

## References

1. Tomás JM. The main *Aeromonas* pathogenic factors. *ISRN Microbiol.* 2012;2012:256261.
2. Álvarez M, Buesa J, Castillo J, Vila J. Diagnóstico microbiológico de las infecciones gastrointestinales; 2008. Available in: <http://www.seimc.org/contenidos/documentoscientificos/procedimientosmicrobiologia/seimc-procedimientomicrobiologia30.pdf> [accessed 01.06.16].
3. Esteve C, Alcaide E, Giménez MJ. Multidrug-resistant (MDR) *Aeromonas* recovered from the metropolitan area of Valencia (Spain): diseases spectrum and prevalence in the environment. *Eur J Clin Microbiol Infect Dis.* 2015;34:137–45.
4. Guarino A, Ashkenazi S, Gendrel D, lo Vecchio A, Shamir R, Szajewska H, European Society for Pediatric Gastroenterology, Hepatology, and Nutrition; European Society for Pediatric Infectious Diseases. European Society for Pediatric Gastroenterology, Hepatology, and Nutrition/European Society for Pediatric Infectious Diseases evidence-based guidelines for the management of acute gastroenteritis in children in Europe: update 2014. *J Pediatr Gastroenterol Nutr.* 2014; 59:132–52.
5. Woodring J, Srijan A, Puripunyakom P, Oransathid W, Wongstitwilairoong B, Mason C. Prevalence and antimicrobial susceptibilities of *Vibrio*, *salmonella*, and *Aeromonas* isolates from various uncooked seafoods in Thailand. *J Food Prot.* 2012;75:41–7.
6. Pérez-Doñate V, Borrás-Mañez M, Domínguez-Márquez V, Navalpotro-Rodríguez D., Colomina-Rodríguez J. Is azithromycin really a therapeutic option in intestinal salmonellosis. *An Pediatr.* 2015;83:346–7 [Article in Spanish].

Jorge Jover-García, Virginia Pérez-Doñate,  
Javier Colomina-Rodríguez\*

*Servicio de Microbiología, Hospital Universitario de la Ribera, Alzira, Valencia, Spain*

\* Corresponding author.

E-mail address: [jcolomina@hospital-ribera.com](mailto:jcolomina@hospital-ribera.com)

(J. Colomina-Rodríguez).

2341-2879/

© 2016 Asociación Española de Pediatría. Published by Elsevier España, S.L.U. All rights reserved.

## Light and noise: Environmental factors in intensive care units<sup>☆</sup>



## Factores ambientales de luz y ruido en las unidades de cuidados intensivos

Dear Editor:

Intensive care units (ICUs) are settings characterised by very sophisticated equipment that require specialised facilities and in many instances produce environments with poor natural light and background noise.<sup>1–3</sup> In these high-tech units, the activities involved in advanced life support and subsequent care may predispose to discomfort. Katherine Kolcaba defined comfort as the state experienced through having the human needs for relief, ease, and transcendence addressed in four contexts: physical, psychospiritual, sociocultural, and environmental.<sup>4</sup>

Aware of the importance of these factors in the care of critically ill patients, we reviewed the standards on light and noise in ICUs and studied the characteristics of these two variables in the PICU of a tertiary care hospital.

We measured environmental light with a CEM DT-1308 light metre in luxes (lx). Measurements were made in the morning and at night and taking into account the three types of lighting that predominate in the unit under study: natural light, white/cool light and warm/yellow light. We defined light colour based on colour temperature expressed

as Kelvin (K). Based on this parameter, cool light corresponds to white tones exceeding 5000 K (fluorescent lights), while warm light corresponds to yellow tones of less than 3300 K (halogen lights).<sup>5</sup>

We measured environmental noise with a PCE-999 type 2 audiometer in decibels (dB). We recorded the noise level every 2 h for 6 days.

The references used for comparison were the European Union Lighting Standard for Interior Lighting (EN 12464.1) and, for environmental noise, guidelines of the American Academy of Pediatrics (AAP) and the Council on Environmental Health, as well as the standards proposed by the World Health Organization (WHO). We ought to note that in order to avoid the Hawthorne effect (the alteration of behaviour in subjects aware of being observed) we performed these measurements without the knowledge of the health care staff in the unit.

We collected a total of 28 light measurements and 72 environmental noise measurements. The recommended light levels are 100 to 1000 lx during the day and 20 lx at night. The median natural light was 51.7 (0–207.2) luxes. As for direct cool lighting, the daytime median was 195.6 (88.1–347.2) luxes compared to 159.6 (57.0–206.7) at night. In comparison, our analysis of indirect warm light resulted in a median of 67.5 (11.4–193.7) luxes during the day versus a median of 27.4 (13.2–72.4) at night. All daytime light measurements complied with the standards, although nighttime luminosity far exceeded the recommended luxes.

When we analysed the environmental noise in the ICU, we found a mean  $57.64 \pm 3.67$  dB during the day versus  $55.48 \pm 3.17$  at night. Both levels exceed the daytime threshold of 45 dB and the nighttime threshold of 35 dB recommended by the reviewed standards.

Therefore, we can conclude that in order to improve environmental factors in our unit, we must continue to promote the use of natural light or, in its absence, warm lighting

<sup>☆</sup> Please cite this article as: Bosch A, Falcó A, Santaolalla M, Domínguez MC, Jordan I. Factores ambientales de luz y ruido en las unidades de cuidados intensivos. *An Pediatr (Barc).* 2017;86:227–228.

during the day, as these were the types of lighting that corresponded to the lowest lux values and best fit the standards. However, the use of light during the night should be restricted to strictly necessary procedures, as it exceeds the reviewed standards. As for environmental noise, it exceeded the daytime 10 dB and the nighttime 20 dB recommended by the AAP and the WHO, so we should promote a culture of environmental quiet, limiting all inputs that generate background noise. Continuous monitoring of environmental light and noise may improve the health care staff's awareness of the importance of these environmental factors in the care of critically ill patients, thus promoting a reduction in their levels.<sup>6</sup>

## References

1. Cavalheiro AM, Moura J, Copes A. Stress in nurses working in intensive care units. *Rev Latino-Am Enferm*. 2008; 16:29–35.
2. Pisani MA, Friese RS, Gehlbach BK, Schwab RJ, Weinhouse GL, Jones SF. Sleep in the intensive care unit. *Am J Respir Crit Care Med*. 2015;191:731–8.
3. Escudero D, Martín L, Viña L, Quindós B, Espina MJ, Forcelledo L, et al. Visitation policy, design and comfort in Spanish intensive care units. *Rev Calid Asist*. 2015;30:243–50.
4. Kolcaba K, DiMarco M. Comfort theory and its application to pediatric nursing. *Pediatr Nurs*. 2005;31:187–94.
5. Instituto para la Diversificación y Ahorro de la Energía (IDAE), el Comité Español de Iluminación (CEI). *Guía Técnica de Eficiencia Energética en Iluminación. Hospitales y Centros de Atención Primaria*. Madrid: Fondo editorial IDAE: publicación técnicas IDAE; 2001.
6. Joussetme C, Vialet R, Jouve E, Lagier P, Martin C, Miche F. Efficacy and mode of action of a noise-sensor light alarm to decrease noise in the pediatric intensive care unit: a prospective, randomized study. *Pediatr Crit Care Med*. 2011;12:e69–72.

Alejandro Bosch<sup>a,\*</sup>, Anna Falcó<sup>b</sup>, Marta Santaolalla<sup>a</sup>,  
María Carmen Dominguez<sup>a</sup>, Iolanda Jordan<sup>a</sup>

<sup>a</sup> *Unidad de Cuidados Intensivos Pediátricos, Hospital Sant Joan de Déu, Barcelona, Spain*

<sup>b</sup> *Departamento de Enfermería Fundamental y Medicoquirúrgica, Escuela de Enfermería, Universidad de Barcelona, Barcelona, Spain*

\* Corresponding author.

E-mail address: [abosch@hsjdbcn.org](mailto:abosch@hsjdbcn.org) (A. Bosch).  
2341-2879/

© 2016 Asociación Española de Pediatría. Published by Elsevier España, S.L.U. All rights reserved.