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Title: BDNF expression in blood. Study in iron deficient females

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Introducción

- La deficiencia de hierro (DFe) es la deficiencia de micronutrientes mas común en todo el mundo.
- Afecta a 614 millones de mujeres y 280 millones de niños (WHO, 2020a).
- Diversos trastornos neurocognitivos relacionados con deficiencia de hierro, están vinculados a alteraciones en factores neurotróficos.
- El factor neurotrófico derivado del cerebro, BDNF, es un polipéptido que actúa como factor de crecimiento modulando la síntesis, metabolismo y liberación de neurotransmisores (Crump et al., 2014), supervivencia, diferenciación y plasticidad sináptica en los sistemas nerviosos central y periférico (Lu & Figurov, 1997; Morse et al., 2015; Texel et al., 2011).

- Se ha demostrado una baja expresión y actividad a largo plazo del BDNF a nivel de hipocampo en sujetos con DFe (Tran et al., 2009).

- BDNF puede atravesar la barrera hematoencefálica; por lo tanto, los niveles en suero y en líquido cefalorraquídeo están fuertemente correlacionados con los niveles cerebrales (Gururajan et al., 2014; Harris & Barraclough, 1997; St Laurent et al., 2013).

- El gen de BDNF está presente un elemento de respuesta al estrógeno (ERE), por lo que los estrógenos aumentan la expresión de este factor neurotrófico (Singh et al., 1995; Sohrabji et al., 1995).

- Pocos estudios se realizan en hembras, con respecto a deficiencia de hierro se desconoce si en éstas la deficiencia crónica de este elemento traza afecta sobre los niveles de BDNF en sangre, un determinante indirecto de los niveles en cerebro.

Metodología

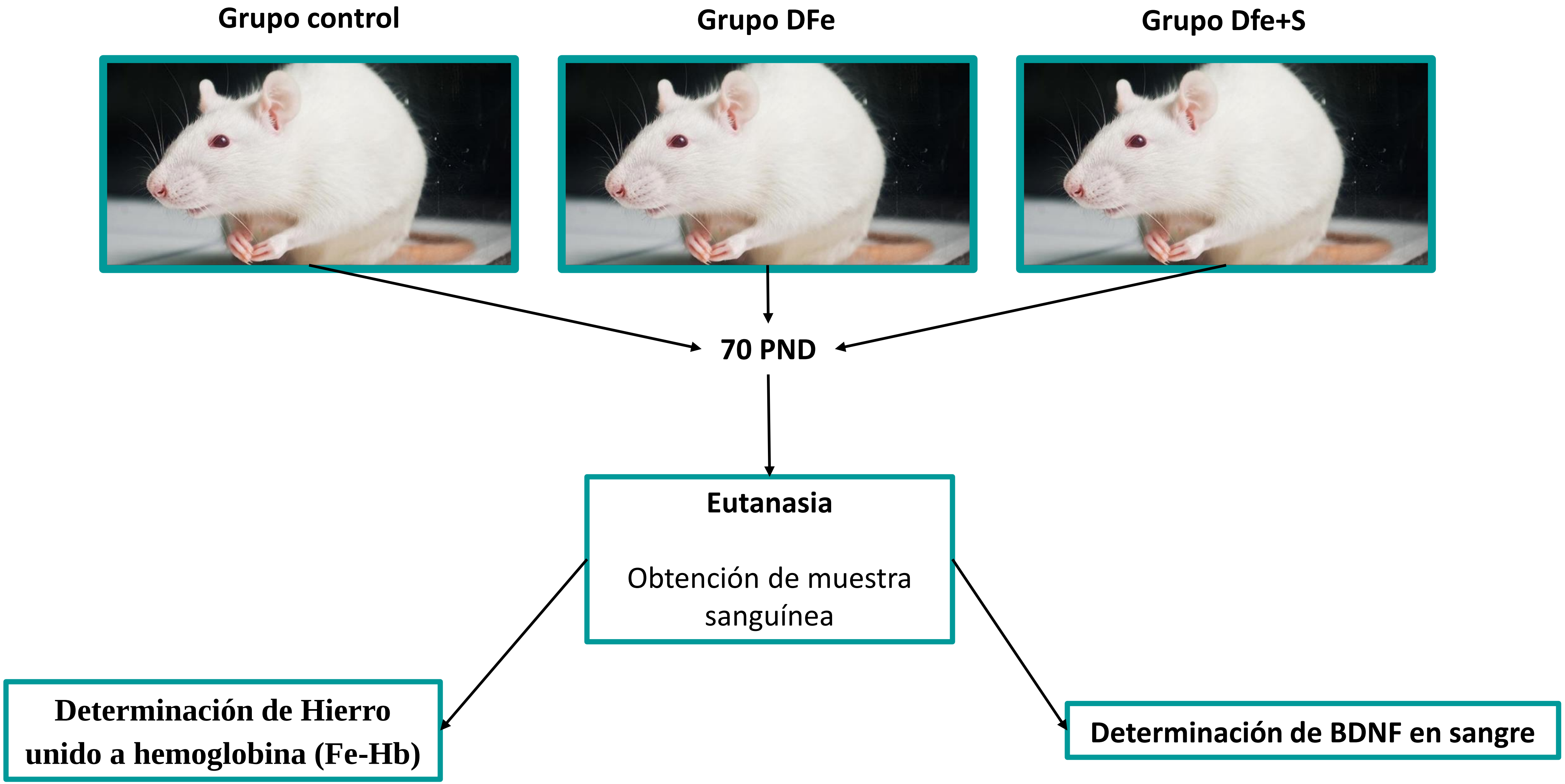
Pie de cría

Grupo Deficiente de hierro (Dfe): 20 ratas hembras (de 3 meses de edad o 250 g) alimentadas con dieta deficiente en hierro (10 ppm $FeSO_4$, Lab Diets AIN-76W / 10) 14 días antes del apareamiento.

Grupo control: 10 ratas hembras alimentadas con dieta control (100 ppm $FeSO_4$, Lab diets AIN-76W / 100) 14 días antes del apareamiento.

Crías

21 días después del nacimiento (DPN), las crías fueron destetadas. Las hembras fueron seleccionadas para el presente experimento, los machos fueron empleados en otros proyectos. Las crías hembras se mantuvieron con el mismo tipo de dieta ofrecida a sus madres hasta los 70 DPN; con la excepción del grupo suplementado "DFe+S", un conjunto de crías hembras ID, que recibieron del 21 al 70 DPN dieta control.


Grupo control
Grupo DFe
Grupo Dfe+S
70 PND
Eutanasia
Obtención de muestra sanguínea
Determinación de Hierro unido a hemoglobina (Fe-Hb)
Determinación de BDNF en sangre

Resultados

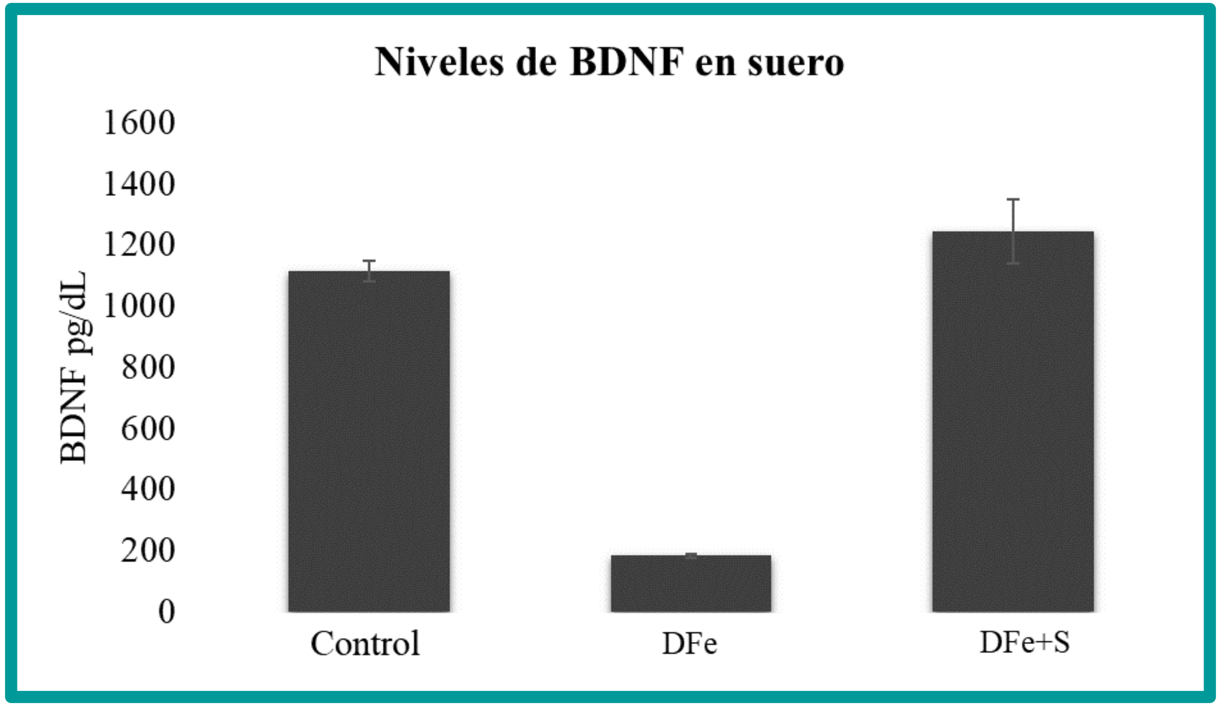
Determinación de hierro unido a hemoglobina

Al estudiar al grupo ID con respecto al grupo control, se encontró que los primeros presentan 10.9% menos de Fe-Hb y 3.8% menos que el grupo ID+S, ver Tabla 1.

Grupo	**Fe - Hb (mg/kg PV)**
Control	3.71±0.11
Deficiente de hierro+suplemento	3.47±0.11
Deficiente de hierro	3.18±0.23*

Tabla 1. Niveles de hierro unido a hemoglobina “Fe-Hb”

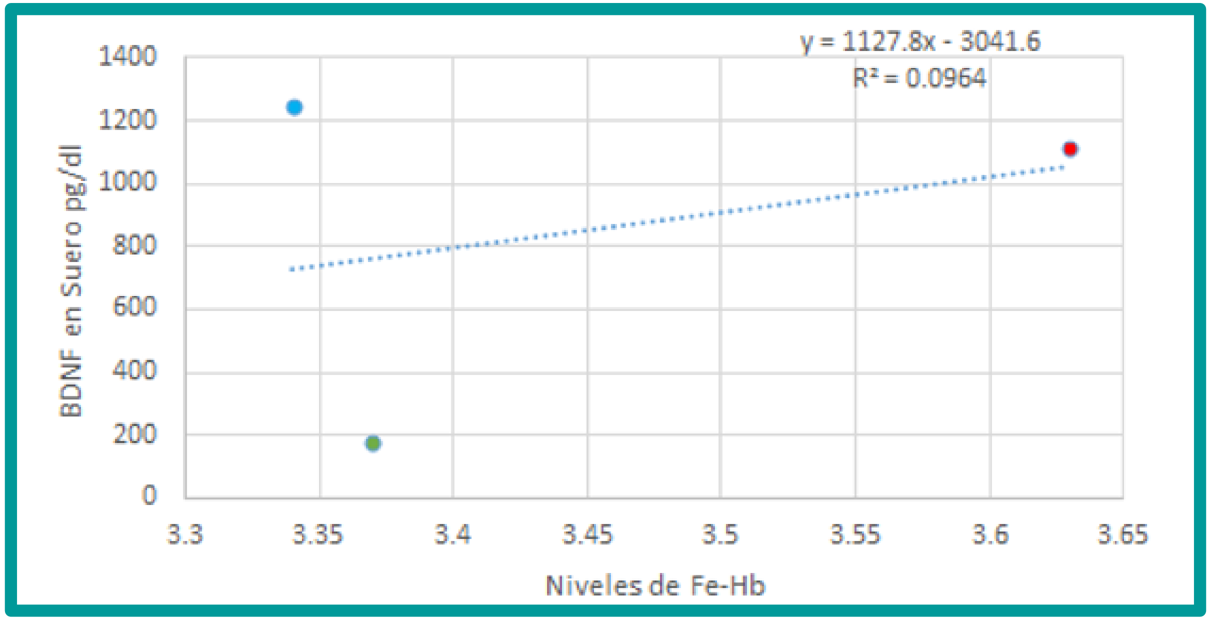
* vs. Hembra del grupo control ($p \leq 0.05$)



Gráfica 1. *Niveles de BDNF en sangre*. Los valores indican la media ± error estándar.

* vs. Hembra del grupo control ($p \leq 0.05$)

**vs. Hembra del grupo Deficiente de hierro+Suplemento ($p \leq 0.05$)



Gráfica 2. *Correlación entre los niveles de BDNF y los de hierro unido a hemoglobina*. Los puntos en rojo indican hembras control; verdes DFe y azules DFe+S.

Conclusiones

A. Ante una deficiencia de hierro crónica, los niveles de BDNF disminuyen periféricamente.

B. La suplementación con hierro en sujetos con deficiencia normaliza los niveles de BDNF a nivel periférico.

C. Los niveles de hierro unido a hemoglobina se correlacionan positivamente con los niveles de BDNF en sangre.

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