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利用分子對接技術對全身麻醉藥與蛋白靶點的連接位點及親和力預測

Binding Site and Affinity Prediction of General Anesthetics to Protein Targets Using Docking

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背景 全身麻醉藥的蛋白作用位點仍未明確，因此首先需要一種工具來預測全麻藥結合的潛在結合位點。此項研究對 AutoDock 這一計算方法能否作爲此類工具進行了探討。
方法 獲得水溶性蛋白（細胞色素 C，去鐵蛋白，人血清白蛋白）和膜蛋白（從無類囊體藍藻 GLIC 中提取的五聚體配體門控離子通道）的高解析度晶體結構資料。採用等溫滴定量熱（ITC）實驗，測定溶液中麻醉藥對去鐵蛋白的親和力。使用拉馬克遺傳演算法及 solis 和 wets 局域搜索方法的分子對接伺服器進行分子對接的計算（http://www.dockingserver.com/web）。 發現 20 種全身麻醉藥可與去鐵蛋白對接。將預測的結合常數與從 ITC 實驗獲得的資料進行比較以明確其可能的聯繫。在與去鐵蛋白對接時，將得到的具體結合位點和它們之間的相互作用與最新共晶資料進行了比較。對目前臨床使用的已明確 50%有效濃度值（EC50 值）的六種全麻藥（異氟醚，七氟醚，地氟醚，氟烷，異丙酚，依託咪酯）同樣進行了與所有測試蛋白的對接計算。並將從對接試驗得出的六種全麻藥的結合常數與已知的 EC50 值和辛醇/水分配係數進行比較。
結果 所有 20 種全身麻醉藥都明確地與從去鐵蛋白的晶體結構中發現的麻醉藥結合位點對接。利用對接計算獲得的 20 種麻醉藥的結合常數與從 ITC 實驗獲得的資料相關（$p = 0.04$）。GLIC 的晶體結構中鑒定出的結合位點被包含在對接技術預測的位點之內，但並非最佳位點。對接計算表明最有可能的結合位點位於 GLIC 的胞外分子域。在 GLIC 中鑒

定出來的結合位點上，預測得到的親和力與已知的 EC_{50} 值一致($P = 0.006$)。然而，預測的六種全麻藥與去鐵蛋白、人血清白蛋白、細胞色素 C 的親和力和已知的 EC50 值並不一致。在 GLIC 的結合位點上，預測的親和力和辛醇/水分配係數之間的相關性較低。
結論 本研究證實，可通過自動化的分子對接伺服器（AutoDock）對水溶性和膜蛋白進行對接計算來預測麻醉藥結合位點及相對親和力。預測出 6 種常用麻醉藥的親和力和 EC_{50} 僅在 GLIC,這一與麻醉機制相關的蛋白家族成員中有相關性。
（夏蘇雲　譯　陳傑　校）
BACKGROUND: The protein targets for general anesthetics remain unclear. A tool to predict anesthetic binding for potential binding targets is needed. In this study, we explored whether a computational method, AutoDock, could serve as such a tool.
METHODS: High-resolution crystal data of water-soluble proteins (cytochrome C, apoferritin, and human serum albumin), and a membrane protein (a pentameric ligand-gated ion channel from *Gloeobacter violaceus* [GLIC]) were used. Isothermal titration calorimetry (ITC) experiments were performed to determine anesthetic affinity in solution conditions for apoferritin. Docking calculations were performed using DockingServer with the Lamarckian genetic algorithm and the Solis and Wets local search method (http://www.dockingserver.com/web). Twenty general anesthetics were docked into apoferritin. The predicted binding constants were compared with those obtained from ITC experiments for potential correlations. In the case of apoferritin, details of the binding site and their interactions were compared with recent cocrystallization data. Docking calculations for 6 general anesthetics currently used in clinical settings (isoflurane, sevoflurane, desflurane, halothane, propofol, and etomidate) with known 50% effective concentration (EC_{50}) values were also performed in all tested proteins. The binding constants derived from docking experiments were compared with known EC_{50} values and octanol/water partition coefficients for the 6 general anesthetics.
RESULTS: All 20 general anesthetics docked unambiguously into the anesthetic binding site identified in the crystal structure of apoferritin. The binding constants for 20 anesthetics obtained from the docking calculations correlate significantly with those obtained from ITC experiments ($P = 0.04$). In the case of GLIC, the identified anesthetic binding sites in the crystal structure are among the docking predicted binding sites, but not the top ranked site. Docking calculations suggest a most probable binding site located in the extracellular domain of GLIC. The predicted affinities correlated significantly with the known EC_{50} values for the 6 frequently used anesthetics in GLIC for the site identified in the experimental crystal data ($P = 0.006$). However, predicted affinities in apoferritin, human serum albumin, and cytochrome C did not correlate with these 6 anesthetics' known experimental EC_{50} values. A weak correlation between the predicted affinities and the octanol/water partition coefficients was observed for the sites in GLIC.
CONCLUSION: We demonstrated that anesthetic binding sites and relative affinities can be predicted using docking calculations in an automatic docking server (AutoDock) for both water-soluble and membrane proteins. Correlation of predicted affinity and EC_{50} for 6 frequently used general anesthetics was only observed in GLIC, a member of a protein family relevant to anesthetic mechanism.

綜述：連續無創性總體、碳氧和高鐵血紅蛋白濃度檢測現狀

Review Article: The Current Status of Continuous Noninvasive Measurement of Total, Carboxy, and Methemoglobin Concentration

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Anesth Analg May 2012 114:972-978

圍術期貧血的早期發現，一氧化碳暴露後碳氧血紅蛋白毒性水準的確定和藥物劑量滴定以預防高鐵血紅蛋白毒性水準，這些都是非常重要的。脈氧儀通過向組織照射光並感應光的吸收量而發揮作用。這種相同的原理也被用在實驗室血紅蛋白儀中，來測量血紅蛋白濃度。由於這兩個儀器有相同的工作原理，可進行脈氧儀改造，使其也能監測血紅蛋白濃度。目前，有兩種商業化的脈氧儀(Masimo Rainbow SET 和 OrSense NBM-200MP)可檢測總體血紅蛋白濃度，其中(Masimo)還可以檢測高鐵血紅蛋白和碳氧血紅蛋白。此綜述討論了關於此類儀器精確性的同行評議文章。
（範逸臣　譯　陳傑　校）
Intraoperative early detection of anemia, identifying toxic levels of carboxyhemoglobin after carbon monoxide exposure and titrating drug dosage to prevent toxic levels of methemoglobin are important goals. The pulse oximeter works by illuminating light into the tissue and sensing the amount of light absorbed. The same methodology is used by laboratory hemoglobinometers to measure hemoglobin concentration. Because both devices work in the same way, efforts were made to modify the pulse oximeter to also measure hemoglobin concentration. Currently there are 2 commercial pulse oximeters (Masimo Rainbow SET and OrSense NBM-200MP) that measure total hemoglobin concentration and one (Masimo) that also measures methemoglobin and carboxyhemoglobin. In this review, we describe the peer-reviewed literature addressing the accuracy of these monitors.

夜間血氧監測儀檢測去氧飽和指數：檢測外科手術病人睡眠呼吸障礙的一個特異性和敏感性工具

Oxygen Desaturation Index from Nocturnal Oximetry: A Sensitive and Specific Tool to Detect Sleep-Disordered Breathing in Surgical Patients

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引言：給所有疑有睡眠呼吸障礙（sleep disordered breathing, SDB）的外科手術病人檢測多導睡眠圖（polysomnography, PSG）是不現實的。因此本研究探討夜間血氧監測儀在手術病人中診斷 SDB 的作用。
方法：所有在術前門診就診而將行擇期手術的病人（大於等於 18 歲）都納入到本項研究中。剔除有異常腦電圖發現的病人。所有病人通過可攜帶性裝置和一個脈氧儀在家中監測夜間 PSG。所有的 PSG 結果由有資質的睡眠技師進行評分。對脈氧儀記錄進行電子化處理。
結果：共 475 位病人完成了本項研究：其中 217 位是男性，258 位女性，平均年齡在 60 ± 11 歲, 平均 BMI 爲 31 ± 7 kg/m^2。呼吸暫停低通氣指數（apnea-hypopnea index, AHI），即

每小時內呼吸暫停和低通氣次數的平均值，爲 9.1（2.8~21.4）[中位數（四分位間距）]，且 64%的病人 AHI>5。去氧飽和指數（oxygen desaturation index, ODI,即單位小時內減飽和次數的平均值）和夜間脈氧儀顯示的 SpO_2 <90% (CT90)累計次數百分比與 PSG 記錄的睡眠呼吸障礙參數之間均有顯著的相關性。但和 CT90 相比較，ODI 有更顯著的相關性，且是個更好的 AHI 預測指標。ODI 預測 AHI>5、AHI>12 和 AHI>30 的受試者工作特徵曲線下面積（the area under the receiver operating characteristic curve, AUC）分別是 0.908（可信區間：0.880---0.936）、0.931（可信區間: 0.090 to 0.952）和 0.958 （可信區間: 0.937 to 0.979）。ODI 預測 AHI>5、 AHI >15 和 AHI >30 最大準確度的截斷值分別是：ODI>5、ODI >15 和 ODI >30。準確度分別是：86% （可信區間： 83%–88%）、 86% （可信區間：83%–89%）和 94% （可信區間: 92%–96%）。ODI>10 檢測中重度 SDB 的敏感性和特異性分別爲 93%和 75%。

結論：高解析度夜間血氧監測儀來源的 ODI 應用于外科手術病人中，是一項具有敏感性和特異性檢測未經診斷 SDB 的工具。

（俞芳　譯　陳傑　校）

INTRODUCTION: It is impractical to perform polysomnography (PSG) in all surgical patients suspected of having sleep disordered breathing (SDB). We investigated the role of nocturnal oximetry in diagnosing SDB in surgical patients.

METHOD: All patients 18 years and older who visited the preoperative clinics for scheduled inpatient surgery were approached for study participation. Patients expected to have abnormal electroencephalographic findings were excluded. All patients underwent an overnight PSG at home with a portable device and a pulse oximeter. The PSG recordings were scored by a certified sleep technologist. The oximetry recordings were processed electronically.

RESULT: Four hundred seventy-five patients completed the study: 217 males and 258 females, aged 60 ± 11 years, and body mass index 31 ± 7 kg/m^2. The apnea-hypopnea index (AHI), the average number of episodes of apnea and hypopnea per hour of sleep, was 9.1 (2.8 to 21.4) [median (interquartile range)] and 64% patients had AHI >5. There was a significant correlation between oxygen desaturation index (ODI, hourly average number of desaturation episodes) and cumulative time percentage with SpO_2 <90% (CT90) from nocturnal oximetry, with the parameters measuring sleep breathing disorders from PSG. Compared to CT90, ODI had a stronger correlation and was a better predictor for AHI. The area under receiver operator characteristics curve for ODI to predict AHI >5, AHI >15, and AHI >30 was 0.908 (CI: 0.880 to 0.936), 0.931 (CI: 0.090 to 0.952), and 0.958 (CI: 0.937 to 0.979), respectively. The cutoff value based on the maximal accuracy for ODI to predict AHI >5, AHI >15, and AHI >30 was ODI >5, ODI >15, and ODI >30. The accuracy was 86% (CI: 83%–88%), 86% (CI: 83%–89%), and 94% (CI: 92%–96%), respectively. The ODI >10 demonstrated a sensitivity of 93% and a specificity of 75% to detect moderate and severe SDB.

CONCLUSIONS: ODI from a high-resolution nocturnal oximeter is a sensitive and specific tool to detect undiagnosed SDB in surgical patients.

入院時 CT 估計比重可預測創傷性腦損傷患者入 ICU 後 6 個月預後

Computed Tomography–Estimated Specific Gravity at Hospital Admission Predicts 6-Month Outcome in Mild-to-Moderate Traumatic Brain Injury Patients Admitted to the Intensive Care Unit

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背景: 眾所周知嚴重創傷性腦損傷(TBI)病人可發生致命性神經性退化。但對於輕中度創傷性腦損傷(MM-TBI)病人, 即使入住 ICU,，也難以預測 6 個月後哪些患者有不良預後。標準 CT 成像掃描能提供資訊來評估比重(eSG)。之前研究已證明標準 CT 讀片後更高的比重測值與嚴重 TBI 後預後不良有關。本研究目的在於確定顱內容物比重是否能預測輕中度 TBI 的 6 個月後預後。
方法:本研究分析了 66 例收入神經外科 ICU 的輕中度 TBI 病人入院時臨床和 CT 掃描資料（包括 eSG）。主要預後指標定義爲 6 個月後患者的 Glasgow 預後評分（1-3 分）。計算 eSG 預測 6 個月後不良預後的辨別力（受試者特徵曲線下面積[ROC-AUC]，95%置信區間) 。隨後比較了 eSG 和主要 ICU 特徵的相關性。
結果: 單因素和逐步多元分析表明 eSG 與 6 個月後不良預後獨立相關（p = 0.001）。用來預測 6 個月後預後 eSG 的 ROC-AUC 爲 0.87(置信區間爲 0.77–0.96)。入院時 eSG 值與主要 ICU 特徵，尤其是 14 天死亡率(P=0.004)，機械通氣的的時間(P=0.01)，ICU 停留時間(P=0.045)，和 ICU 住院操作如顱內壓監測(P<0.001)相關。
結論: 對於此項收入 ICU 的輕中度 TBI 佇列，常規 CT 掃描得出的 eSG 與死亡率，ICU 嚴重度相關，且能預測 6 個月後不良預後。 需要進一步的研究，包括對 TBI 嚴重度的分類，來確認此項研究結果。
（俞劼晶　譯　陳傑　校）
BACKGROUND: It is clear that patients with a severe traumatic brain injury (TBI) develop secondary, potentially lethal neurological deterioration. However, it is difficult to predict which patients with mild-to-moderate TBI (MM-TBI), even after intensive care unit (ICU) admission, will experience poor outcome at 6 months. Standard computed tomography (CT) imaging scans provide information that can be used to estimate specific gravity (eSG). We have previously demonstrated that higher eSG measurements in the standard CT reading were associated with poor outcomes after severe TBI. The aim of this study was to determine whether eSG of the intracranial content predicts 6-month outcome in MM-TBI. **METHODS:** We analyzed admission clinical and CT scan data (including eSG) of 66 patients with MM-TBI subsequently admitted to our neurosurgical ICU. Primary outcome was defined as a Glasgow Outcome Scale score of 1 to 3 after 6 months. Discriminating power (area under the receiver operating characteristic curve [ROC-AUC], 95% confidence interval) of eSG to predict 6-month poor outcome was calculated. The correlation of eSG with the main ICU characteristics was then compared.
RESULTS: Univariate and stepwise multivariate analyses showed an independent association between eSG and 6-month poor outcome (*P* = 0.001). ROC-AUC of eSG for the prediction of 6-month outcomes was 0.87 (confidence interval: 0.77–0.96). Admission eSG values were

correlated with the main ICU characteristics, specifically 14-day mortality ($P = 0.004$), length of mechanical ventilation ($P = 0.01$), length of ICU stay ($P = 0.045$), and ICU procedures such as intracranial pressure monitoring ($P < 0.001$).
CONCLUSIONS: In this MM-TBI cohort admitted to the ICU, eSG of routine CT scans was correlated with mortality, ICU severity, and predicted 6-month poor outcome. An external validation with studies that include the spectrum of TBI severities is warranted to confirm our results.

綜述：可重複使用和一次性手術紡織品比較：2012 現代可持續發展技術

Review Article: A Comparison of Reusable and Disposable Perioperative Textiles: Sustainability State-of-the-Art 2012

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現今對重複使用和一次性使用圍術期紡織品（手術衣和鋪巾等）的比較反映出生產和再利用此類產品技術的重大變革。可重複使用和一次性使用手術衣和鋪巾由人工合成的輕薄面料製造，不僅滿足醫務工作者和患者保護的新標準，同時價格也具有競爭力。在基於多元科學的生命週期環境研究中，可重複使用手術衣與鋪巾相對於同類一次性產品，顯示了極大的可持續收益，具體在自然資源能源（200%-300%），水(250%–330%)，碳元素（200%–300%），揮發性有機物，固體廢物(750%)和儀器回收方面。因爲所有其他因素（成本，保護和舒適）是相似的，作爲衛生保健可持續發展專案的一部分，可重複使用手術衣和鋪巾所帶來的環境收益對於此工業是重要的。因此，不再認爲可重複使用對某些環境下更有利而一次性使用在其他情況下更好。同樣重要的是我們認識到，在過去的五至十年，對舒適、保護和經濟大規模研究未能得到積極推行，因此對提高可重複使用和一次性使用系統的因素難以評估。此外，職業相關比較研究較少，但可能會進一步支持可重複使用。總之，現有的圍術期紡織品舒適、安全，成本相似，但可重複使用而非一次性使用的紡織品爲護士、醫生和醫院提供了減少對環境影響的機會。對環境因素比較的循證醫學支持這個結論：可重複使用的手術衣和鋪巾對可持續發展提供了極大的支援。可重複使用系統的益處與麻醉領域中其他的再利用方面類似，如喉罩通氣道或吸引器，但需要生命週期研究來證實這些益處。
（龔寅　譯　陳傑　校）

Contemporary comparisons of reusable and single-use perioperative textiles (surgical gowns and drapes) reflect major changes in the technologies to produce and reuse these products. Reusable and disposable gowns and drapes meet new standards for medical workers and patient protection, use synthetic lightweight fabrics, and are competitively priced. In multiple science-based life cycle environmental studies, reusable surgical gowns and drapes demonstrate substantial sustainability benefits over the same disposable product in natural resource energy (200%–300%), water (250%–330%), carbon footprint (200%–300%), volatile organics, solid wastes (750%), and instrument recovery. Because all other factors (cost, protection, and comfort) are reasonably similar, the environmental benefits of reusable surgical gowns and drapes to health care sustainability programs are important for this industry. Thus, it is no longer valid to indicate that reusables are better in some environmental impacts and disposables are better in other

environmental impacts. It is also important to recognize that large-scale studies of comfort, protection, or economics have not been actively pursued in the last 5 to 10 years, and thus the factors to improve both reusables and disposable systems are difficult to assess. In addition, the comparison related to jobs is not well studied, but may further support reusables. In summary, currently available perioperative textiles are similar in comfort, safety, and cost, but reusable textiles offer substantial opportunities for nurses, physicians, and hospitals to reduce environmental footprints when selected over disposable alternatives. Evidenced-based comparison of environmental factors supports the conclusion that reusable gowns and drapes offer important sustainability improvements. The benefit of reusable systems may be similar for other reusables in anesthesia, such as laryngeal mask airways or suction canisters, but life cycle studies are needed to substantiate these benefits.

醫學情報：評估麻醉氣體對全球氣候的影響

Medical Intelligence Article: Assessing the Impact on Global Climate from General Anesthetic Gases

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雖然目前鹵族有機化合物在大氣中的混合濃度比二氧化碳（被認爲人類活動引起氣候變化的主要原因）低 10 萬倍，但從工業時代開始（約 1750 年），它占了人類活動引起全球變暖效應總體效應的 10-15%。麻醉氣體家族包括幾種鹵族有機化合物，都是強大的溫室氣體。此報告提供了關於麻醉氣體釋放對環境影響的概述，特別注重輻射對氣候變化的影響。
（滕淩雅　譯　陳傑　校）

Although present in the atmosphere with a combined concentration approximately 100,000 times lower than carbon dioxide (i.e., the principal anthropogenic driver of climate change), halogenated organic compounds are responsible for a warming effect of approximately 10% to 15% of the total anthropogenic radiative forcing of climate, as measured relative to the start of the industrial era (approximately 1750). The family of anesthetic gases includes several halogenated organic compounds that are strong greenhouse gases. In this short report, we provide an overview of the state of knowledge regarding the impact of anesthetic gas release on the environment, with particular focus on its contribution to the radiative forcing of climate change.

特約文章：以減少環境污染的新鮮氣體流量管理

Special Article: Managing Fresh Gas Flow to Reduce Environmental Contamination

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麻醉藥物可能造成全球氣候變暖。雖然麻醉藥對二氧化碳排放的總體影響目前尚存爭議，但不同的用藥模式確實可以減少環境污染的程度。尤其密切注意新鮮氣體流量管理可使麻醉藥物作用更高效，即對患者起到相同藥效又可減少浪費。單個病例對環境的影響可能極小，但放眼至整個麻醉行業，若每個從業者都能對新鮮氣體流量進行管理，則能顯著影響麻醉氣體在大氣中的排放。麻醉維持期是減少新鮮氣體流量的最佳時期，因爲此期呼吸回路中的氣體濃度相對穩定且爲整個手術過程中時間最長的時期。同時，誘導期和初始期的新鮮氣體流量管理能減少麻醉揮發藥物的浪費。本文闡述了關於新鮮氣體流量管理的背景資訊，討論了在使用麻醉回路系統時，麻醉各階段新鮮氣體流量管理的策略，以期減少藥物浪費。氧氣以及麻醉氣體濃度的監測對於安全且有效的執行這些策略而言是必須的。未來，新鮮氣體流量難度的管理需倚靠麻醉供應系統的技術改進。

（陸秉瑋　譯　陳傑　校）

Anesthetic drugs have the potential to contribute to global warming. There is some debate about the overall impact of anesthetic drugs relative to carbon dioxide, but there is no question that practice patterns can limit the degree of environmental contamination. In particular, careful attention to managing fresh gas flow can use anesthetic drugs more efficiently—reducing waste while achieving the same effect on the patient. The environmental impact of a single case may be minimal, but when compounded over an entire career, the manner in which fresh gas flow is managed by each individual practitioner can make a significant difference in the volume of anesthetic gases released into the atmosphere. The maintenance phase of anesthesia is the best opportunity to reduce fresh gas flow because circuit gas concentrations are relatively stable and it is often the longest phase of the procedure. There are, however, methods for managing fresh gas flow during induction and emergence that can reduce the amount of wasted anesthetic vapor. This article provides background information and discusses strategies for managing fresh gas flow during each phase of anesthesia with the goal of reducing waste when using a circle anesthesia system. Monitoring oxygen and anesthetic gas concentrations is essential to implementing these strategies safely and effectively. Future technological advances in anesthetic delivery systems are needed to make it less challenging to manage fresh gas flow.

超聲引導下坐骨神經分叉處單次注射的腘窩坐骨神經阻滯較傳統的神經刺激技術起效更快

Ultrasound-Guided Popliteal Sciatic Block with a Single Injection at the Sciatic Division Results in Faster Block Onset than the Classical Nerve Stimulator Technique

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背景：爲了達到成功的且起效迅速的腘窩坐骨神經阻滯（SPB），推薦在坐骨神經分叉上單次注射，或分 2 次注射阻滯脛神經（TN）和腓總神經（CPN）。此項研究中將傳統的神經刺激（NS）引導下坐骨神經分叉水準上阻滯與超聲（US）引導下于分叉水準脛神經和腓總神經間單次注射局部麻醉劑（LA）進行比較。推測，US-SPB 下 TN 及 CPN 間單次注射較 NS-SPB 下單次注射起效更快。
方法：52 例患者隨機接受 NS-SPB 或 US-SPB。對於這兩種神經阻滯，爲了控制注射力度，使用自動注射泵給予 1.5%20 毫升甲吡卡因單次注射。NS-SPB 要求在腘窩折痕上 7 釐米引出在低於 0.5 mA 刺激下的脛神經反應（靠近 TN 和腓總神經的分支處），並在此處注射局麻藥。對於 US-SPB，超聲引導針在分叉水準插入脛神經和腓總神經之間給予注射局麻藥。運動反應不一定能引出但若存在即被記錄下來。兩組中局麻藥的定位和擴散均由超聲進行評估。每隔 5 分鐘對脛神經和腓總神經進行運動和感覺阻滯情況的連續評估並做組間比較。
結果：兩組患者均在注射 30 分鐘後阻滯完全，定義爲不需其他干預手段，感覺阻滯完全達到手術要求。US-SPB 組發生完全感覺阻滯（80%比 4%，P <0.01）和運動阻滯的比例（60%和 8%，P <0.01）較高，定義爲在注射後 15 分鐘所有神經分佈範圍都發生了感覺缺失和麻痹。超聲顯示神經內注射在 NS-SPB 組有 19 位患者(73%)而在 US-SPB 組有 25 位患者(100%) (*P* < 0.001)。
結論：US-SPB 組在超聲引導下于分叉水準脛神經和腓總神經之間給予單次注射局麻藥，在 30min 時阻滯成功率與 NS-SPB 相似；然而，US-SPB 組有更多的患者在 15 分鐘內被完全阻滯。
（孫曉瓊　譯　陳傑　校）
BACKGROUND: For successful, fast-onset sciatic popliteal block (SPB), either a single injection above the division of the sciatic nerve, or 2 injections to block the tibial nerve (TN) and common peroneal nerve (CPN) separately have been recommended. In this study, we compared the traditional nerve stimulator (NS)-guided SPB above the division of the sciatic nerve with the ultrasound (US)-guided block with single injection of local anesthetic (LA) between the TN and CPN at the level of their division. We hypothesized that US-SPB with a single injection between TN and CPN would result in faster block onset than a single-injection NS-SPB.
METHODS: Fifty-two patients were randomized to receive either an NS-SPB or a US-SPB. For both blocks, a single injection of 20 mL mepivacaine 1.5% was given using an automated injection pump while controlling for injection force. For NS-SPB, a TN response below 0.5 mA was sought 7 cm above the popliteal fossa crease (and proximal to the divergence of the TN and peroneal nerves). For US-SPB, the injection was made after a US-guided needle was inserted between the TN and CPN at the level of their separation. Motor response was not actively sought but registered if present. The location and spread of LA were evaluated by US in both groups. Onset of motor and sensory blocks was serially assessed in 5-minute intervals in the TN and CPN divisions and compared between the groups.
RESULTS: All patients in both groups had successful block at 30 minutes after the injection, defined as sensory block to allow surgery without supplementation. A higher proportion of patients in the US-SPB group had a complete sensory (80% vs 4%, *P* < 0.001) and motor block (60% vs 8%, *P* < 0.001), defined as anesthesia and paralysis in all nerve territories, at 15 minutes after injection. US signs of intraepineural injection were present in 19 patients (73%) in the NS-SPB group and 25 patients (100%) in the US-SPB group (*P* < 0.001).

CONCLUSIONS: A single injection of LA in US-SPB with needle insertion at the separation of the TN and CPN results in a similar success rate at 30 minutes; however, more patients in the US-SPB group than in the NS-SPB group had complete block at 15 minutes.

造影劑增強超聲應用於心肌灌注顯像

Medical intelligence article: contrast-enhanced ultrasound for myocardial perfusion imaging

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在造影劑增強超聲（CEUS）應用中，那些由氣體填充的微細氣泡型超聲造影劑可以增強檢測心肌結構，功能及血流方面的可視度。增強超聲在心血管方面的一個有趣的應用是它可以對心肌灌注方面即時成像。儘管在過去有一些研究證實了它的臨床價值，但目前對這項成像技術的質疑限制了其在圍術期的應用。所以就目前的情況，我們想做一些關於 CEUS 在心肌灌注成像應用方面的基本原理概要及其方法學和技術方面的討論。
（鄧利兵譯 薛張綱校）

Ultrasound contrast agents are gas-filled microbubbles that enhance visualization of cardiac structures, function and blood flow during contrast-enhanced ultrasound (CEUS). An interesting cardiovascular application of CEUS is myocardial contrast echocardiography, which allows real-time myocardial perfusion imaging. The intraoperative use of this technically challenging imaging method is limited at present, although several studies have examined its clinical utility during cardiac surgery in the past. In the present review we provide general information on the basic principles of CEUS and discuss the methodology and technical aspects of myocardial perfusion imaging.

氣管導管套囊壓力感受注射器的設計和體外測試

Design and In Vitro Testing of a Pressure-Sensing Syringe for Endotracheal Tube Cuffs

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摘要:氣管插管是一項經常用在院前，重症監護室和手術中的操作。氣管導管套囊必須充氣達到一定壓力以防止空氣洩漏而不有損氣管粘膜血流。爲了同步氣管導管套囊的膨脹與測量，我們設計並測試了一個全新的體外壓力感受注射器。它的原型是使用一個標準 10ml 裝配了一個活塞，一個矽膠波紋管和一個壓感元件的聚碳酸酯注射器。波紋管的可

行性是使用有限元分析確定和模擬的。各個波紋管（壓力 vs 撓曲度）在不同壓力下的可重複性試驗在 0.3cm 至 1.61cm（1%-5%的誤差）平均標準差之內。使用一個無液壓力計來作比較，得出了一個相當於 30cm H_2 O，斯皮爾曼等級爲 0.99（P < 0.001）極佳的線性相關關係。

（方昕譯 薛張綱校）

Abstract：Endotracheal intubation is a frequently performed procedure in the prehospital setting, intensive care unit, and for patients undergoing surgery. The endotracheal tube cuff must be inflated to a pressure that prevents air leaks without compromising tracheal mucosal blood flow. For simultaneous endotracheal tube cuff inflation and measurement, we designed and tested a novel pressure-sensing syringe in vitro. The prototype was developed using a standard 10-mL polycarbonate syringe body that houses a plunger and a silicone rubber bellows, the pressure-sensing element. Bellow feasibility was determined and modeled using finite element analysis. Repeatability testing at each pressure measurement for each bellows (pressure versus deflection) was within an average standard deviation of 0.3 cm to 1.61 cm (1%–5% error). Using an aneroid manometer for comparison, there was excellent linear correlation with a Spearman rank of 0.99 (P < 0.001), up to 30 cm H_2 O .

簡報：女性患者中使用觸診確認環甲軟骨方式的準確性:一向觀察性研究

Brief report: accuracy of identification of the cricothyroid membrane in female subjects using palpation: an observational study.

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背景:環甲軟骨(CTM）是環甲軟骨切開行緊急氣道供氧的推薦位置。儘管這一技術十分簡便，臨床急救時常常達不到其目標，且併發症多多。氣管切開失敗的原因仍然未知，因此我們想瞭解臨床醫生正確識別女性環甲軟骨的能力。

方法：要求臨床醫生在患者仰臥頸正中位通過使用螢光“隱形”墨水標記環甲軟骨，之後患者改變爲頸過伸位元進行標記。我們使用超聲確定環甲軟骨的準確位置，並且測量了準確的位置與醫生標記的位置之間的距離。準確的估計範圍是在環甲軟骨的上下緣之間，且距正中線5mm 之內的範圍。研究參與者同時要求用10-cm 視覺類比評分（VAS）評價環甲軟骨觸診。

結果：56位患者參與本研究其中15位爲肥胖患者。在仰臥頸正中位時，非肥胖與肥胖患者環甲軟骨確定率分別爲10/41和0/15（P=0.048）。在46位沒有準確定環甲軟骨的患者中，與標準位置相比24位定位過高（最大3cm），22位過低（最大3cm）。在頸過伸位時我們得到了類似的結果；非肥胖與肥胖分別爲12/41和1/15。差距範圍也更大；過高最大達2.5cm，過低最大達4cm，偏離正中最大達1.6cm。參與的醫生發現環甲軟骨的觸診在肥胖患者中比非肥胖患者組更難以確認；觸診難度的 VAS 評分分別爲5.25±2.5和3.3±2.5，P=0.005。應用多元線性回歸，觸診準確率的 VAS 評分與患者升高增長和甲頦間距增加負

相關（分別 P<0.001和 P=0.006），與頦胸間距以及頸圍正相關（分別 P=0.011和 P=0.001)。

結論：女性患者的環甲軟骨誤定位十分常見且在肥胖患者中定位的準確度更低，這項研究暗示了經環甲軟骨行氣道通氣的可行性。

（郭晨躍譯 薛張綱校）

BACKGROUND:The cricothyroid membrane (CTM) is the recommended site of access to the airway during cricothyroidotomy to provide emergency oxygenation. Despite the apparent simplicity of the technique, this rescue maneuver frequently fails to achieve its goals and complications are numerous. The reasons for this failure are unclear. We sought to determine the ability of physicians to correctly identify the CTM in female patients.

METHODS:Using fluorescent "invisible" ink, the physician was asked to mark the CTM with the patient in the supine neutral position and then with the head extended. The actual level was identified using ultrasound and the distance between the actual and estimated margin of the CTM was measured. A correct estimation was defined as a mark made between the upper and lower limits of the membrane and within 5 mm of midline. Participants were also asked to assess the ease of CTM palpation using a 10-cm visual analog scoring (VAS) scale.

RESULTS:Fifty-six patients participated of whom 15 were obese. In the supine neutral neck position, the CTM was identified in 10/41 vs 0/15 (P = 0.048) in nonobese versus obese, respectively. Of the 46 incorrectly identified CTMs in this position, 24 were above (maximum 3 cm) and 22 below (maximum 3 cm) the actual level. Similar results were observed when the patients were placed with the neck in the extended position; the CTM was identified correctly in 12/41 vs 1/15 nonobese and obese patients, respectively. The range of values was also extensive; the estimation of the position of the membrane was as high as 2.5 cm above and 4 cm below the actual level, and up to 1.6 cm laterally. Participating doctors found palpation of the CTM subjectively more difficult in the obese than nonobese groups; VAS score for palpation difficulty was 5.25 ± 2.5 vs 3.3 ± 2.5, respectively, P = 0.005. Using multiple linear regression, VAS scores for palpation correlated negatively with increased patient height (P < 0.001) and greater thyromental distance (P = 0.006), and correlated positively with increased sternomental distance (P = 0.011) and neck circumference (P = 0.001).

CONCLUSIONS:Misidentification of the CTM in female patients is common and its localization is less precise in those who are obese. This has implications for the likely success of invasive airway access via the CTM.

兩例惡性高熱家族中出現雙倍和單倍諾丁受體 1 變異

Novel double and single ryanodine receptor 1 variants in two austrian malignant hyperthermia families.

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背景：惡性高熱是一種與揮發性麻醉藥和去極化肌松藥有關的潛在的致死性疾病。欲證明惡性高熱引起顯著基因變異，必須先證明諾丁受體 1 的鈣通道的敏感性。故我們選定這兩個出現嚴重惡性高熱並有明顯基因變異的家庭做研究。
方法：我們首先按順序排好兩個奧地利家庭每個人的 RYR1 基因編碼區，分離基因型並記錄基因變化進程；功能正常情況下，含有突變基因的個體在 f2 酸酶作用下釋放鈣離子，而非易感個體無釋放。特異的鈣離子激動劑有：咖啡因、4-CmC、氟烷等。
結果：家庭 A，惡性高熱易感型，存在 A612P 突變，表現爲細胞對促鈣離子釋放物質的敏感性增高；家庭 B，存在兩種突變型（p.R2458H/p.R3348C），p.R2458H 型和 p.R2458H/p.R3348C 突變型都提示惡性高熱易感，p.R3348C 型是否爲 MH 易感還不確定。與陰性對照組相比，鈣離子釋放試驗提示：除了存在 p.R2458H/p.R3348C 突變的 4-CmC 以外，機體儲存的氨基酸能增加實驗物質的敏感性。
結論：這些突變基因是 MH 新的變異。
(韓旭譯 薛張綱校)
BACKGROUND:Malignant hyperthermia (MH) is a potentially lethal genetic disorder in response to volatile anesthetics and depolarizing muscle relaxants. To support the claim that a novel genetic variant causes MH, it is necessary to demonstrate that it has significant effects on the sensitivity of the ryanodine receptor (RYR1) calcium channel. In this study we focused on 2 Austrian families with strong MH disposition and new RYR1 variants.
METHODS:We sequenced the entire coding region of the RYR1 from 2 Austrian MH individuals. Genotype-phenotype segregation and evolutionary conservation of the variants were considered. On a functional level, Ca(2+) release experiments with fura-2-acetoxymethyl ester were performed in cultured skeletal muscle cells derived from individuals carrying the new variants and compared with control cells from nonsusceptible individuals. Caffeine, 4-chloro-m-cresole (4-CmC), and halothane were used as specific Ca(2+) releasing agents.
RESULTS:The variant p.A612P in family A segregated with an MH-susceptible phenotype and cells showed an increased sensitivity for all Ca(2+)-releasing substances tested. In family B, 2 variants (p.R2458H/p.R3348C) were identified. While p.R2458H and p.R2458H/p.R3348C segregated with an MH-susceptible diagnosis, p.R3348C alone showed an MH equivocal diagnosis. Ca(2+)-release experiments showed that exchanges of these highly conserved amino acids increased the sensitivities for the substances tested (except 4-CmC with p.R2458H and p.R3348C) when compared with the MH-negative control group.
CONCLUSIONS: Our results suggest that these variants are new causative MH variants.

一項關於麻醉師對手術室廢物回收的意見的調查

A survey of anesthesiologists' views of operating room recycling.

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背景：手術室能顯著增加醫院廢物的體積和成本。然而，很少有人知道醫生關於醫院廢物回收的意見，儘管他們對改善回收計畫有潛在影響。我們研究在澳大利亞，新西蘭和英格蘭的城鎮或大都市，公立醫院或私人診所工作的麻醉師對醫院廢物回收的觀點。我們提出以下幾點：（1）認爲手術室廢物回收重要的麻醉科醫生的比例占多少？（2）受訪者認爲阻礙手術室回收的識別障礙是什麼？
方法：我們對麻醉師對手術室廢物回收的態度進行網路調查，共 11 個問題。試點後，調查通過電子郵件發送給 500 個隨機選擇的澳大利亞和新西蘭麻醉師學院的研究員。英國國民健康服務的所有麻醉部門也收到電子郵件，並由英語顧問麻醉師完成調查。
結果：我們共收到 780 份麻醉師的回應，210 份來自澳大利亞和新西蘭（41%的回應率），570 份來自英格蘭（在最壞的情況下只有 11%的回應率）。無論地域或工作的性質，大部分（725，93%，95%可信區間[CI]爲：91%至 95%）回應的麻醉師願意增加手術室廢物的回收利用，並願意花時間，但不是自己的錢這樣做。只有 87（11%，95% CI：9%至 14%）的受訪者同意/非常同意，廢物回收已經發生在他們的手術室。受訪者認爲，廢物回收的最大障礙是：（1）回收設施不足，381（49%）;（2）消極的工作人員的態度，133（17%）;（3）如何回收廢物資訊不足，121 （16%）。及時，安全，回收容器空間不足和成本分別被<5%的受訪者認爲是回收的最大障礙
結論：大多數麻醉師支持更大的手術室廢物回收，但他們認爲有識別障礙。麻醉醫師可以發揮領導作用，並與醫院其他員工合作來提高手術室回收。我們建議研究提高手術室回收設施，文化程度，和工作人員態度的影響因素
（賀盼譯 薛張綱校）

BACKGROUND: Operating rooms contribute significantly to the increasing volumes and costs of hospital waste. Little is known, however, about doctors' views of hospital waste recycling despite their potential influence in improving recycling programs. We surveyed the waste recycling views held by anesthesiologists in Australia, New Zealand, and England in regional or metropolitan and public or private practice. We asked the following: (1) What proportion of anesthesiologists consider recycling operating room waste to be important? (2) What do respondents consider to be identifiable barriers preventing operating room recycling?
METHODS: We performed a Web-based survey of 11 questions of attitudes to operating room waste recycling held by anesthesiologists. After piloting, the survey was e-mailed to 500 randomly selected Fellows of the Australian and New Zealand College of Anesthetists. All anesthetic departments of the National Health Service of England also received the e-mail with a request that English consultant anesthesiologists complete the survey.
RESULTS: We received 780 responses from anesthesiologists, 210 (41% response rate) from Australia and New Zealand and 570 (11% response rate at worst) from England. Regardless of location or type of practice, most (725, 93%; 95% confidence interval [CI]: 91% to 95%) responding anesthesiologists would like to increase recycling of operating room waste and would commit their time, but not their money to doing so. Only 87 (11%; 95% CI: 9% to 14%) respondents agreed/strongly agreed that waste recycling occurred in their operating rooms already. Survey respondents thought that the greatest barriers to recycling waste were (1) inadequate recycling facilities, 381 (49%); (2) negative staff attitudes, 133 (17%); and (3)

inadequate information on how to recycle waste, 121 (16%). Time, safety, inadequate space for recycling receptacles, and cost were each thought by <5% of respondents to be the greatest barrier to recycling.
CONCLUSIONS: Most responding anesthesiologists supported greater operating room waste recycling but thought that there were identifiable barriers. Anesthesiologists could take a leadership role and work with other hospital employees to improve operating room recycling. We suggest studies of the effect of improving operating room recycling facilities, education, and staff attitudes.

可重複使用和一次性使用中心靜脈導管裝置的使用週期評估

A Life Cycle Assessment of Reusable and Single-Use Central Venous Catheter Insertion Kits

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背景：對於手術室中很多使用的專案來說，可重複使用的專案是否比一次性使用的專案更具備環保和經濟效益並不十分清楚。我們研究了可重複使用的和一次性使用的中心靜脈導管裝置。我們沒有研究中心靜脈導管裝置本身的性能。我們評估了裝置總的環境和經濟成本，包括消毒所需的能源消耗。
方法：對於可重複使用的中心靜脈導管裝置，在澳大利亞墨爾本的健康中心，我們運作了一個“時間動量”研究來計算勞力耗損和計算在清洗和消毒中使用的能源和水。對於大部分的一次性使用裝置的投入，我們依據行業和採購資料。我們將可重複使用和一次性使用中心導管裝置做成了蒙特卡羅分析模型。
結果：包含勞力，可重複使用中心靜脈導管裝置花費$6.35 澳大利亞（$A）(95%可信區間 $A5.89 到$A6.86)，而一次性裝置花費$8.65。可重複使用裝置，CO2 排放量 1211g(95%可信區間 1099 到 1323 克)，而一次性裝置排放 407g(95%可信區間 379 到 442 克)。水的耗用對於可重複使用裝置是 27.7 升(95%可信區間 27 到 28.6 升)， 而一次性使用裝置是 2.5 升(95%可信區間 2.1 到 2.9 升)。對於可重複使用的裝置，消毒耗費巨大的環境成本，而對於一次性使用裝置，製造所使用的塑膠和金屬則是其最大的環境成本。不同來源的電造成可重複使用裝置使病人再次受到 CO2 排放的影響：醫院燃氣產電導致 436gCO2 排放（95%可信區間 410 到 473gCO2），美國電網排放 764gCO2（95%可信區間 509 到 1174gCO2），歐洲電網排放 572g（95%可信區間 470 到 713gCO2）。
結論：包含勞力，可重複使用中心靜脈導管裝置比一次性使用裝置昂貴。對於我們醫院，使用煤源電力來說，環境成本消耗方面，可重複使用裝置比一次性使用裝置花費要貴許多。努力減少可重複使用環境成本最直關鍵的是降低清潔和消毒的水和能源消耗。醫院的電力來源相對反映著迴圈使用專案的環境影響。
（胡曉清譯 薛張綱校）

BACKGROUND: For most items used in operating rooms, it is unclear whether reusable items are environmentally and financially advantageous in comparison with single-use variants. We examined the life cycles of reusable and single-use central venous catheter kits used to aid the insertion of single-use, central venous catheters in operating rooms. We did not examine the actual disposable catheter sets themselves. We assessed the entire financial and environmental costs for the kits, including the influence of the energy source used for sterilization.
METHODS: For the reusable central venous catheter kit, we performed a "time-in-motion" study to determine the labor costs and measured the energy and water consumption for cleaning and sterilization at Western Health, Melbourne, Australia. For the majority of the inputs for the single-use kit, we relied upon industry and inventory-sourced databases. We modeled the life cycles of the reusable and single-use central venous catheter kits with Monte Carlo analysis.
RESULTS:Inclusive of labor, the reusable central venous catheter insertion kits cost $6.35 Australian ($A) (95% confidence interval [CI], $A5.89 to $A6.86), and the single-use kits cost $A8.65. For the reusable kit, CO_2 emissions were 1211 g (95% CI, 1099 to 1323 g) and for the single-use kit 407 g (95% CI, 379 to 442 g). Water use was 27.7 L (95% CI, 27.0 to 28.6 l) for the reusable kit and 2.5 L (95% CI, 2.1 to 2.9 l) for the single-use kit. For the reusable kit, sterilization had the greatest environmental cost, and for the single-use kit, the manufacture of plastic and metal components had the largest environmental costs. Different sources of electricity to make the reusable kits patient-ready again affected the CO_2 emissions: electricity from hospital gas cogeneration resulted in 436 g CO_2 (95% CI, 410 to 473 g CO_2), from the United States electricity grid 764 g CO_2 (95% CI, 509 to 1174 g CO_2), and from the European electricity grid 572 g (95% CI, 470 to 713 g CO_2).
CONCLUSIONS: nclusive of labor, the reusable central venous catheter insertion kits were less expensive than were the single-use kits. For our hospital, which uses brown coal–sourced electricity, the environmental costs of the reusable kit were considerably more expensive than those of the single-use kit. Efforts to reduce the environmental footprint of reusable items should be directed towards decreasing the water and energy consumed in cleaning and sterilization. The source of hospital electricity significantly alters the relative environmental effects of reusable items.

麻醉中的異丙酚浪費

Propofol Wastage in Anesthesia

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背景：藥品浪費已被認爲是環境污染和不必要的醫療保健費用的一個重要因素。
方法：我們在 8 個手術室中手工整理每個醫藥廢物收集器中的內容，並將結果匯總。能返回到藥店的異丙酚，不計入浪費藥物。
結果：浪費或丟棄的異丙酚，占所有藥物浪費的 45%。
結論：異丙酚在自然界中不會降解，在體內脂肪中積聚，對水生生物有毒。我們以最小尺寸（20 毫升）的異丙酚代替 50 和 100 毫升瓶裝異丙酚可以減少浪費。
（郁玲玲譯 薛張綱校）
BACKGROUND: Drug waste has been implicated as a significant contributor to environmental contamination and unnecessary health care costs.

METHODS: We collected the contents of pharmaceutical waste collection containers in each of 8 operating rooms, sorted them by hand, and tabulated the results. Propofol returned to the pharmacy was not counted as wasted drug.
RESULTS: Wasted or discarded propofol accounted for 45% of all the drug waste.
CONCLUSIONS: Propofol does not degrade in nature, accumulates in body fat, and is toxic to aquatic life. We reduced wastage by removing 50 and 100 mL vials of propofol from the pharmacy, retaining only the smallest size (20 mL).

啓動中樞大麻素 2 型受體系統可以預防紫杉醇引起的神經病

Prevention of Paclitaxel-induced neuropathy through activation of the central cannabinoid type 2 receptor system.

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背景：周圍神經病是化療的一個重要的劑量限制性毒性反應，特別是在應用了多個療程的紫杉醇之後。由紫杉醇引起的神經病，其發展與啓動小膠質細胞後導致星形膠質細胞的活化和增殖，以及在脊髓背角表達和釋放前炎性細胞因數密切相關。在神經退行性病變的模型中，小膠質細胞表達了大麻素 2 型（CB（2））受體。
方法：爲了探索 CB（2）激動劑預防紫杉醇引起的神經病的能力，我們設計並合成了一種新型 CB（2）選擇性激動劑，即 MDA7。在 大鼠和 CB（2）（+ / +）及 CB（2）（ - / - ）小鼠身上，我們評估了 MDA7 在預防紫杉醇引起痛覺異常方面的效果。我們假設 CB（2）受體在負反饋回路起作用，因此早期應用 MDA7 可以削弱紫杉醇引起的神經炎症反應，並且能通過干擾特定的信號通路從而預防機械性痛覺異常。
結果：我們發現，MDA7 在不影響紫杉醇的抗腫瘤作用的同時，能夠以劑量和時間依賴的方式預防紫杉醇在小鼠與大鼠身上引起的機械性痛覺異常。MDA7 的神經保護作用在 CB（2）（ - / - ）小鼠中缺失，並且能夠被 CB（2）拮抗劑阻斷，表明 MDA7 的作用直接涉及 CB（2）受體的啓動。 MDA7 治療能夠在早期干預紫杉醇引起的神經炎症反應，這是因爲目前已經證實了它能夠相對減少 Toll 樣受體及 CB（2）在腰髓的表達，降低細胞外信號調節激酶 1/2 的活性水準，減少啓動的小膠質細胞和神經膠質細胞的數量，減少在體內和體外模型中前炎症介質的分泌。
結論：我們的研究結果表明這是一種新的預防化療引起的神經病的治療方法。有了這種方法，可以在更加積極應用化療方案的同時，減少長期的後遺症。
（周玲譯 薛張綱校））

BACKGROUND: Peripheral neuropathy is a major dose-limiting toxicity of chemotherapy, especially after multiple courses of paclitaxel. The development of paclitaxel-induced neuropathy is associated with the activation of microglia followed by the activation and proliferation of astrocytes, and the expression and release of proinflammatory cytokines in the spinal dorsal horn. Cannabinoid type 2 (CB(2)) receptors are expressed in the microglia in neurodegenerative disease models.

METHODS: To explore the potential of CB(2) agonists for preventing paclitaxel-induced neuropathy, we designed and synthesized a novel CB(2)-selective agonist, namely, MDA7. The effect of MDA7 in preventing paclitaxel-induced allodynia was assessed in rats and in CB(2)(+/+) and CB(2)(-/-) mice. We hypothesized that the CB(2) receptor functions in a negative-feedback loop and that early MDA7 administration can blunt the neuroinflammatory response to paclitaxel and prevent mechanical allodynia through interference with specific signaling pathways.
RESULTS: We found that MDA7 prevents paclitaxel-induced mechanical allodynia in rats and mice in a dose- and time-dependent manner without compromising paclitaxel's antineoplastic effect. MDA7's neuroprotective effect was absent in CB(2)(-/-) mice and was blocked by CB(2) antagonists, suggesting that MDA7's action directly involves CB(2) receptor activation. MDA7 treatment was found to interfere with early events in the paclitaxel-induced neuroinflammatory response as evidenced by relatively reduced toll-like receptor and CB(2) expression in the lumbar spinal cord, reduced levels of extracellular signal-regulated kinase 1/2 activity, reduced numbers of activated microglia and astrocytes, and reduced secretion of proinflammatory mediators in vivo and in in vitro models.
CONCLUSIONS: Our findings suggest an innovative therapeutic approach to prevent chemotherapy-induced neuropathy and may permit more aggressive use of active chemotherapeutic regimens with reduced long-term sequelae.

簡報：臂叢神經中肌皮神經的出現水準：鎖骨下神經阻滯的影響因素

Brief report: the emergence level of the musculocutaneous nerve from the brachial plexus: implications for infraclavicular nerve blocks.

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背景：在這項針對屍體的研究中，我們測量在鎖骨下入路的神經阻滯中針尖刺入部位與肌皮神經出現點的距離
方法：我們研究了 20 例成人防腐屍體的 40 例臂叢神經。暴露肌皮神經從其側線起源至喙肱肌。測量肌皮神經在側線的出現點至喙肱肌的內側角的直線距離。將穿刺針按之前描述的方法放置，並測量針尖位置至肌皮神經出現點的距離。
結果：肌皮神經經常出現在喙肱肌行程的遠端。在針尖刺入部位，80%的肌皮神經早已出現在側線上。此距離至喙肱肌爲近端 8.5 釐米至遠端 12 釐米。
結論：本解剖研究提示橫向入針行鎖骨下神經阻滯時單次注射技術阻滯肌皮神經不全的原因可能與肌皮神經的出現點的變異有關。
（楊琰譯 薛張綱校）

BACKGROUND: In this cadaveric study we assessed the level of the emergence of the musculocutanous nerve (MCN) relative to needle insertion site during infraclavicular block.
METHODS: Forty brachial plexi from 20 embalmed adult cadavers were dissected. The MCN was exposed from its origin on the lateral cord to its penetration into the coracobrachialis muscle.

The point of emergence of the MCN from the lateral cord relative to a line drawn directly caudad from the anteromedial tip of the coracoid process was measured. A needle was placed predissection using our previously described technique, and the distance from the needletip to the emergence of the MCN was measured.
RESULTS: MCN often emerged distal to the coracoid process. At the needle insertion site, 80% of MCN had already emerged from the lateral cord. The distance of emergence ranged from 8.5 cm proximal to 12 cm distal to the coracoid process.

CONCLUSION: This anatomical study suggests that MCN may be one of the factors explaining MCN block failure for the single-injection technique of infraclavicular block using lateral needle trajectory.

幼豬氰化物毒性和它被一種新的前體藥物 Sulfanegen Sodium 逆轉

Cyanide Toxicity in Juvenile Pigs and Its Reversal by a New Prodrug, Sulfanegen Sodium

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背景：氰化物（CN）中毒時一種比較嚴重的臨床問題，可能會發生在給予硝普鈉（SNP）、意外煙吸入、工業事故以及生化恐怖活動時。本研究中，我們分別對幼豬使用硝普鈉或者是氰化鈉(NaCN)單獨製造嚴重氰化物中毒的模型，從而證明嚴重的氰化物中毒可以被一種新型解毒劑——3-巯基丙酮酸的前體藥物 sulfanegen sodium 的逆轉作用。
方法：SNP 研究：在 11 只麻醉機械通氣狀態下的幼豬中進行預實驗，來決定誘導產生 CN 中毒的 SNP 劑量。監測血 CN、血清乳酸鹽和血氣。CN 中毒的定義爲出現嚴重的乳酸性酸中毒伴隨血 CN 水準明顯升高。基於這個預實驗，8 只麻醉後的豬使用高劑量靜脈輸注 SNP（100 mg/h），維持 2h 以誘導產生 CN 中毒。然後隨機將它們分爲 2 組，使用 sulfanegen sodium 組和使用安慰劑組。4 只豬在誘導嚴重 CN 中毒後每小時使用 3 個劑量的 sulfanegen sodium（2.5g IV），4 只豬使用安慰劑。NaCN 研究：預實驗 4 只豬，在異丙酚和氯胺酮鎮靜下自主呼吸，在數小時內確保血流動力學和代謝穩定。之後，6 只豬採用同樣的鎮靜方式，間斷使用等劑量 NaCN 以產生 CN 中毒，最終導致死亡。隨訪血流動力學和代謝變數來定義 CN 中毒的峰值。另外 6 只豬，採用這種方式誘導產生嚴重的 CN 中毒，並且在毒性峰值時，給予動物 sulfanegen sodium（2.5g IV），60min 後在存活的動物中重複使用此劑量。
結果：SNP 組：預實驗表明，高劑量 SNP 組均發生了顯著的血 CN 水準升高（$P < 0.05$）和嚴重的乳酸性酸中毒（$P < 0.05$）。使用 sulfanegen sodium 引起血乳酸鹽以及 CN 水準的逐步顯著下降，存活率 100%（$P < 0.05$），而安慰劑組豬惡化且無存活（$P < 0.05$）。NaCN 研究：NaCN 注射在所有豬均導致 CN 中毒，伴嚴重的乳酸性酸中毒以及死亡。Sulfanegen sodium 逆轉了這種毒性，並且這個解毒藥防止了所有豬的死亡。
結論：使用 SNP 或 NaCN 在幼豬模型中可成功誘導產生 CN 中毒。前體藥物 sulfanegen sodium，能有效逆轉 SNP 或 NaCN 誘導產生的 CN 毒性。
（安光惠 譯 馬皓琳 李士通 校）

BACKGROUND: Cyanide (CN) toxicity is a serious clinical problem and can occur with sodium nitroprusside (SNP) administration, accidental smoke inhalation, industrial mishaps, and bio-terrorism. In this study, we induced severe CN toxicity independently with SNP or sodium cyanide (NaCN) in a juvenile pig model to demonstrate reversal of severe CN toxicity with a new antidote, sulfanegen sodium, a prodrug of 3-mercaptopyruvate.
METHODS: SNP study: A pilot study in 11 anesthetized, mechanically ventilated juvenile pigs allowed us to determine the dose of SNP to induce CN toxicity. Blood CN, serum lactates, and blood gases were monitored. CN toxicity was defined as the occurrence of severe lactic acidosis accompanied by significant elevation in blood CN levels. Based on this pilot study, 8 anesthetized pigs received a high-dose IV infusion of SNP (100 mg/h) for 2 hours to induce CN toxicity. They were then randomized to receive either sulfanegen sodium or placebo. Four pigs received 3 doses of sulfanegen sodium (2.5 g IV) every hour after induction of severe CN toxicity, and 4 pigs received placebo. NaCN study: A pilot study was conducted in 4 spontaneously ventilating pigs sedated with propofol plus ketamine to demonstrate hemodynamic and metabolic stability for several hours. After this, 6 pigs were similarly sedated and given NaCN in bolus aliquots to produce CN toxicity ultimately resulting in death. Hemodynamics and metabolic variables were followed to define peak CN toxicity. In another group of 6 pigs, severe CN toxicity was induced by this method, and at peak toxicity, the animals were given sulfanegen sodium (2.5 g IV) followed by a repeat dose 60 minutes later in surviving animals.
RESULTS: SNP study: The pilot study demonstrated the occurrence of a significant increase in blood CN levels ($P < 0.05$) accompanied by severe lactic acidemia ($P < 0.05$) in all pigs receiving a high dose of SNP. Administration of the sulfanegen antidote resulted in progressive significant reduction in blood lactate and CN levels with 100% survival ($P < 0.05$), whereas the placebo-treated pigs deteriorated and did not survive ($P < 0.05$). NaCN study: NaCN injection resulted in CN toxicity accompanied by severe lactic acidosis and mortality in all the pigs. Sulfanegen sodium reversed this toxicity and prevented mortality in all the pigs treated with this antidote.
CONCLUSIONS: CN toxicity can be successfully induced in a juvenile pig model with SNP or NaCN. The prodrug, sulfanegen sodium, is effective in reversing CN toxicity induced by SNP or NaCN.

異丙酚/瑞芬太尼致呼吸暫停後的血紅蛋白氧飽和度下降: 一項健康志願者自主呼吸恢復的研究

Hemoglobin Desaturation After Propofol/Remifentanil-Induced Apnea: A Study of the Recovery of Spontaneous Ventilation in Healthy Volunteers

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背景:一項較早的調查“不能通氣/不能插管”的臨床情況的研究表明，應用硫噴妥鈉 5 mg / kg 和琥珀膽鹼 1.0mg/kg 的麻醉誘導引起血紅蛋白飽氧和度下降的顯著風險。琥珀膽鹼導

致的呼吸暫停可能是延長的呼吸暫停的原因。我們假設在氣管插管時使用異丙酚和瑞芬太尼也許可以避免由於肌肉鬆弛而導致的長時間呼吸暫停和隨後的氧飽和度下降。
方法：有 24 位健康志願者參與了實驗，年齡分佈在 18 到 45 歲。在吸氧達到呼氣末氧濃度大於 90%後，志願者們接受了異丙酚 2mg/kg 及分別爲 2 mcg/kg（組 1；*n*=12）或 1.5 mcg/kg (group 2; *n* = 12)的瑞芬太尼。測量了手指、耳垂和前額的氧飽和度(SpO_2)。如果氧飽和度下降低於了 80%，則托起志願者下頜，如果此情況持續，則進行輔助通氣。
結果：5 名志願者出現了飽和度降低（SpO_2 < 80%）：4 名在高劑量(2 mcg/kg)瑞芬太尼組，1 名在低劑量(1.5 mcg/kg)瑞芬太尼組。3 名志願者需要托下頜和輔助通氣。在高劑量瑞芬太尼組中，最低的氧飽和度是 82.4 ± 10.5 (均值± 標準差)，而在低劑量瑞芬太尼組中，最低的氧飽和度是 92.4 ± 8.6 (*P* = 0.019)。低劑量組的呼吸暫停時間(4.7 ± 1.5)比高劑量組的呼吸暫停時間(6.1 ± 1.0)要短(*P* = 0.0093)。在高劑量組中，有良好或者可接受的插管條件的志願者爲 11 名（92； 95%可信區間，65-99%）；在低劑量組中，有良好或者可接受的插管條件的志願者爲 8 名（67%; 95% 可信區間, 39%–86%）。
結論：在同時給予異丙酚 2 mg/kg 的情況下，爲了產生可接受的插管條件所需的瑞芬太尼劑量 2 mcg/kg，會導致呼吸暫停同時有降低氧飽和的顯著風險，然而 1.5 mcg/kg 劑量的瑞芬太尼無法可靠地提供可接受的插管條件，也沒有減少氧飽和降低的風險。
（張怡 譯 馬皓琳 李士通校）
BACKGROUND: In an earlier study investigating the “can't ventilate/can't intubate” clinical scenario, induction of anesthesia with thiopental 5 mg/kg and succinylcholine 1.0 mg/kg was associated with a significant risk of hemoglobin desaturation. It appeared that succinylcholine-induced apnea was responsible for the prolonged apnea. Our hypothesis was that using propofol and remifentanil for tracheal intubation might avoid prolonged apnea and subsequent desaturation attributable to muscle relaxation.
METHODS: Twenty-four healthy volunteers ages 18 to 45 years participated. After oxygen administration to end-tidal oxygen >90%, volunteers received 2 mg/kg propofol and remifentanil either 2 mcg/kg (group 1; *n* = 12) or 1.5 mcg/kg (group 2; *n* = 12). Oxygen saturation (SpO_2) was measured at a finger, an ear lobe, and the forehead. If SpO_2 decreased below 80%, volunteers received chin lift and, if persistent, assisted ventilation.
RESULTS: Desaturation (SpO_2 < 80%) occurred in 5 volunteers: 4 in the higher remifentanil dose (2 mcg/kg) group and 1 in the lower dose (1.5 mcg/kg) group. Chin lift and assisted ventilation was necessary in 3 volunteers. The lowest SpO_2 was 82.4 ± 10.5 (mean ± SD) in the higher-dose group vs. 92.4 ± 8.6 with the lower dose of remifentanil (*P* = 0.019). Apnea time was shorter (*P* = 0.0093) with the lower dose (4.7 ± 1.5) than with the higher dose of remifentanil (6.1 ± 1.0). Conditions for intubation were excellent or acceptable in 11 volunteers (92%; 95% confidence interval [CI], 65%–99%) in the higher-dose group, and in 8 (67%; 95% CI, 39%–86%) with the lower dose.
CONCLUSIONS: Administered with propofol 2 mg/kg, the remifentanil dose necessary to produce acceptable intubating conditions, 2 mcg/kg, produces apnea that carries a significant risk of desaturation, whereas a remifentanil dose of 1.5 mcg/kg does not reliably produce acceptable intubating conditions and does not eliminate the risk of desaturation.

重症監護病房裡的非計劃性氣管拔管：系統綜述、嚴格評估和循證建議

Unplanned Endotracheal Extubations in the Intensive Care Unit: Systematic Review, Critical Appraisal, and Evidence-Based Recommendations

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背景：在本研究中，我們更新了重症監護病房對非計劃性氣管拔管的認識狀態。重點探討以下主題：發生率、危險因素、非計劃性拔管後重插管、結果以及預防。根據本綜述提出預防非計劃性拔管的建議。
方法：搜索 1950 年 1 月 1 日到 2011 年 6 月 30 日有關出版物的電子資料庫，包括 MEDLINE、EMBASE、CINAHL、SciELO、LILACS 和 Cochrane 系統。得到 50 篇適合提取資料的文章。用 Newcastle-Ottawa 標度評價研究品質。根據牛津循證醫學中心評價推薦等級。
結果：非計劃性拔管發生率爲 0.1-3.6 次/100 插管日。與非計劃性拔管相關的危險因素包括男性（優勢比[OR]4.8）、APACHE 評分≥17（OR 9.0）、COPD、多動/激動（OR 3.3-30.6）、低鎮靜水準（OR 2.0-5.4）、高清醒水準（OR 1.4-2.0）以及使用身體約束物品（OR 3.1）。非計劃性拔管的重插管率爲 1.8%-88%。13 項研究評估了避免非計劃性拔管的預防措施。這些研究集中在資料收集工具、標準化流程、工作人員教育、工作人員監視以及高危患者的確認和處理。這些研究報導非計劃性拔管減少了 22%-53%。氣管導管最佳固定方法和身體約束物品的使用仍存在爭議。
結論：雖然關於非計劃性拔管的出版物很多，但極少有研究評價不良事件的預防措施，且極少有臨床試驗評價非計劃性拔管。根據現有文獻提出建議。
（陳彬彬 翻譯， 馬皓琳 李士通審校）

BACKGROUND: In this study, we updated the state of knowledge on unplanned tracheal extubations in the intensive care unit. We focused on the following topics: incidence, risk factors, reintubation after unplanned extubation, outcomes, and prevention. Based on this review, recommendations were made for preventing unplanned extubations.
METHODS: Electronic databases were searched for relevant publications from January 1, 1950 through June 30, 2011 on the MEDLINE, EMBASE, CINAHL, SciELO, LILACS, and Cochrane systems. Fifty articles were eligible for data abstraction. Study quality was assessed using the Newcastle-Ottawa Scale. Grades of recommendation were assessed according to the Oxford Centre for Evidence-Based Medicine.
RESULTS: Unplanned extubations occur at a rate of 0.1 to 3.6 events per 100 intubation days. Risk factors associated with unplanned extubations included male gender (odds ratio [OR] 4.8), APACHE score ≥17 (OR 9.0), chronic obstructive pulmonary disease, restlessness/agitation (OR 3.3–30.6), lower sedation level (OR 2.0–5.4), higher consciousness level (OR 1.4–2.0), and use of physical restraints (OR 3.1). Reintubation rates ranged from 1.8% to 88% of unplanned extubations. Thirteen studies assessed preventive measures for avoiding unplanned extubations. These studies focused on data collection tools, standardization of procedures, staff education, staff surveillance, and identification and management of high-risk patients. These studies reported reductions in unplanned extubation rate from 22% to 53%. The best methods of securing the endotracheal tube and use of physical restraints remain controversial issues.

CONCLUSIONS: Despite numerous publications on unplanned extubation, few studies assess preventive strategies for adverse events, and few clinical trials have assessed unplanned extubations. Recommendations are proposed based on the currently available literature.

尼莫地平引起的低血壓而不是硝酸甘油引起的低血壓保留成年小鼠長期和短期記憶

Nimodipine-Induced Hypotension but Not Nitroglycerin-Induced Hypotension Preserves Long- and Short-Term Memory in Adult Mice

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背景：急性低血壓可能引起認知功能障礙。L-型鈣通道阻斷劑在低氧條件下保護學習和記憶。我們驗證尼莫地平(NIMO)和尼卡地平(NICA)誘發的低血壓對比硝酸甘油(NTG)誘發的低血壓將產生保護長期和短期記憶作用。
方法：40 只 S-W 小鼠（30-35g，6-8 周）隨機分爲 4 組，手術當日被動逃避（PA）學習後立即腹膜內注射藥物：(1) 硝酸甘油(30 mg/kg)；(2) 尼卡地平(40 mg/kg)；(3) 尼莫地平(40 mg/kg)；(4)生理鹽水。記錄 PA 訓練等待時間（s）從懸吊的平臺到進入一個有機玻璃管，在這裡電擊（0.3 毫安培，持續時間 2 秒）自動傳送。在第二天無電擊進行傳輸的複核子試驗過程中記錄等待時間。等待時間大於 900s 被指定爲此數值。更低的測試等待時間顯示出損害長期相關記憶。另外 49 只小鼠隨機分爲類似分組用於物體辨識測試(ORT)，並且在手術當日給予腹膜注射。ORT 測量短期記憶通過探索在有熟悉物體的情況下小鼠傾向喜歡新穎物體。在訓練的第 5 天，2 個相同的物體被放置在一個圓形舞臺，並且小鼠進行探索 15 分鐘。用新穎物體替換熟悉的物體後 1 小時，進行 3 分鐘的試驗。具有完整記憶的小鼠花大約 65%的時間探索新物體。記憶損害的小鼠花了相同時間探索新老物體。辨識指數(RI)定義爲花在探索新事物與花在探索兩個物體的時間比值。在小鼠兩個獨立組進行平均動脈壓(MAP)、腦血流和身體及腦氧合飽和度(PO_2)研究，用來確定每次處理生理情況和低血壓程度的對應劑量。
結果：不同情況下中位元 PA 等待時間如下：NTG，219.5 ± 93.5 s 四分位距（SIQR）；NICA，372.5 ± 75.5 s SIQR；NIMO，540 ± 200s SIQR 和生理鹽水，804 ± 257.5 s SIQR。用等級方法來分析 PA 等待時間的顯著性差異。NTG 等待時間明顯短於 NIMO 等待時間(P = 0.012)和生理鹽水等待時間(P = 0.006)，但不短於 NICA 等待時間(P = 0.126)。ORT RI 值顯示出類似模式。我們發現 NTG RI (47.2 ± 5.9% SEM) 不同於 NIMO RI (60.2 ± 4.6% SEM, P = 0.031)，並且不同於生理鹽水 RI (66.9 + 3.7% SEM, P = 0.006)。生理實驗顯示，在注射 10-15 分鐘內變得對外界刺激的反應微弱的所有動物中平均動脈壓降至 45- 50 mm Hg。組間差異在平均動脈壓，體和腦氧合和腦血流沒有統計學意義。
結論：NIMO 誘發的急性低血壓保護與臨床後處理階段有關的兩類記憶形成。由 PA 學習模式測得的瞬間長期相關記憶結構和由 ORT 模式測得的延遲性短期工作記憶功能與 NTG 誘發的低血壓相應水準比較，有顯著改善。這些結果顯示對 L-型鈣通道阻斷劑作爲低血壓和低流率狀態下保護認知功能的一種潛在方式的進一步研究的實用性。

BACKGROUND: Acute hypotension may be implicated in cognitive dysfunction. L-Type calcium channel blockers in the setting of hypoxia are protective of learning and memory. We tested the hypothesis that hypotension induced by nimodipine (NIMO) and nicardipine (NICA) would be protective of long- and short-term memory compared to hypotension induced by nitroglycerin (NTG).
METHODS: Forty Swiss-Webster mice (30 to 35 g, 6 to 8 weeks) were randomized into 4 groups for IP injection immediately after passive avoidance (PA) learning on day 0: (1) NTG (30 mg/kg); (2) NICA (40 mg/kg); (3) NIMO (40 mg/kg); and (4) saline. PA training latencies (seconds) were recorded for entry from a suspended platform into a Plexiglas tube where a shock (0.3 mA; 2-second duration) was automatically delivered. On day 2 latencies were recorded during a testing trial during which no shock was delivered. Latencies >900 seconds were assigned this value. Lower testing latency is indicative of an impairment of long-term associative memory. Forty-nine additional mice were randomized into similar groups for object recognition testing (ORT) and given IP injections on day 0. ORT measures short-term memory by exploiting the tendency of mice to prefer novel objects where a familiar object is present. On day 5 during training, 2 identical objects were placed in a circular arena and mice explored both for 15 minutes. A testing trial was conducted 1 hour later for 3 minutes after a novel object replaced a familiar one. Mice with intact memory spend about 65% of the time exploring the novel object. Mice with impaired memory devote equal time to each object. Recognition index (RI) is defined as the ratio of time spent exploring the novel object to time spent exploring both objects was the measure of memory. Mean arterial blood pressure (MAP), cerebral bloodflow, and body and brain oxygenation (PO_2) studies were done in separate groups of mice to determine the dosages for matched degrees of hypotension and the physiological profile of each treatment.
RESULTS: The median PA latencies for the different conditions were as follows: NTG (219.5 ± 93.5 second semi-interquartile range [SIQR]), NICA (372.5 ± 75.5 second SIQR), NIMO (540 ± 200 second SIQR) and saline (804 ± 257.5 second SIQR). Rank methods were used to analyze the PA latencies for significant differences. NTG latency was significantly shorter than NIMO latency ($P = 0.012$) and saline latency ($P = 0.006$), but not NICA latency ($P = 0.126$). ORT RI values showed a similar pattern. We found that NTG RI (47.2 ± 5.9% SEM) was different from NIMO RI (60.2 ± 4.6% SEM, $P = 0.031$) and different from saline RI (66.9 + 3.7% SEM, $P = 0.006$). Physiological experiments showed that MAP decreased to 45 to 50 mm Hg in all animals who became minimally responsive to external stimuli within 10 to 15 minutes of injection. Intergroup differences for MAP, body and brain oxygenation, and cerebral bloodflow were not statistically significant.
CONCLUSION: Acute hypotension induced by NIMO was protective of 2 categories of memory formation relevant to the clinical posttreatment period. Both immediate long-term associative memory consolidation as measured by the PA learning paradigm and delayed short-term working memory function as measured by the ORT paradigm were significantly improved compared to matched levels of hypotension induced by NTG. These results indicate the utility of further investigation of L-type calcium channel blockers as a potential means of preserving cognition in the setting of hypotensive and low flow states.

一次性喉罩氣道和可迴圈使用喉罩氣道生命週期評估的比較

Comparative Life Cycle Assessment of Disposable and Reusable Laryngeal Mask Airways

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背景：在環境和公共衛生的衛生保健實踐中，人們越來越認識到其帶來的負面影響。這就要求我們需從生命週期標準的日常篩選過程進入到設備選擇的決策過程。這裡我們對兩種類型的喉罩氣道進行使用週期的評估：使用一次即丟棄的新型喉罩氣道和可重複使用 40 次的傳統型喉罩氣道。
方法：在生命週期評估中，我們將比較的基礎稱爲“功能單位”。本研究將使用 40 個一次性喉罩氣道或使用 40 次同一個可迴圈使用喉罩氣道維持氣道通暢定義爲功能單位。本文對喉罩氣道的研究包括了喉罩的輸入和輸出、運輸、使用和廢棄處理的全過程。兩種喉罩對環境的影響用 Simapro 生命週期評估軟體和對建築環境和經濟可持續性影響評定方法來評估。爲了幫助解釋本研究的結果，我們還進行靈敏度和簡單生命週期成本的分析。
結果：在耶魯紐海文醫院，使用可迴圈使用喉罩氣道對環境影響比使用一次性喉罩氣道更有利。使用一次性喉罩氣道對環境最重要的影響是聚合物的生產、包裝以及廢物處理，而使用可迴圈使用喉罩氣道主要是清洗和消毒。
討論:就對環境的影響來說，可迴圈使用喉罩氣道優於一次性喉罩氣道，但是這種益處必須與是否會造成感染的傳播相權衡。衛生保健設施可以通過使用可迴圈使用喉罩氣道、使用可降解塑膠的一次性喉罩氣道型號、從當地代理商散裝進貨的方法來減少其環境影響。一些措施能進一步減少可迴圈使用喉罩氣道對環境的影響，諸如增加高壓蒸汽滅菌裝置的使用次數（從單次使用到使用 10 次）可減少 25%溫室氣體的排放，提高 10%壓蒸汽機的能源效益可減少 8%溫室氣體的排放。從環境和成本兩方面考慮，在管理和操作過程中我們都應付之於行動以確保“不過早丟棄可迴圈使用喉罩氣道”。
BACKGROUND: Growing awareness of the negative impacts from the practice of health care on the environment and public health calls for the routine inclusion of life cycle criteria into the decision-making process of device selection. Here we present a life cycle assessment of 2 laryngeal mask airways (LMAs), a one-time-use disposable Unique™ LMA and a 40-time-use reusable Classic™ LMA.
METHODS: In life cycle assessment, the basis of comparison is called the “functional unit.” For this report, the functional unit of the disposable and reusable LMAs was taken to be maintenance of airway patency by 40 disposable LMAs or 40 uses of 1 reusable LMA. This was a cradle-to-grave study that included inputs and outputs for the manufacture, transport, use, and waste phases of the LMAs. The environmental impacts of the 2 LMAs were estimated using SimaPro life cycle assessment software and the Building for Environmental and Economic Sustainability impact assessment method. Sensitivity and simple life cycle cost analyses were conducted to aid in interpretation of the results.
RESULTS: The reusable LMA was found to have a more favorable environmental profile than the disposable LMA as used at Yale New Haven Hospital. The most important sources of impacts for the disposable LMA were the production of polymers, packaging, and waste management, whereas for the reusable LMA, washing and sterilization dominated for most impact categories.

DISCUSSION: The differences in environmental impacts between these devices strongly favor reusable devices. These benefits must be weighed against concerns regarding transmission of infection. Health care facilities can decrease their environmental impacts by using reusable LMAs, to a lesser extent by selecting disposable LMA models that are not made of certain plastics, and by ordering in bulk from local distributors. Certain practices would further reduce the environmental impacts of reusable LMAs, such as increasing the number of devices autoclaved in a single cycle to 10 (−25% GHG emissions) and improving the energy efficiency of the autoclaving machines by 10% (−8% GHG emissions). For both environmental and cost considerations, management and operating procedures should be put in place to ensure that reusable LMAs are not discarded prematurely.

麻醉藥物溫室氣體排放的生命週期

Life Cycle Greenhouse Gas Emissions of Anesthetic Drugs

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背景：麻醉醫師必須考慮藥物的整個生命週期，以便將其對環境的影響納入臨床決策。在本研究中，我們用生命週期評價來研究以下五種麻醉藥品對氣候變化的影響：七氟醚、地氟醚、異氟醚、笑氣和異丙酚。
方法：本研究採取完整的全程方法，包括原料選取、藥物製造、藥物運輸到健康保健設施、藥物輸送至病人以及藥物清理或排放至環境。生命週期的每個階段，能量、物質的投入和排放以及每種藥物使用的特殊影響均被考慮在內。這 4 種吸入麻醉氣體是溫室氣體（GHGg），所以溫室氣體排放的生命週期包括廢麻醉氣體排放至大氣和起於其他生命週期階段的排放物（主要是二氧化碳）。
結果：當在氧氣/空氣混合氣體中給予時，地氟醚每 MAC-小時麻醉氣體的生命週期溫室氣體影響在這些麻醉藥物中最大，是異氟醚的 15 倍，七氟醚的 20 倍。當混吸笑氣/氧氣時，所有藥物的溫室氣體排放量顯著增加。對於所有吸入麻醉藥物，溫室氣體影響主要由於廢麻醉氣體的無節制排放引起。丙泊酚的溫室氣體影響相對較小，比地氟醚和氧化亞氮低了近 4 個數量級。不同於吸入藥物，丙泊酚的溫室氣體影響主要來自注射泵所需的電力而並非源於藥物產生或直接釋放至環境。
討論：本研究結果在提供這些吸入藥物整個生命週期溫室氣體效果的同時重申了先前公佈的資料。對此，有幾個實際的環境影響緩解策略。地氟醚和笑氣應該密封在容器中，這樣可降低發病率和死亡率超過替代藥物。臨床醫生在使用所有吸入藥物時應避免不必要的高新鮮氣體流速。有廢麻醉氣體採集系統，即使在再生麻醉氣體使用前，應充分考慮廢氣採集系統的應用。本研究表明吸入麻醉外的其他麻醉技術，如全憑靜脈麻醉，椎管內，或外周神經阻滯麻醉，可能對環境的影響最小。
（許辛 譯 馬皓琳 李士通校）

BACKGROUND: Anesthesiologists must consider the entire life cycle of drugs in order to include environmental impacts into clinical decisions. In the present study we used life cycle assessment to examine the climate change impacts of 5 anesthetic drugs: sevoflurane, desflurane, isoflurane, nitrous oxide, and propofol.
METHODS: A full cradle-to-grave approach was used, encompassing resource extraction, drug manufacturing, transport to health care facilities, drug delivery to the patient, and disposal or emission to the environment. At each stage of the life cycle, energy, material inputs, and emissions were considered, as well as use-specific impacts of each drug. The 4 inhalation anesthetics are greenhouse gases (GHGs), and so life cycle GHG emissions include waste anesthetic gases vented to the atmosphere and emissions (largely carbon dioxide) that arise from other life cycle stages.
RESULTS: Desflurane accounts for the largest life cycle GHG impact among the anesthetic drugs considered here: 15 times that of isoflurane and 20 times that of sevoflurane on a per MAC-hour basis when administered in an O_2/air admixture. GHG emissions increase significantly for all drugs when administered in an N_2O/O_2 admixture. For all of the inhalation anesthetics, GHG impacts are dominated by uncontrolled emissions of waste anesthetic gases. GHG impacts of propofol are comparatively quite small, nearly 4 orders of magnitude lower than those of desflurane or nitrous oxide. Unlike the inhaled drugs, the GHG impacts of propofol primarily stem from the electricity required for the syringe pump and not from drug production or direct release to the environment.
DISCUSSION: Our results reiterate previous published data on the GHG effects of these inhaled drugs, while providing a life cycle context. There are several practical environmental impact mitigation strategies. Desflurane and nitrous oxide should be restricted to cases where they may reduce morbidity and mortality over alternative drugs. Clinicians should avoid unnecessarily high fresh gas flow rates for all inhaled drugs. There are waste anesthetic gas capturing systems, and even in advance of reprocessed gas applications, strong consideration should be given to their use. From our results it appears likely that techniques other than inhalation anesthetics, such as total IV anesthesia, neuraxial, or peripheral nerve blocks, would be least harmful to the environment.

小兒麻醉學會的雨天

Rainy Days for the Society for Pediatric Anesthesia

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兒科麻醉學（SPA）委員發現 47%的降雨率比預期的要多影響其全國性會議。，我們將從 1987 年開始每次 SPA 會議第一天的天氣情況的與用日、月及每次會議地點的歷史資料進行了對比。使用廣義估計方程模型，比較會議與非會議日期的下雨比值爲 2.63（*P*=0.006，95%可信區間 1.32–5.22）。這些結果進一步證實了：在全國 SPA 會議期間，下雨的實際概率的要比預期高。
（安光惠 譯 馬皓琳 李士通 校）
Members of the Society for Pediatric Anesthesia (SPA) perceive the 47% rain rate has burdened its national meetings more than would be expected. We compared weather conditions on the first

day of each national SPA meeting since 1987 with historical data using the day, month, and location of each meeting. Using a generalized estimating equations model, the odds ratio of rain comparing meeting and nonmeeting days was 2.63 (*P* value 0.006, 95% confidence interval 1.32–5.22). These results confirm a significantly higher frequency of rain at national SPA meetings than would be anticipated.

用超聲成像和經皮神經刺激來識別耳大神經

Identification of the Great Auricular Nerve by Ultrasound Imaging and Transcutaneous Nerve Stimulation

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約 8%患者在肌間溝臂叢神經阻滯術後發生頸淺叢神經病變。耳大神經是參與發生頸淺叢神經病變的其中一個神經。本文報導在大多數病例中（95%置信區間下限 63%）通過超聲和經皮神經電刺激成功識別了耳大神經。女性和肥胖患者的神經識別顯著較難。進一步的研究將考慮確定這些資訊是否將有助於減少頸淺叢神經病變。
（許辛 譯 馬皓琳 李士通校）
Superficial cervical plexus neuropathy after interscalene brachial plexus block affects about 8% of patients postoperatively. One of the nerves involved in superficial cervical plexus neuropathy is the great auricular nerve. We report success in identification of the great auricular nerve with ultrasound and transcutaneous nerve stimulation in a clinical setting in the majority of cases (95% lower confidence limit 63%). Identification of the nerve is significantly more difficult in female and in obese patients. Further studies will allow determination of whether this information will help to reduce the incidence of superficial cervical plexus neuropathy.