Comment optimiser la déposition médicamenteuse chez le patient ventilé ?

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réanimation 2017
PARIS 11-13 JANVIER

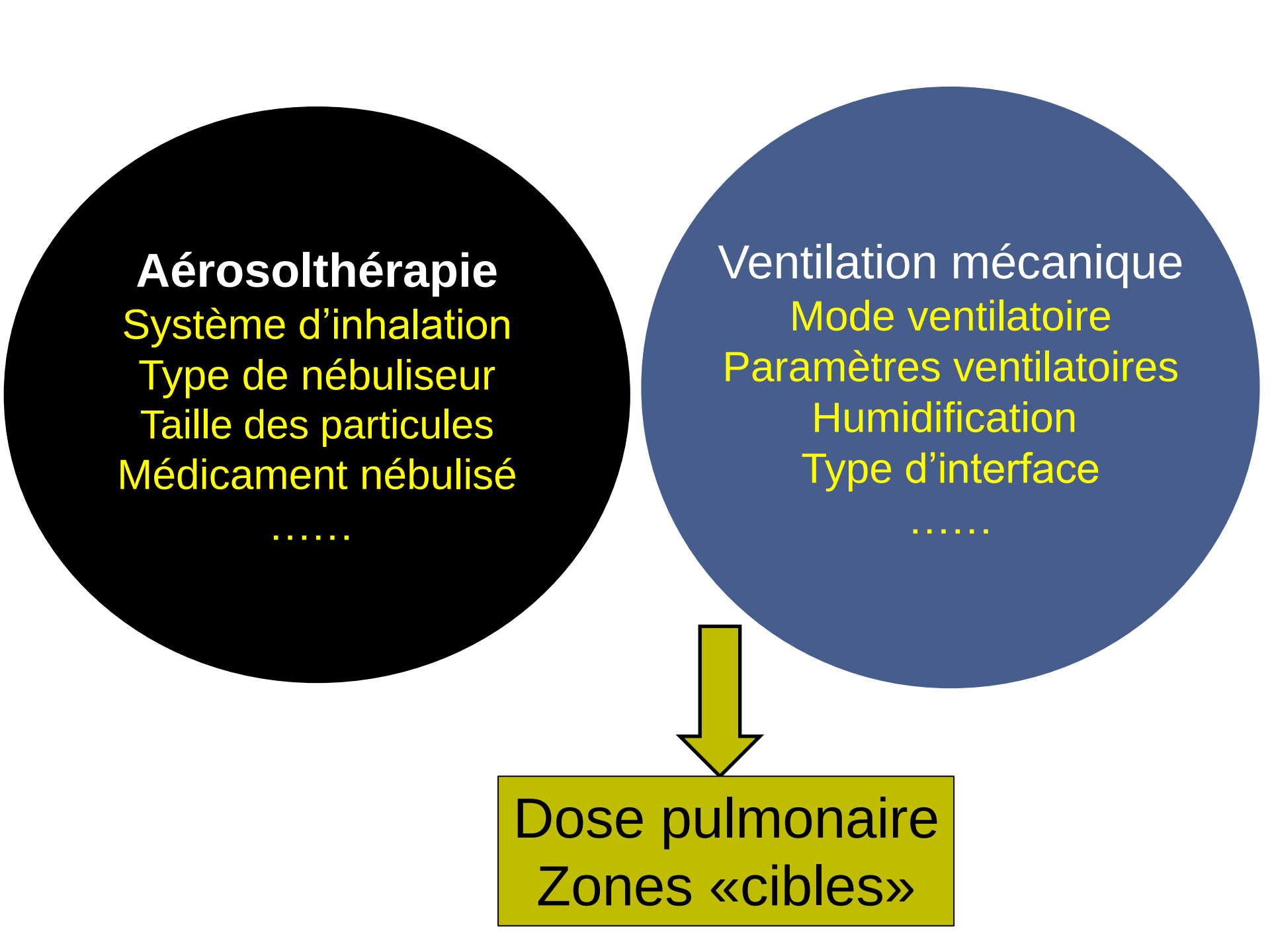
Déclaration de liens

mon intervention
ne présente aucun conflit d'intérêt

srlf
SOCIÉTÉ DE RÉANIMATION DE LANGUE FRANÇAISE

Introduction


RESPIRONICS


Aérosolthérapie
Système d'inhalation
Type de nébuliseur
Taille des particules
Médicament nébulisé
……
Ventilation mécanique
Mode ventilatoire
Paramètres ventilatoires
Humidification
Type d'interface
……
Dose pulmonaire
Zones «cibles»


Comment optimiser ?

Quel système d'inhalation ?

Pneumatique

Ultrasonique

Mesh

MDI

Quel médicament ?

(formes disponibles, dosage, limitations…)

Quel(s) site(s) de déposition ?

(MMAD,…)

Quel budget ?

Nébuliseur(s) vs Aérosol doseur ?

Ex : β2-mimétiques, anticholinergiques, corticostéroïdes

→ Site de déposition centrale

Pneumatique

Ultrasonique

Mesh

MDI

Cochrane Database Syst Rev 2013 June 6 (6).

Cochrane Library

Cochrane Database of Systematic Reviews

Metered dose inhalers versus nebulizers for aerosol bronchodilator delivery for adult patients receiving mechanical ventilation in critical care units (Review)

Holland A, Smith F, Penny K, McCrossan G, Veitch L, Nicholson C

AUTHORS' CONCLUSIONS

Implications for practice

Existing randomized controlled trials, including randomized cross-over trials where the order of the intervention was randomized, comparing a nebulizer and MDI for aerosol bronchodilation in mechanically ventilated adult patients do not provide sufficient evidence to support either delivery method at this time.

Nébuliseur(s) vs Aérosol doseur ?

- Durée du traitement ↓
- Risques de contamination ↓
- Influence du mode ventilatoire sur la déposition ↓
- Coût ↓
- …

→ **Aérosol doseur**

Crit Care. 2016 Oct 7;20(1):269. Review

Quel(s) nébuliseur(s) ?

Ex : antibiotiques, prostacyclines, protéines…

→ Site de déposition périphérique

Pneumatique

Ultrasonique

Mesh

Quel(s) nébuliseur(s) ?

- Performances ↑ (dose résiduelle, temps de traitement,…)
- Risques de contamination ↓ (membrane = séparation, position sup.,…)
- Pas d'interaction avec ventilateur (pas de débit gazeux)
- Pas de production de chaleur (produits thermosensibles)
- ….

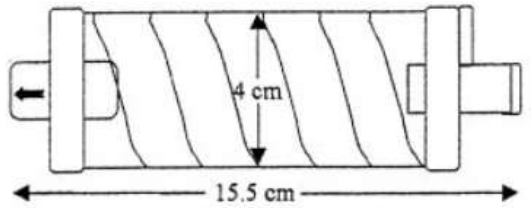
→ **Nébuliseur mesh**

→ Budget +++

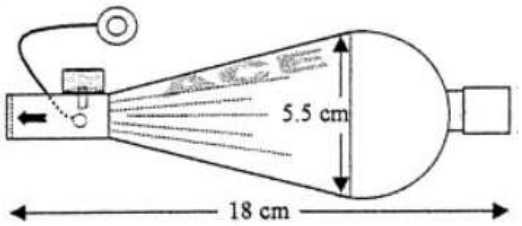
Crit Care. 2016 Oct 7;20(1):269. Review

Quelle connexion ?

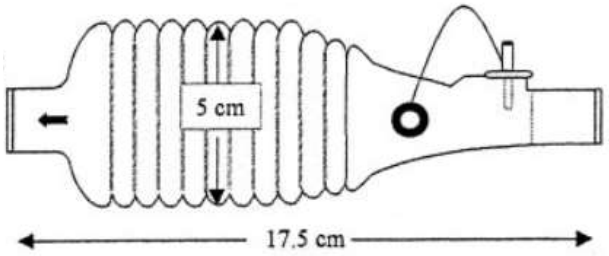
Aérosol doseur



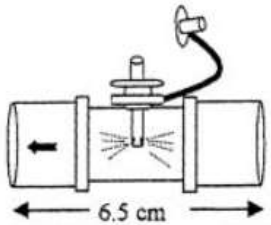
Monaghan AeroVent™ Reservoir



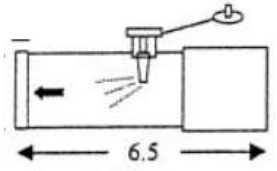
DHD ACE ™ Reservoir



Airlife™ MediSpacer Chamber



Airlife ™ Dual Spray Minispacer
MDI Dispenser



Hudson RCI® MDI Adaptor

Respir Care 2005;50(10):1331–1344

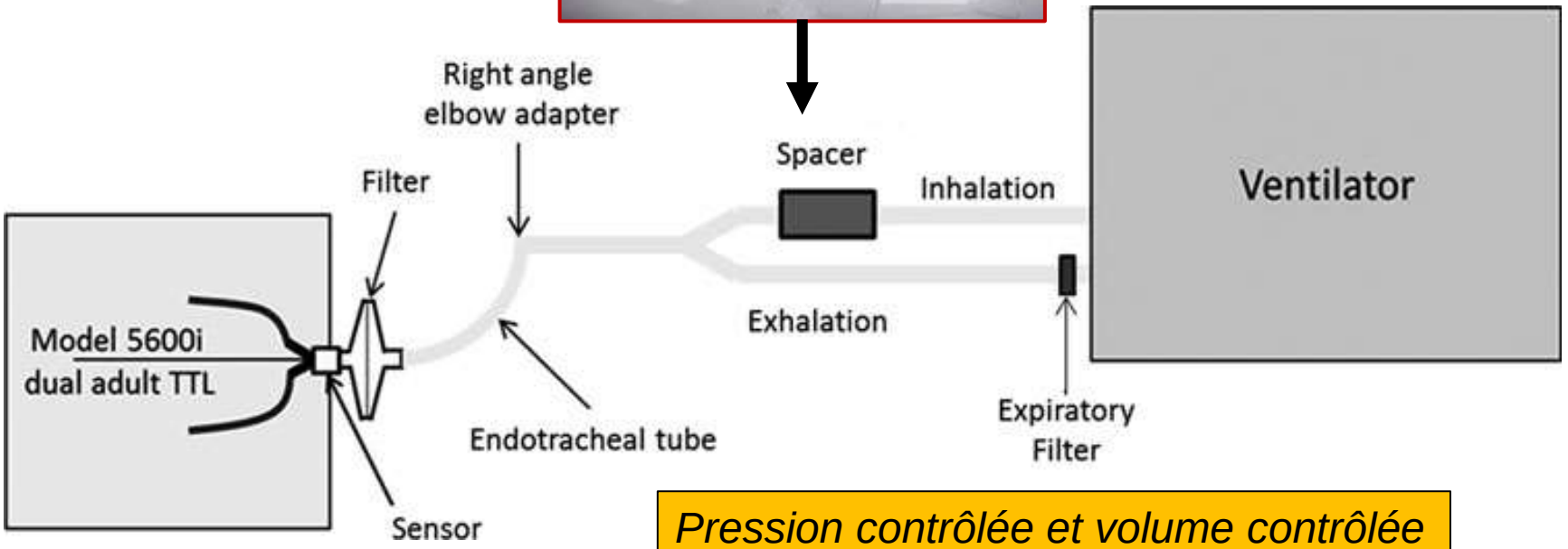
Nébuliseur mesh : chambre *vs* adaptateur ?

T-adaptateur

In Vitro Performance of Spacers for Aerosol Delivery during Adult Mechanical Ventilation

Nabile Boukhettala, PhD,[1,2] Thierry Porée,[2] Patrice Diot, MD, PhD,[1] and Laurent Vecellio, PhD[1,3]

Combihaler



Pression contrôlée et volume contrôlée
Salbutamol et amikacin

J Aeros Med Pulm Drug Deliv 2015; 28(2):130-136

In Vitro Performance of Spacers for Aerosol Delivery during Adult Mechanical Ventilation

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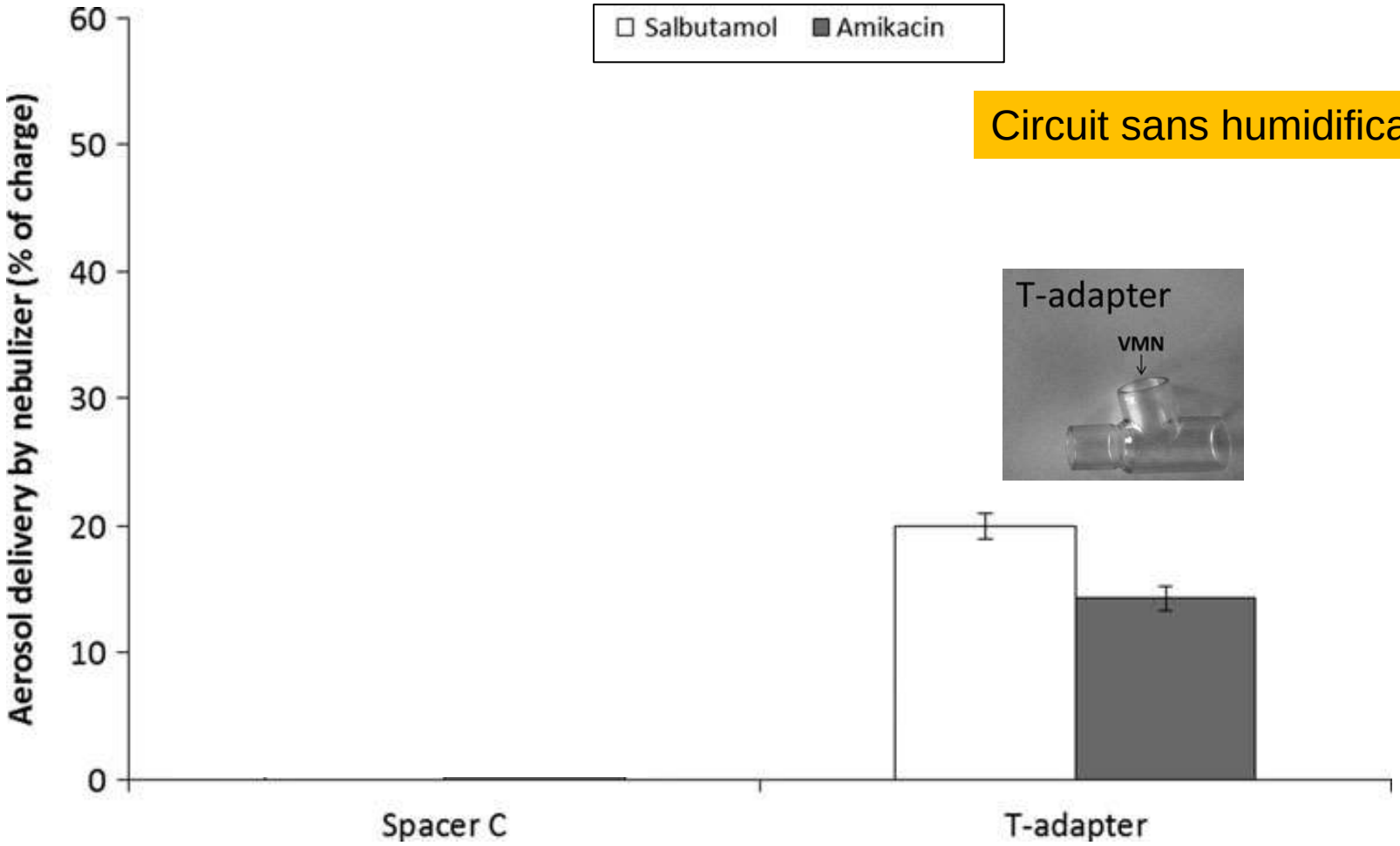
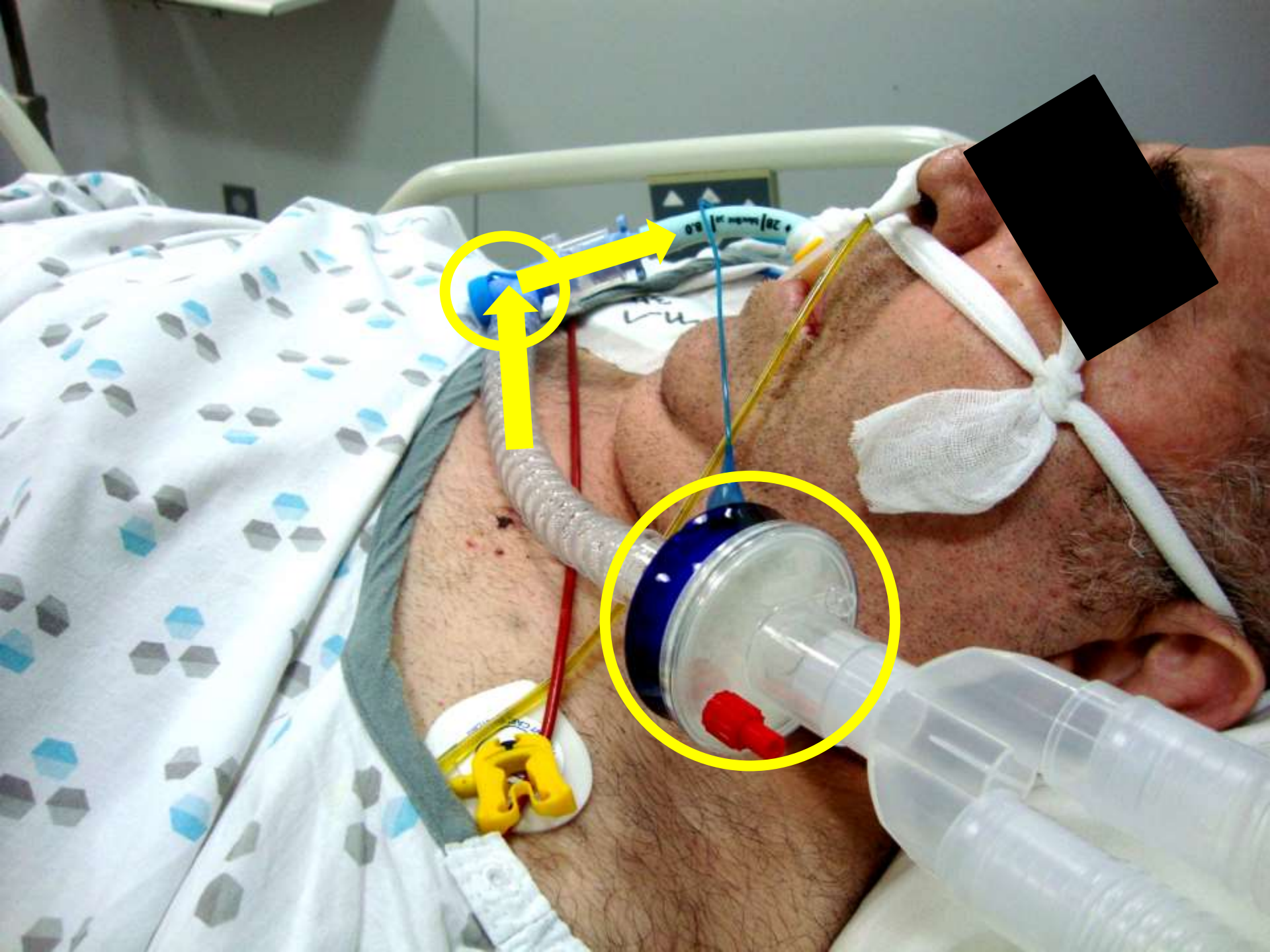


Circuit sans humidification

J Aeros Med Pulm Drug Deliv 2015; 28(2):130-136

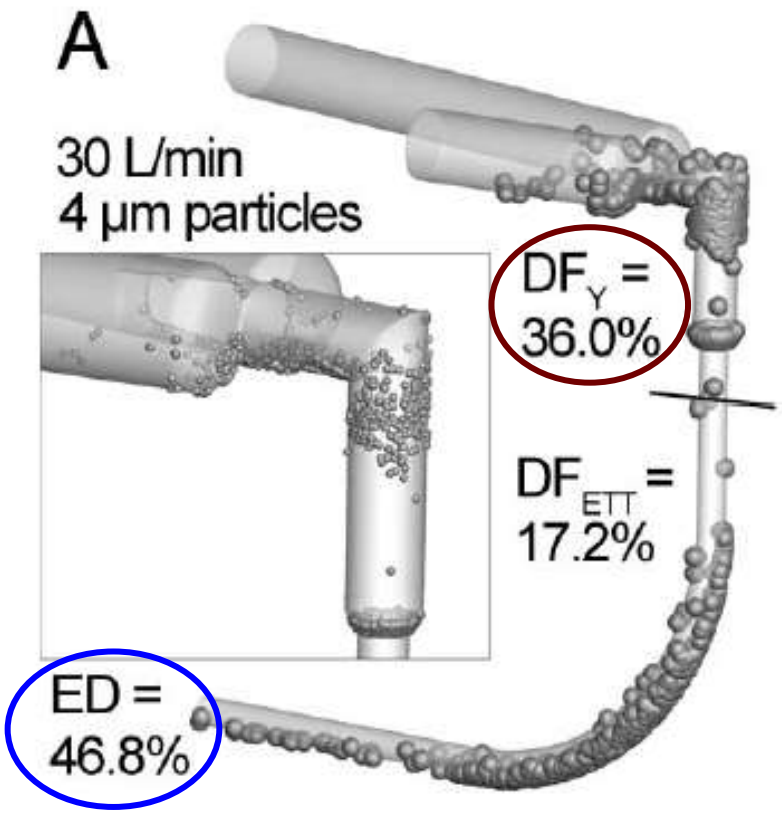


Improving Aerosol Drug Delivery During Invasive Mechanical Ventilation With Redesigned Components

P Worth Longest PhD, Mandana Azimi PharmD, Laleh Golshahi PhD, and Michael Hindle PhD

Respir Care 2014;59(5):686–698

Dynamique des fluides - simulation



Limiter les doses perdues dans le circuit

Quelle position ?

Influence of Nebulizer Type, Position, and Bias Flow on Aerosol Drug Delivery in Simulated Pediatric and Adult Lung Models During Mechanical Ventilation

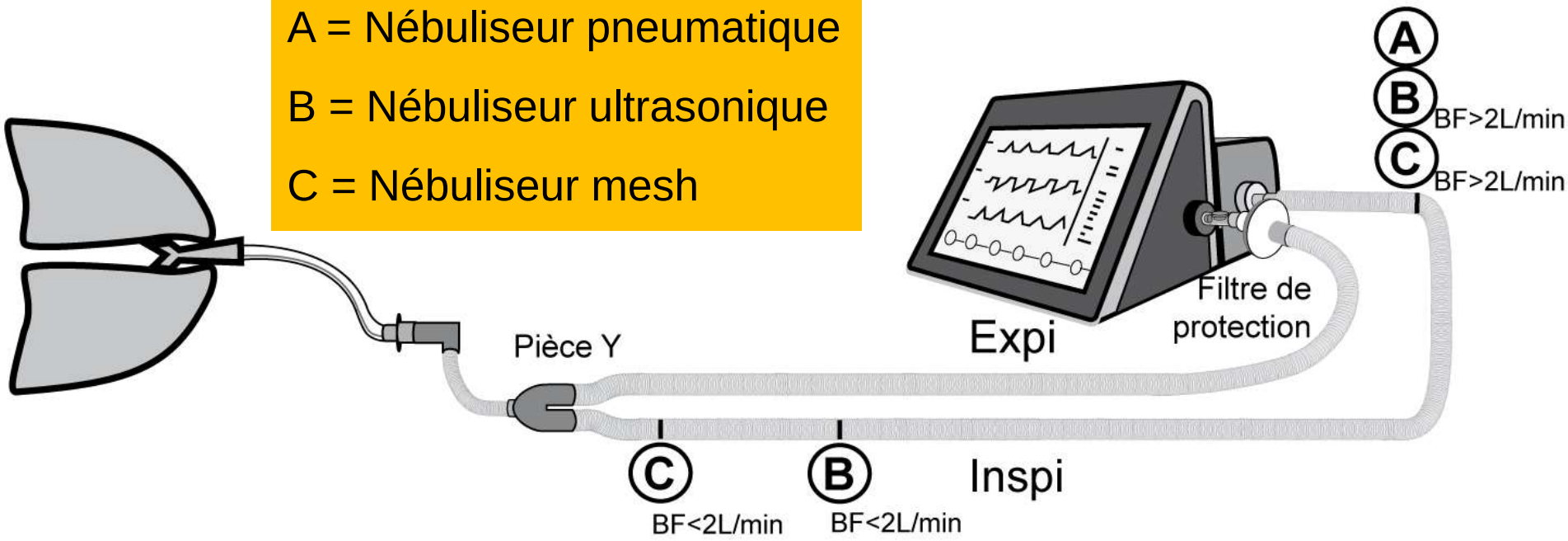
Arzu Ari PhD RRT PT CPFT, Orcin Telli Atalay PhD PT, Robert Harwood MSA RRT, Meryl M Sheard MSc RRT, Essam A Aljamhan MSc RRT, and James B Fink PhD RRT FAARC

Respir Care 2010;55(7):845–85

A = Nébuliseur pneumatique

B = Nébuliseur ultrasonique

C = Nébuliseur mesh



(15 à 40 cm de la pièce en Y)

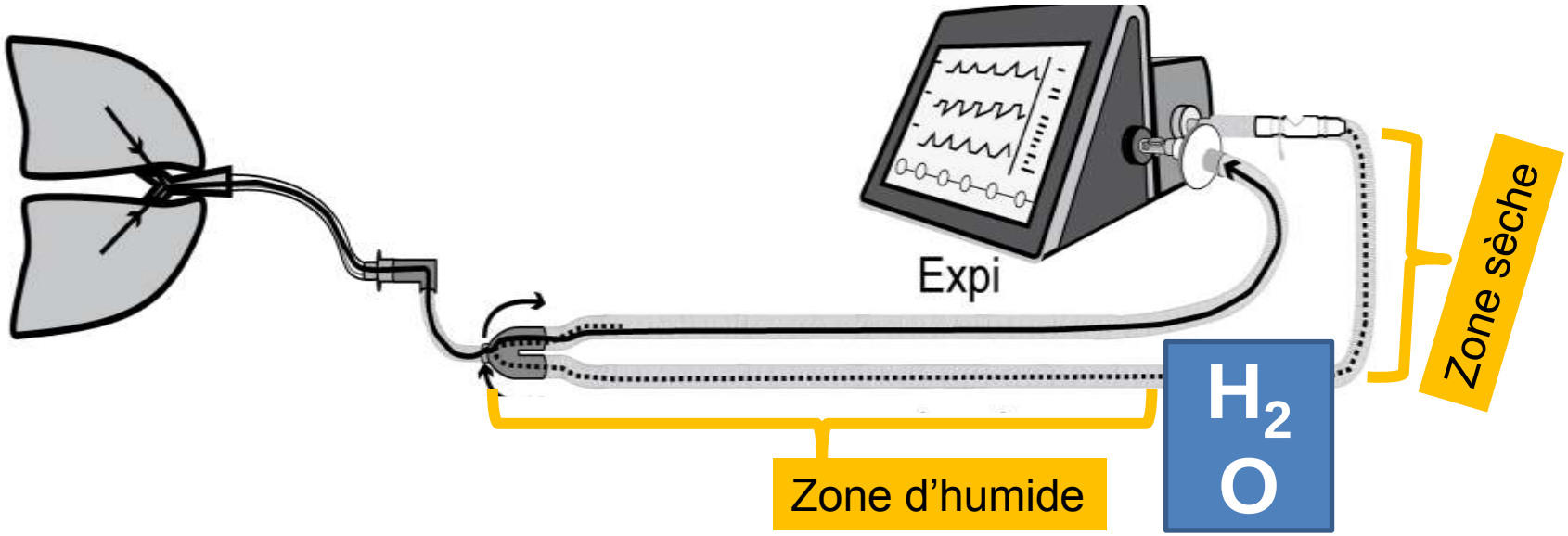
Nébuliseur en mode continu = Favoriser l'effet « réservoir »

D'après J. Dugernier

Humidification ?

Influence of Moisture Accumulation in Inline Spacer on Delivery of Aerosol Using Metered-Dose Inhaler During Mechanical Ventilation

Hui-Ling Lin MSc RRT RN, James B Fink PhD RRT FAARC, Yue Zhou PhD, and Yung-Sung Cheng PhD



Faut-il arrêter l'humidification active ?

Respir Care 2009;54(10):1336 –1341

Influence of Moisture Accumulation in Inline Spacer on Delivery of Aerosol Using Metered-Dose Inhaler During Mechanical Ventilation

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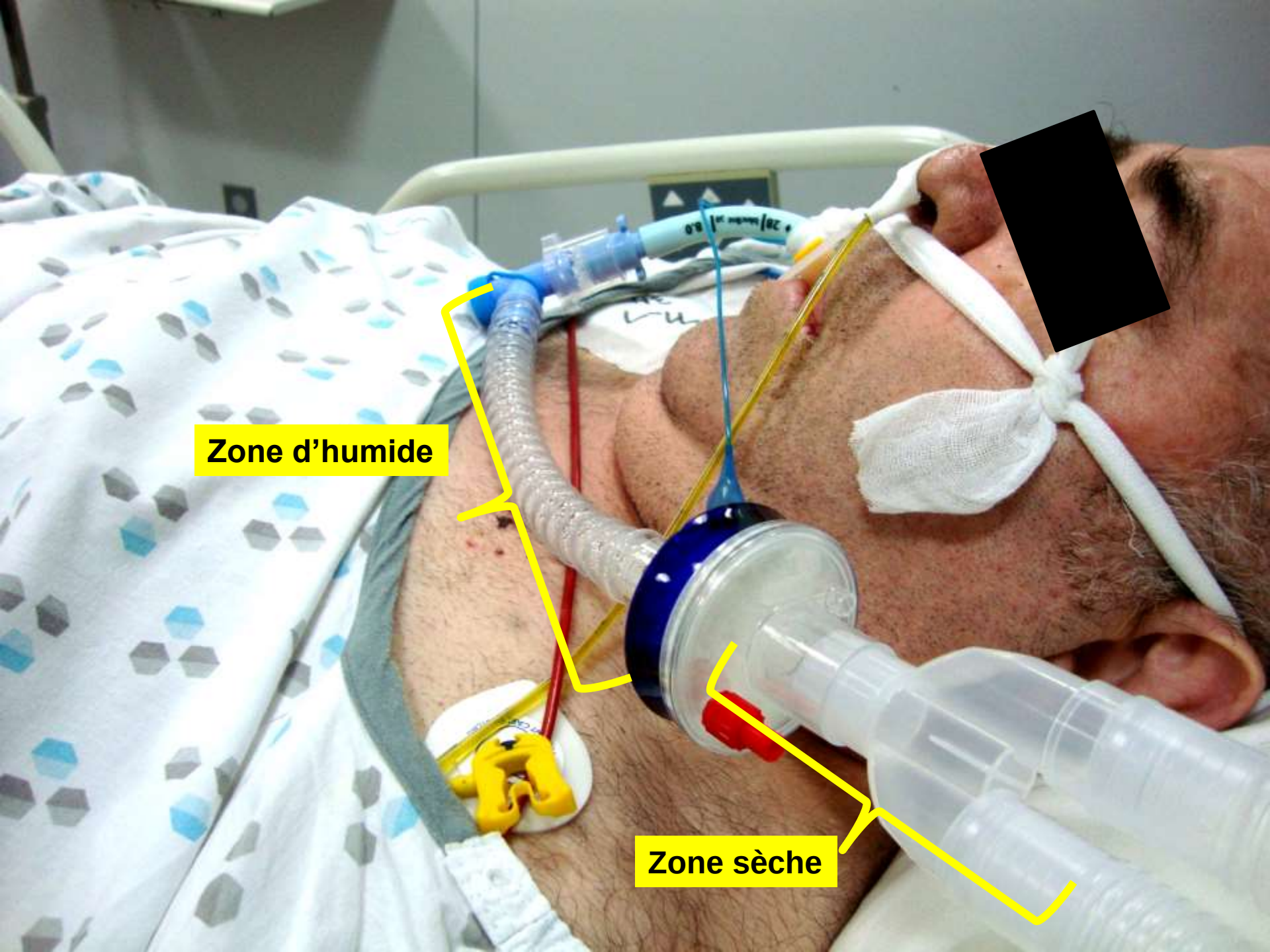
Table 1. Mean Percentage of Drug Mass

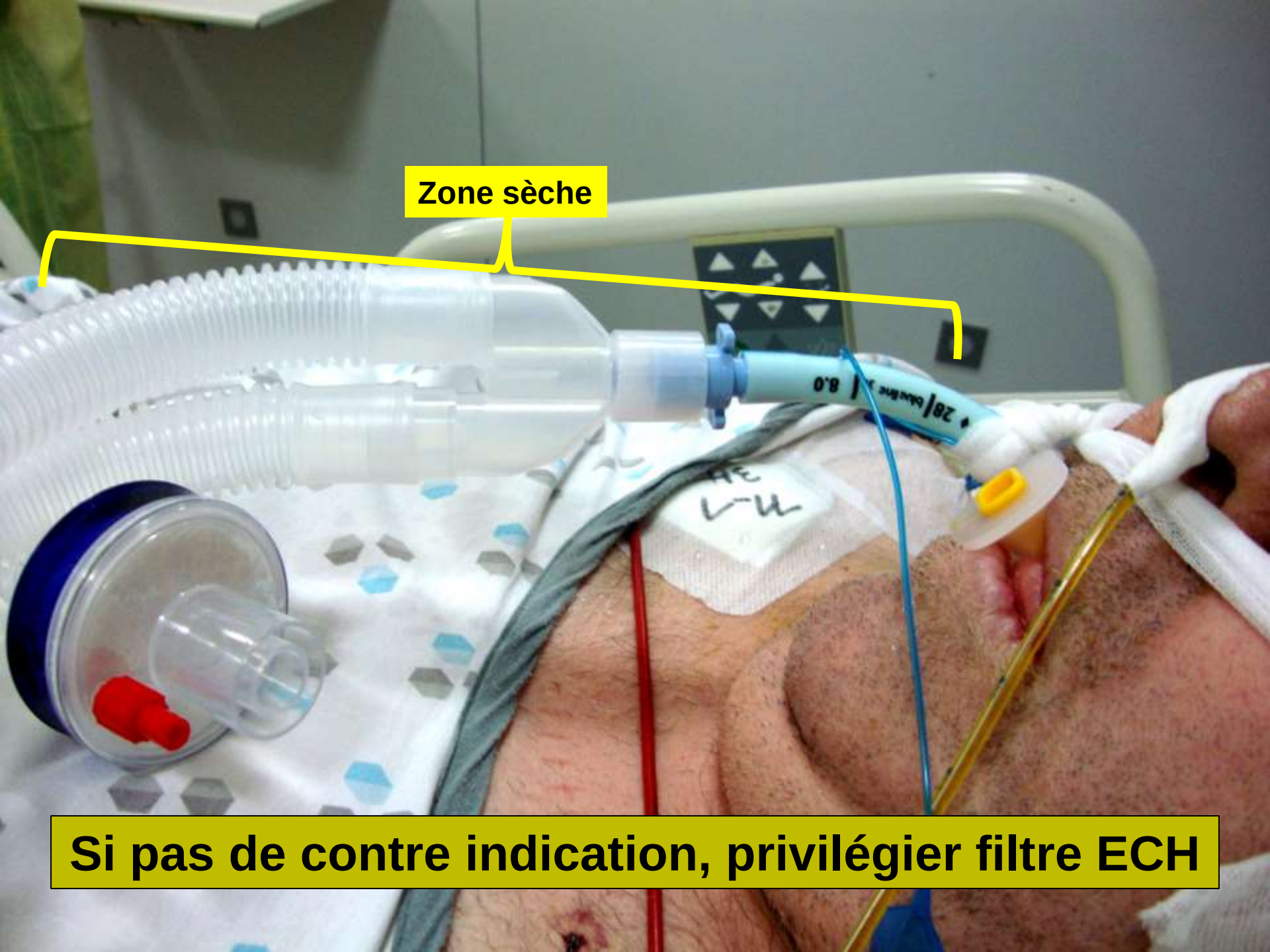
Time/Test Condition	Total Mass (mean ± SD %)
Dry chamber*	21.8 ± 3.3
1 h	23 ± 2.1
2 h	11.4 ± 3.8
3 h	12.3 ± 0.8
Heater off **(après 10 min)**	12.7 ± 0.3

* The *P* values were .004 compared to 2 h, .009 compared to 3 h, and .013 compared to heater off.

Humidification active = diminution de la dose inhalée

Respir Care 2009;54(10):1336 –1341


Zone d’humide
Zone sèche


Zone sèche
Si pas de contre indication, privilégier filtre ECH

Quels paramètres ?

REVIEW Open Access

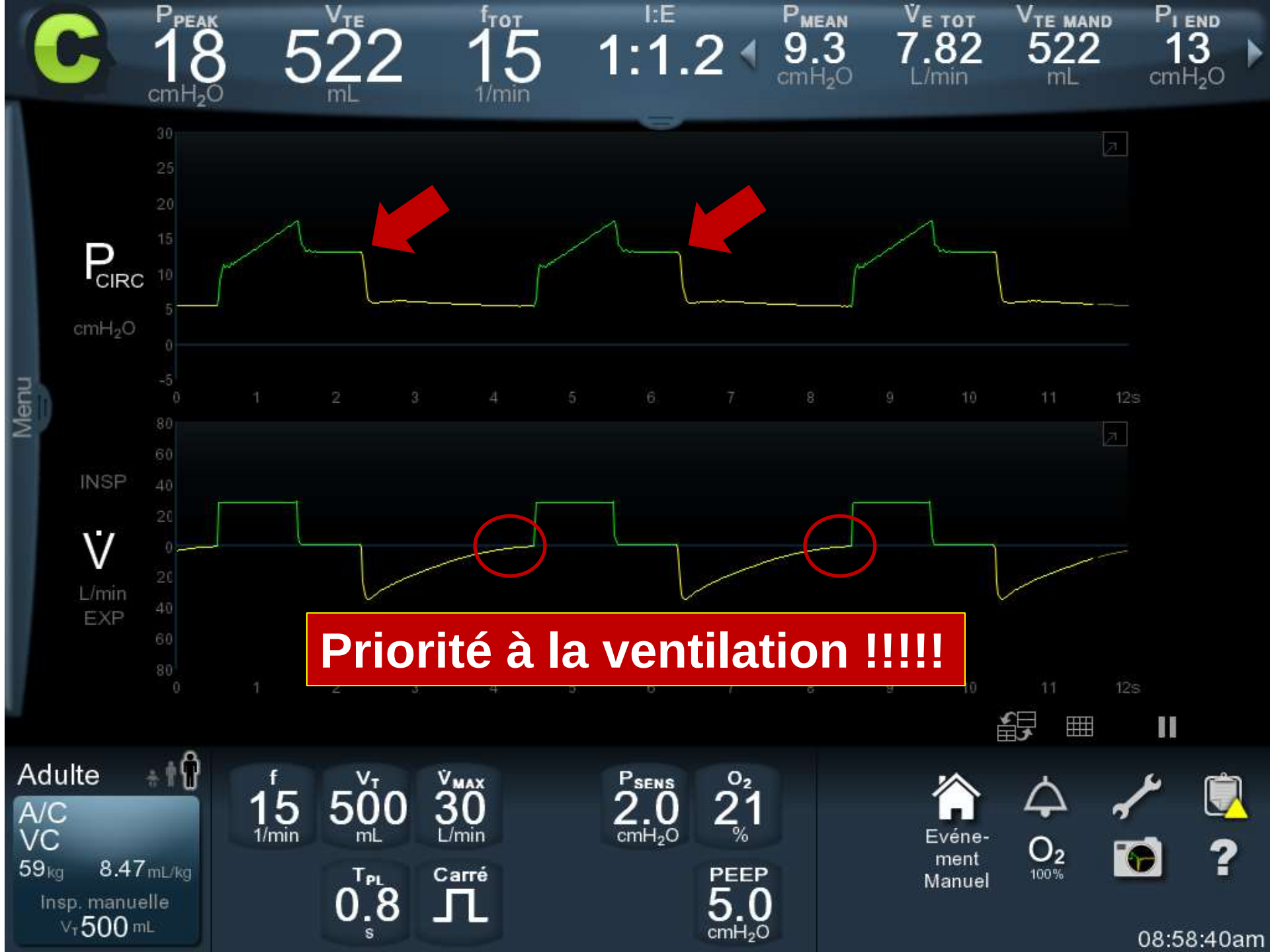
Fundamentals of aerosol therapy in critical care

Jayesh Dhanani[1,2*], John F. Fraser[3,4], Hak-Kim Chan[5], Jordi Rello[8,9,10], Jeremy Cohen[1,2] and Jason A. Roberts[1,2,6,7]

- Diminuer le débit inspiratoire
- Augmenter le rapport I/E
- Augmenter le volume courant (6 – 8 ml/kg)
- PEP => recrutement de zone de déposition
- …

Situations cliniques (BPCO, SDRA, …) !!!!!

Crit Care. 2016 Oct 7;20(1):269. Review


P PEAK 18 cmH2O
V TE 522 mL
f TOT 15 1/min
I:E 1:1.2
P MEAN 9.3 cmH2O
V̇ E TOT 7.82 L/min
V TE MAND 522 mL
P I END 13 cmH2O
P CIRC
cmH2O
INSP
V̇
L/min
EXP
Priorité à la ventilation !!!!!
Menu
Adulte
A/C
VC
59 kg
8.47 mL/kg
Insp. manuelle
VT 500 mL
f 15 1/min
VT 500 mL
V̇MAX 30 L/min
TPL 0.8 s
Carré
PSENS 2.0 cmH2O
O2 21 %
PEEP 5.0 cmH2O
Evéne-ment Manuel
O2 100%
08:58:40am

Conclusions

Optimisation :

- Choix du dispositif
- Connexions
- Chambre d’inhalation
- Désencombrement
- Position du patient

- Positions ?
- Mode synchronisé ?

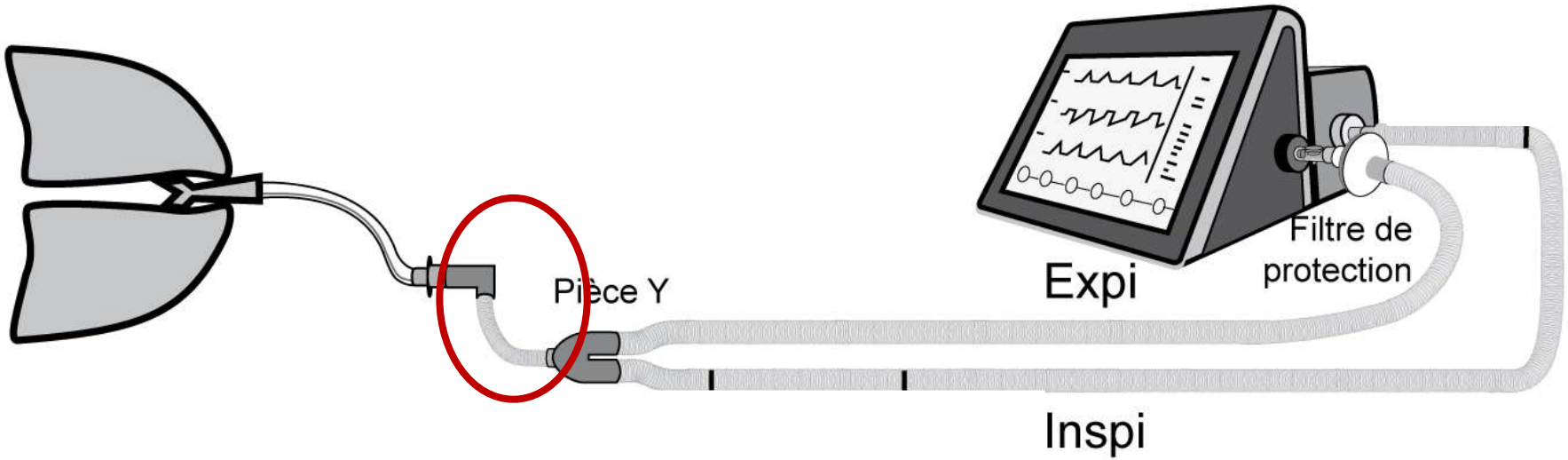
- Humidification active
- Paramètres ventilatoires
- Diamètre du tube

Quelles solutions ?

Aerosol Drug Delivery During Mechanical Ventilation: Devices, Selection, Delivery Technique, and Evaluation of Clinical Response to Therapy

Arzu Ari, PhD, RRT, PT, CPFT, FAARC, and James B. Fink, PhD, RRT, FAARC, FCCP

Clin Pulm Med 2015;22:79–86

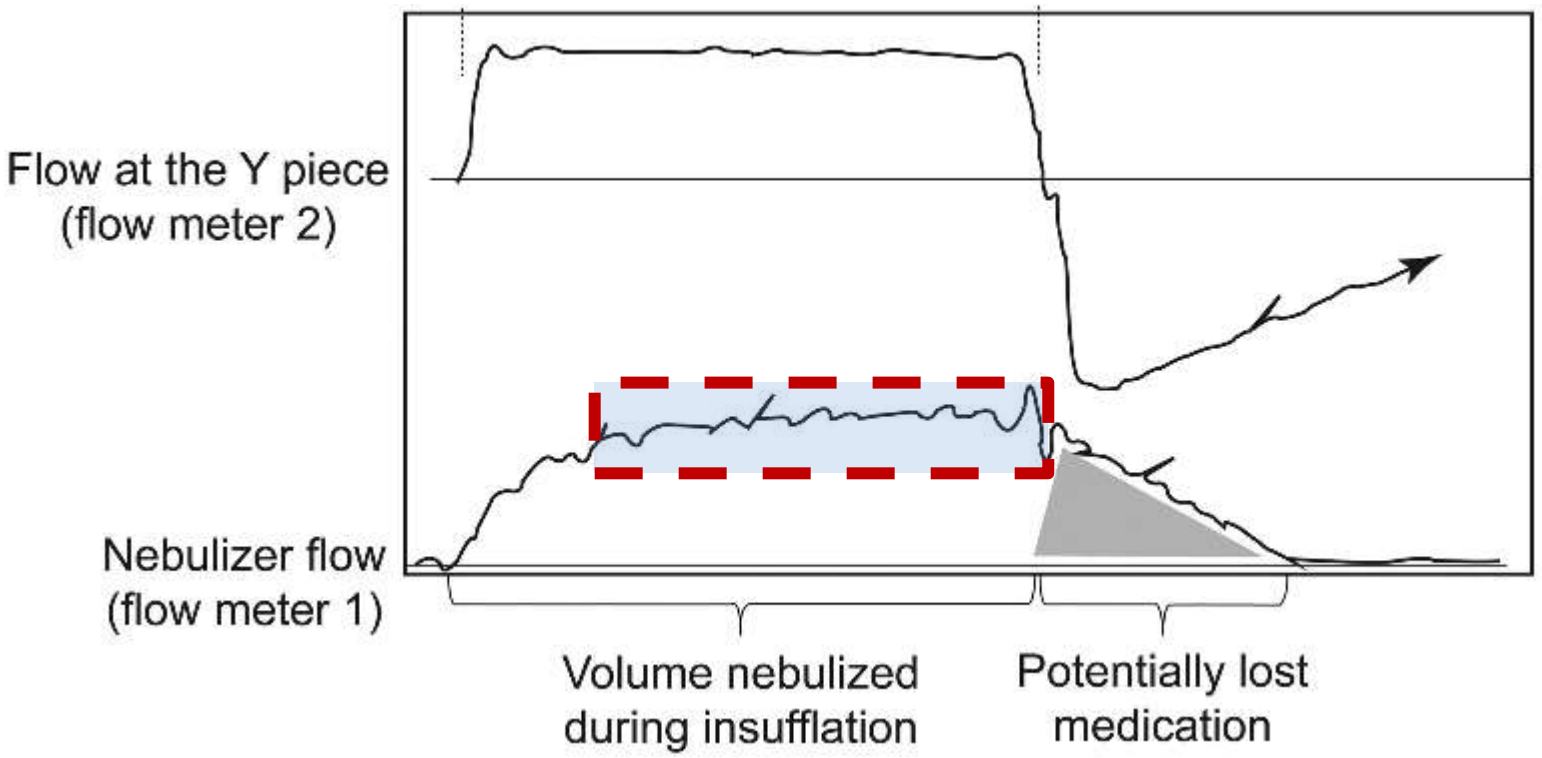


Solution = Nébulisation synchronisée

Adapté de J. Dugernier

Ventilator-Integrated Jet Nebulization Systems: Tidal Volume Control and Efficiency of Synchronization

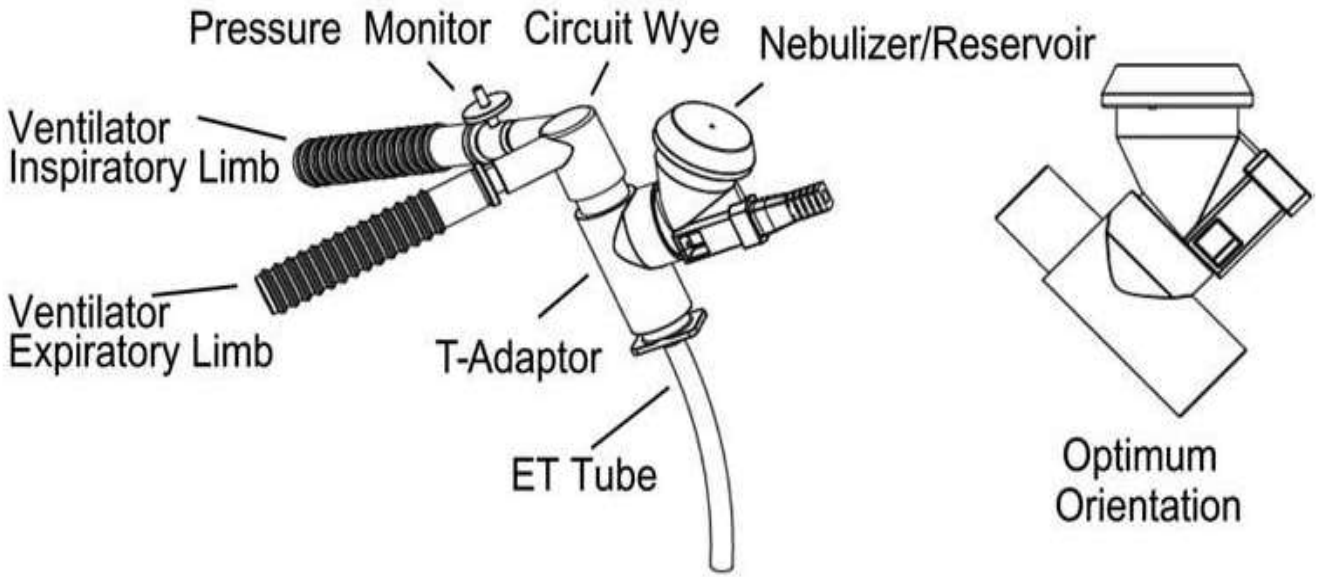
Stephan Ehrmann MD PhD, Aissam Lyazidi PhD, Bruno Louis PhD, Daniel Isabey PhD, Déborah Le Pennec, Laurent Brochard MD PhD, and Gabriela Apiou-Sbirlea PhD

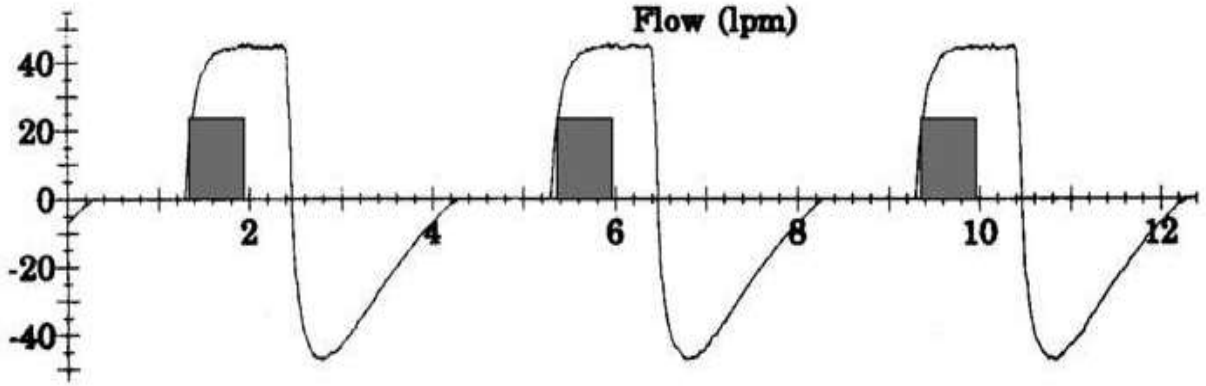


Nébulisation pneumatique synchronisée

Respir Care 2014;59:1508-16

Pulmonary Drug Delivery System (PDDS)



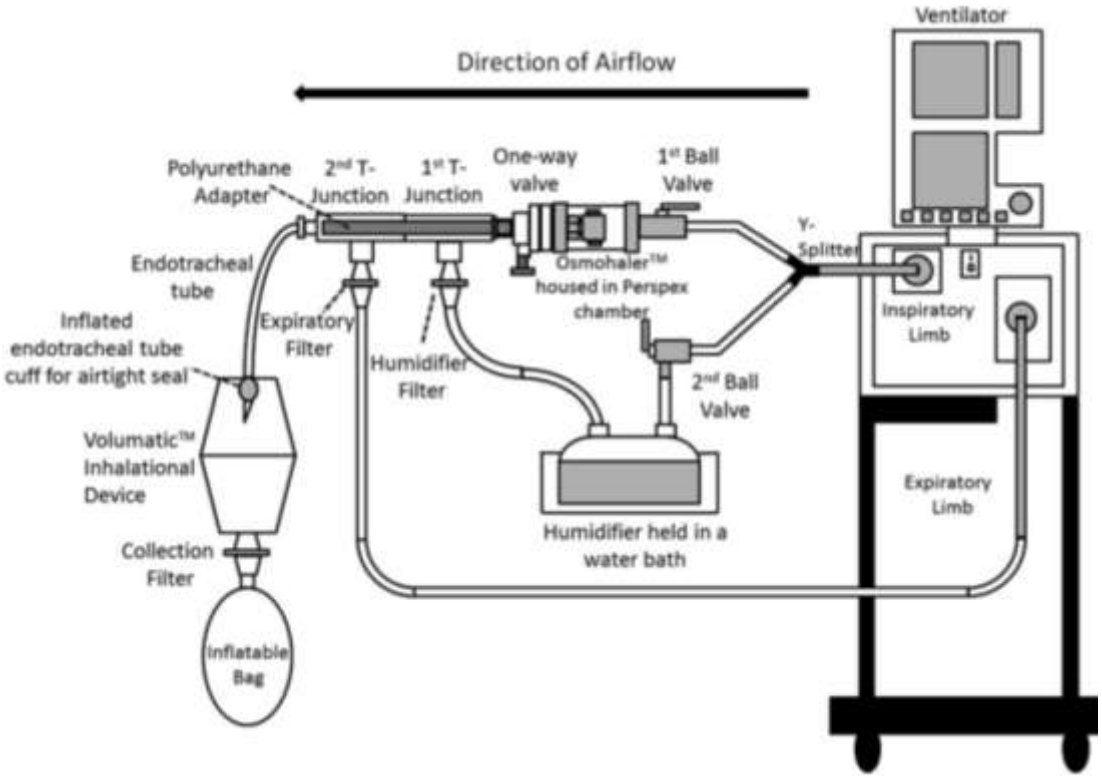


JOURNAL OF AEROSOL MEDICINE AND PULMONARY DRUG DELIVERY
Volume 29, Number 0, 2016

Pp. 1–8
DOI: 10.1089/jamp.2016.1320

A Novel In-Line Delivery System to Administer Dry Powder Mannitol to Mechanically Ventilated Patients

Benny Feng, BPharm,[1] Patricia Tang, PhD,[1] Sharon Shui Yee Leung, PhD,[1] Jayesh Dhanani, MD,[2,3] and Hak-Kim Chan, PhD, DSc[1]




Merci pour votre attention !

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- Choix du dispositif
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- Chambre d’inhalation
- Désencombrement
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