The Danish Blood Donor Study

Update on hemoglobin and ferritin with data from the Danish Blood Donor Study

Henrik Ullum
Copenhagen University Hospital

Topics

• Iron depletion in blood donors
• Clinical consequences of iron depletion
• The Copenhagen ferritin algorithm
• Future directions
• WHO 2011: 400 million children and women of reproductive age suffer from iron deficiency anemia
• Estimated 2.7 billion suffer from iron deficiency
• Blood donors are at special risk
Predictors of iron levels in 14,737 Danish blood donors

The strongest predictors of iron deficiency were donation intensity, sex & menopausal status

*Rigas A.R. Transfusion Volume 54, Issue 3 2013*

Restless legs syndrome associated to:
- Number of blood donations
- Weight
- Age
- Educational level
- Intake of alcohol
RLS associated to:
- Poor self perceived health (mentally and physically)
- Depression
- Migraine

Iron deficiency and depression

- 3262 female donors, outcome MDI score >25:
- Ferritin<15: Increased risk of depression, OR=2.32; 95% CI:1.29-4.2
- MCV≤83 fL: Increased risk of depression, OR=1.92; 95% CI: 1.09-3.38
- Most frequent symptom: lack of energy and strength
Iron deficiency, pregnancy

- 293,897 first live singleton births to Danish women between 1997 and 2012
- Adjusting for: gestational age, birth weight, child sex, parental age, maternal smoking status during pregnancy, and parental education length, and annual income

Birthweight compared between groups

Each annual donation reduced birth weight by 10.5 g (95% CI: 3.3-17.7 g)
The Copenhagen Ferritin algorithm

Algorithm initiated February 1st 2012

The Copenhagen ferritin algorithm

Ferritin monitoring and iron supplementation increases hemoglobin levels and reduces hemoglobin deferral rates
The Copenhagen ferritin algorithm

• Testing costs < 3 Euro
• Integrated with centralized Hb monitoring: 1.5 lab technician per 100,000 donations
• Price supplementation 1-5 Euro
• Little daily work load on doctors in the blood bank
• Well accepted by donors and general practitioners
• Adherence? Effects on re-donation rates?

The future 1

Time to monitor for iron deficiency and provide iron supplement or defer?

• Smoking gun?
• Prediction algorithms including genetics

Precautionary principle
The future 2: Multi-national RCT

- Female first time donors <40 years three arms:
  - 1) No ferritin measurement
  - 2) Ferritin guided iron supplementation
  - 3) Ferritin guided deferral
- Primary outcomes: risk of deferral for low hemoglobin, risk of ferritin <30ng/mL during 24 months of follow up after inclusion

Thanks to

Dept. of Clinical Immunology, Copenhagen University Hospital
- Erik Sørensen, Lise Wagner-Themme, Kristoffer Selskov Burgdorf, Andreas Siribörd Rigès, Mårten Larsen, Maria Didriksen, Rikke Fisker, Jakob Højholt von Steenrod
- Dept. of Clinical Immunology, Aarhus University Hospital
  - Christian Ernstrup, Mikkal Sørensen Petersen, Susan Mikkelsen, Khush Meher Doshi, Katriina Kaasen
  - Dept. of Clinical Immunology, Naestved Hospital
    - Ole Birger Pedersen, Thorsten Brodersen, Isabella Paulsen, Peter Risse
    - Dept. of Clinical Immunology, Aalborg University Hospital
      - Kaspar Ravn Nielsen
      - Dept. of Clinical Immunology, Odense University Hospital
        - Helene Pinney, Torben Barington, Mie Topholm Brun
    - Dept. of Epidemiology Research, Statens Serum Institut
      - Henrik Hyggom, Klaus Roedgaard
    - The Blood Donors in Denmark
      - Poul Erik Hansen Petersen, Flemming Bagh-Sørensen
    - Novo Nordisk Foundation Center for Protein Research
      - Karina Banasik, Søren Brunak
    - Copenhagen Business School
      - Steffen Rasmussen

The Lundbeck Foundation Initiative for Integrative Psychiatric Research - iPSYCH
- Thomas Hansen, Thomas Werge
- DBDBS Genomic Consortium
  - Thomas Werge, Søren Brunak, Karina Banasik, Thomas Hansen, Per Jøhannsen, Peter Nygaard, Poul Jønnum, Steffen Andersen, Gregg Jenks, Jes Olsen

International collaborators
- deCODE genetics
- Karolinska Institute
- University of Cambridge / The INTERVAL study

The Danish Blood Donor Study