Current concepts in iron metabolism relevant to transfusion and haemovigilance
Iron metabolism

Classical background

Recent advances

Relevance to transfusion and haemovigilance
Transferrin  Ferritin
Transferrin  Ferritin
Iron metabolism

Classical background

Recent advances

Regulation

Toxicity

Relevance to transfusion and haemovigilance
Bone marrow
Hepcidin
Hepcidin

Fe
Ferroportin
Transferrin saturation (%)
Transferrin saturation < 45%
Transferrin saturation (%)
Transferrin saturation (%)
FeNTBI
(Non-Transferrin Bound Iron)
LPI = labile plasma iron.
Fe
Transferrin saturation < 45%
LPI = labile plasma iron.
Transferrin saturation $> 45\%$

NTBI (Non-Transferrin Bound Iron)
Transferrin saturation > 75%

LPI (Labile Plasma Iron)
Reactive Oxygen Species

LPI

Reactant

Oxygen Species
Iron metabolism

Relevance to transfusion and haemovigilance

The fate of transfusional iron

Damaging impact of transfusional iron

« Iron clinical attitude »
Iron metabolism

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« Iron clinical attitude »
Chronic anemia

FIRST ORGAN IRON HIT

Iron overload
Chronic anemia

« SECOND ORGAN  IRON HIT »
(NTBI)

Iron overload
Chronic anemia

Anemia

Iron overload

Question mark
Chronic anemia

Dyserythropoiesis

Anemia

Iron overload
Hepcidin

Erythroferrone*

Dyserythropoiesis

* Kautz L et al Nat Genet 2014: 46: 678-84
Hepcidin

Fe
Inflammation
IRON cytokines Systemic inflammation
Infection
Iron

Bacterial growth

Bacterial resistance
Iron metabolism

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Ferritin

MRI
(Magnetic resonance imaging)
1. Increased serum ferritin

2. Increased serum ferritin
1. Increased serum ferritin

2. Increased serum ferritin
1. Increased serum ferritin

2. Increased serum ferritin

3. Hyperferritinemia level depends on cellular iron distribution
Macrophagic siderosis

Transfusional first cellular hit

Parenchymal siderosis

Transfusional second cellular hit

NTBI

Dyserythropoiesis
Serum ferritin is more elevated in macrophagic than in parenchymal siderosis for the same degree of iron excess.
macrophage

Serum ferritin

hepatocyte

Serum ferritin
Ferritin  MRI
Transfusional iron overload

Dyserythropoiesis

Transfusion not responsible!
Conclusions

In terms of iron:

- The human body ensures a finely tuned regulation, in a very conservative way

  behaving as if iron was as precious as... gold

- The transfusional process may disturb this equilibrium, leading to deleterious iron excess

- The «transfusion physician» must therefore be careful about iron status
HAEMOVIGILANCE

« Iron vigilance »