcus Brynolf, and Björn Holmström  
*This study demonstrates that the epidural space in swine can be identified by optical spectroscopy using a custom needle with integrated optical fibers.*
- Buprenorphine Enhances and Prolongs the Postoperative Analgesic Effect of Bupivacaine in Patients Receiving Infragluteal Sciatic Nerve Block** 1419  
 Kenneth D. Candido, Jason Hennes, Sergio Gonzalez, Marianne Mikat-Stevens, Michael Pinzur, Vladimir Vasic, and Nebojsa Nick Knezevic  
*Buprenorphine may enhance and prolong the analgesic effect of bupivacaine when used for sciatic nerve blocks. Buprenorphine may not have equi-analgesic efficacy in all peripheral nerve blocks when combined with local anesthetics.*

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## ◆ Impact of a Comprehensive Safety Initiative on Patient-controlled Analgesia

### Errors

1427

James E. Paul, Barbara Bertram, Karen Antoni, Marianne Kampf, Terri Kitowski, Aled Morgan, Ji Cheng, and Lehana Thabane

*Adverse drug events related to patient controlled analgesia (PCA) place patients at risk for perioperative complications. Critical incident reports were reviewed from three tertiary care hospitals and critical incidents attributable to PCA errors were identified. Then, safety interventions were implemented: new PCA pumps, new preprinted physician orders, nursing and patient education, a manual independent double check, and a formal nursing transfer of accountability. In 25,198 patients treated with PCA during this study, 62 (0.25%) errors were found, 21 (0.08%) involving pump programming. Comparing with the pre-safety intervention period, the odds ratio of a PCA error post-safety intervention was 0.28 (95% confidence interval [CI] = 0.14, 0.53,  $P < 0.001$ ) and the odds ratio of a pump programming error post-safety intervention was 0.05 (95% CI = 0.001, 0.30,  $P < 0.001$ ). The authors conclude that safety can be improved by addressing equipment, education, and process issues. SUPPLEMENTAL DIGITAL CONTENT IS AVAILABLE IN THE TEXT*

## ■ CLASSIC PAPERS REVISITED

### KA ◆ Lidocaine: The Origin of a Modern Local Anesthetic

1433

Torsten Gordh, Torsten E. Gordh, and Kjell Lindqvist

*This article is a revisiting of original material published as: Gordh TE: Xylocain: A new local analgesic. Anaesthesia 1949; 4:4–9. SUPPLEMENTAL DIGITAL CONTENT IS AVAILABLE IN THE TEXT*

### KA Commentary: In Memoriam: Torsten Gordh (1907–2010)

1437

Lars I. Eriksson, Claes Frostell, Lars Irestedt, Sten Lindahl, and Eddie Weitzberg

## ■ EDUCATION

### CASE SCENARIO

#### KA CME ◆ Tailored Sedation to the Individual Needs of the Intensive Care Unit Patient

1439

Peter V. Sackey, Lars I. Eriksson, Claes-Roland Martling, and Peter J. Radell

### IMAGES IN ANESTHESIOLOGY

#### KA Is Routine Use of a Face Mask Necessary in the Operating Room?

1447

Eva Sellden

### ANESTHESIA LITERATURE REVIEW

1448

### CLINICAL CONCEPTS AND COMMENTARY

#### Methicillin-resistant *Staphylococcus Aureus* Colonization, Its Relationship to Nosocomial Infection, and Efficacy of Control Methods

1453

Arielle Butterly, Ulrich Schmidt, and Jeanine Wiener-Kronish

*This review discusses the importance of detection (surveillance) and prophylaxis in methicillin-resistant Staphylococcus aureus colonized patients in the surgical and intensive care unit context.*

### REVIEW ARTICLE

#### KA Nitrate-Nitrite-Nitric Oxide Pathway: Implications for Anesthesiology and Intensive Care

1460

Eddie Weitzberg, Michael Hezel, and Jon O. Lundberg

*The recently discovered mammalian nitrate-nitrite-nitric oxide pathway works independently of nitric oxide synthases. It is fueled by dietary intake of inorganic nitrate, and it is involved in regulation of blood flow, cell signaling, and tissue responses to hypoxia.*

### CASE REPORT

#### Retraction Movement of the Frova Airway Intubation Introducer to Assist Nasotracheal Intubation in Patients with Limited Mouth Opening

1476

Patrick Schoettker, Istvan Bathory, and Martin Broome

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## ■ CORRESPONDENCE

**Reticulocyte Hemoglobin Content in Critically Ill Patients** 1479  
Martin Darveau and Pierre Lachance

**From Creatine Kinase-MB to Troponin: Do We Really Need to Differentiate between Myocardial Injury and Infarction?** 1479  
Jochen D. Muehlschlegel, Stanton K. Shernan, and Simon C. Body

**On Memory, General Anesthesia, and Sleep** 1480  
Mohamed M. Ghoneim

## ■ ANESTHESIOLOGY REFLECTIONS

**Gillray Etches *New Discoveries in PNEUMATICKS!*** 1288  
George S. Bause

**The Irish Connections of Patrick Sim, M.L.S.** 1337  
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**Erdmann's Life Membership No. 1 in the ASA** 1350  
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**A Taste of Sim's *Heritage of Anesthesia*** 1446  
George S. Bause

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## INSTRUCTIONS FOR AUTHORS

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