



## SCIENTIFIC LETTER

## Preparation and administration of insulin infusions in neonatology: A national survey<sup>☆</sup>



### Preparación y administración de perfusiones de insulina en neonatología: Encuesta nacional

To the editor:

Blood glucose abnormalities are a frequent problem in preterm newborns in neonatal intensive care units (NICUs). Specifically, the incidence of hyperglycaemia ranges from 25% to 75%, depending on the sample, the thresholds used for its definition and the frequency of blood glucose measurements.<sup>1</sup> One of the factors involved in its development is insulin resistance secondary to a high circulating level of inflammatory markers, cytokines and catecholamines and a relative insulin deficiency associated with the production of proinsulin by immature beta pancreatic (10 times less active).<sup>2</sup>

Abnormalities in glucose homeostasis may have dire consequences. Some studies have found that hyperglycaemia is associated with an increase in mortality, which in turn is significantly associated with the duration of hyperglycaemia. There is also evidence that hyperglycaemia is associated with an increased incidence of retinopathy of prematurity and grade III and IV intraventricular haemorrhage.<sup>1,3</sup> Therefore, it is necessary to make an accurate diagnosis and provide adequate treatment, which in this population usually consists of continuous intravenous insulin infusion.

Commercial insulin is a genetically engineered polypeptide that due to its molecular characteristics adsorbs to the glass and plastic of syringes and tubing that contain it. To date, there is a scarcity of scientific data on which method would be best to prepare insulin infusions. Some facilities add a variable amount of albumin to saturate the walls of the container and the infusion system and therefore minimise adsorption of insulin.<sup>4</sup> There is also evidence that adsorption increases with low concentrations of insulin and with lower flow rates,<sup>4,5</sup> and therefore the method used for preparation may have an impact on the actual dose delivered to the infant and result in variations in the therapeutic effect. Another factor that may affect the stability of the preparation is the duration of the contact of insulin with the surfaces

**Table 1** Results of the survey on the use of insulin infusions in neonatal units in Spain (n = 44).

|                            |                             | %    |
|----------------------------|-----------------------------|------|
| [1,0]Protocol              | Yes                         | 74.4 |
|                            | No                          | 25.6 |
| [2,0]Dilution fluid        | Physiological saline 0.9%   | 42.8 |
|                            | 5% dextrose in saline       | 52.4 |
|                            | Sterile water for injection | 4.8  |
| [1,0]Albumin               | Yes                         | 39.5 |
|                            | No                          | 60.5 |
| [1,0]Dwelling              | Yes                         | 33.3 |
|                            | No                          | 66.7 |
| [1,0]Bubble trap           | Yes                         | 17.1 |
|                            | No                          | 82.9 |
| [1,0]Protection from light | Yes                         | 33.3 |
|                            | No                          | 66.7 |

of the infusion system, so some units use a pre-conditioning or dwelling time before initiating administration, using the same preparation or a more concentrated solution with the aim of saturating the system and reaching equilibrium.<sup>6</sup> It is unclear whether protection against light exposure in insulin administration has an impact on stability. Lastly, the use of bubble trap filters, the total surface area of the system or the frequency with which infusion sets are changed may also have an effect on the final concentration of the administered insulin.<sup>3-6</sup>

At present there is no consensus on the optimal method to prepare and administer insulin infusions in the NICU setting. Because of this, we conducted a nationwide survey to assess the variability in the methods used to prepare insulin infusions in neonatal units in Spain. We used the software Google Forms<sup>®</sup> and disseminated the questionnaire through social media and sending it by email to the members of the Sociedad Española de Neonatología (Spanish Society of Neonatology).

We received a total of 44 responses from 44 Spanish hospitals with a NICU. Of these respondents, 80% were paediatricians and 20% nurses. Table 1 summarises the main results of the survey.

The collected data evinced great variability in the preparation of infusions in aspects such as the fluid used for dilution, the pre-conditioning dwelling time, use of filters and protection from light. We ought to highlight that 25% of the units did not have a written protocol on how to prepare insulin infusions. We specifically asked if they used albumin in the preparation, and if they did, to note the amount added (albumin concentration, added mL, and total volume in mL

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of the preparation). Only a minority used albumin (37%), and we found substantial variability in the dosage in terms of both the volume and concentration of albumin used. The reported concentrations of albumin ranged from 0.1 to 0.2 g per 50 mL. Another finding that emerged in an open-ended question about the preparation protocol was that 7% of units used concentrated insulin solutions (5 IU/mL) to saturate syringes and tubing.

Our study confirmed the significant heterogeneity in the preparation of insulin infusions and thus the uncertainty in the reliability of the delivered treatment. Therefore, new stability studies are required to establish the optimal method for preparing and administering insulin infusions and allow standardization of a frequently used treatment that has a significant impact on the outcomes of preterm infants.

### Conflicts of interest

The authors have no conflicts of interest to declare.

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### References

1. Beardsall K, Vanhaesebrouck S, Ogilvy-Stuart AL, Vanhole C, Palmer CR, Ong K, et al. Prevalence and determinants of hyperglycemia in very low birth weight infants: cohort analyses of the NIRTURE study. *J Pediatr*. 2010;157, 715-9.e3.
2. Ogilvy-Stuart AL, Beardsall K. Management of hyperglycaemia in the preterm infant. *Arch Dis Child Fetal Neonatal Ed*. 2010;95:F126–31.
3. van der Lugt NM, Smits-Wintjens VE, van Zwieten PH, Walther FJ. Short and long term outcome of neonatal hyperglycemia in very preterm infants: a retrospective follow-up study. *BMC Pediatrics*. 2010;10:52.
4. Kalra S, Bajwa SJS. Intravenous insulin use: technical aspects and caveats. *J Pak Med Assoc*. 2013;63:650–3.
5. Masse M, Maton M, Genay S, Blanchemain N, Barthélémy C, Décaudin B, et al. In vitro assessment of the influence of intravenous extension set materials on insulin aspart drug delivery. *PLoS One*. 2018;13:e0201623.
6. Thompson CD, Vital-Carona J, Faustino EVS. The effect of tubing dwell time on insulin adsorption during intravenous insulin infusions. *Diabetes Technol Ther*. 2012;14:912–6.

Ana García-Robles<sup>a</sup>, Álvaro Solaz García<sup>b</sup>, José Luis Poveda Andrés<sup>c</sup>, Ana Gimeno Navarro<sup>d</sup>, Marta Aguar Carrascosa<sup>e,\*</sup>

<sup>a</sup> Servicio de Neonatología, Unidad de Cuidados Intensivos Neonatales, Servicio de Farmacia, Hospital Universitario y Politécnico La Fe, Grupo Investigación Perinatología, Valencia, Spain

<sup>b</sup> Grupo Investigación Perinatología, Instituto de Investigación Sanitaria La Fe, Hospital Universitario y Politécnico La Fe, Valencia, Spain

<sup>c</sup> Servicio de Farmacia, Hospital Universitario y Politécnico La Fe, Valencia, Spain

<sup>d</sup> Servicio de Neonatología, Unidad de Cuidados Intensivos Neonatales, Hospital Universitario y Politécnico La Fe, Valencia, Spain

<sup>e</sup> Servicio de Neonatología, Unidad de Cuidados Intensivos Neonatales, Hospital Universitario y Politécnico La Fe, Valencia, Spain

\* Corresponding author.

E-mail address: [maraca@alumni.uv.es](mailto:maraca@alumni.uv.es)

(M. Aguar Carrascosa).

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## Follow-up study of late premature infants in a primary care centre; what is the reality of this population?☆



## Estudio de seguimiento del prematuro tardío en un centro de atención primaria. ¿Cuál es la realidad de esta población?

Dear Editor:

The number of late preterm births (between 34 and 36 weeks' gestation) has been increasing in recent years and

amounts to more than 70% of all preterm births. In addition to abnormal neurodevelopment, infants born late preterm are at higher risk of infection, faltering growth, respiratory problems and hospital admission and are less likely to be breastfed.<sup>1–4</sup>

The Sociedad Española de Neonatología (Spanish Society of Neonatology), in collaboration with the Asociación Española de Pediatría de Atención Primaria (Spanish Association of Primary Care Paediatrics), published guidelines for the followup of late preterm infants in 2017 with the aim of minimising the impact of prematurity.<sup>2</sup> The objective of our study was to analyse the comorbidities detected in a population of children born late preterm followed up in a primary care centre.

We conducted a retrospective descriptive study in which we included all children born late preterm between January 2007 and October 2019 followed in an urban primary care centre with a catchment population of 2844 children under 15 years as of September 2019.

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