Adapt and Thrive
Iron deficiency

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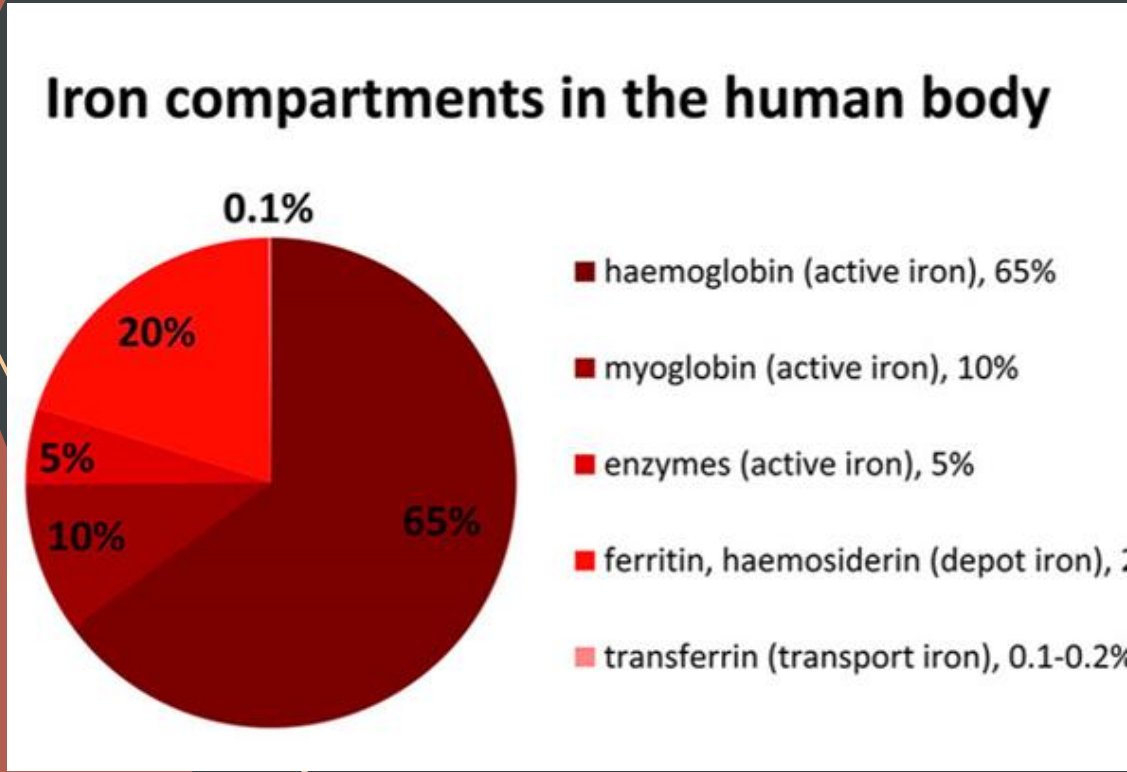
Our discussion points for the day

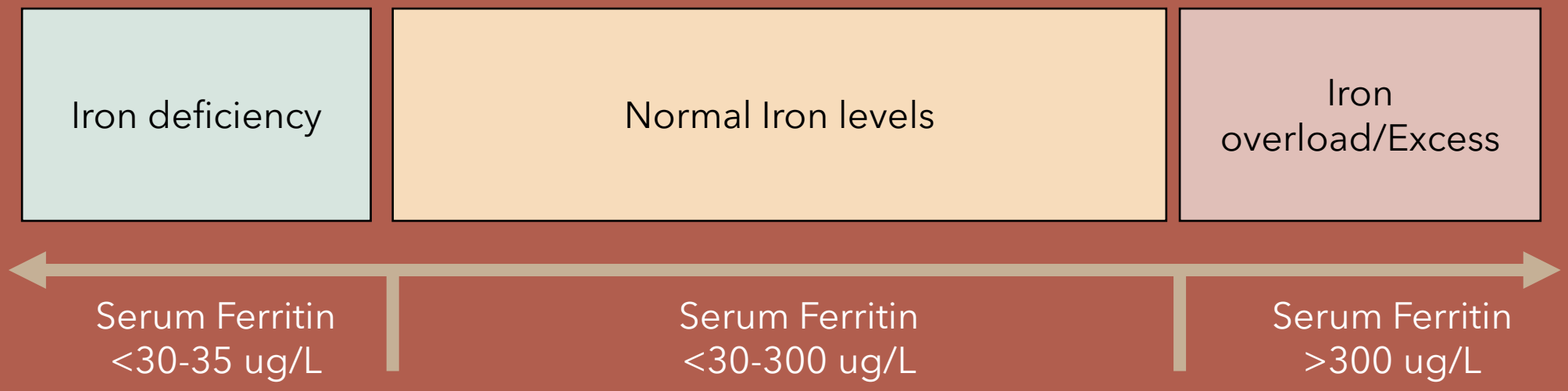
- Understanding iron status: what is normal, too little and too much
- Recognizing the symptoms of Iron Deficiency
- Identify the progressive stages of Iron depletion
- Understand how our body regulates Iron
- Evidence based treatment strategies

Perhaps too much is as bad as too little

- Fundamental mineral for normal functioning
- Human body ~3-5 mg
  - Oxygen delivery and storage
    - Hemoglobin (Hb) + Myoglobin (Mb)
  - Oxidative production of energy
    - Components of electron transport chain in mitochondria
    - Release ATP
  - Enzymes (~1%):
    - Synthesis of steroid hormones & bile acids
    - Signalling by some neurotransmitters
    - DNA production
  - Immune function
    - Influence cell mediated immunity



Sitting in the healthy mid range zone



Stages of Iron depletion

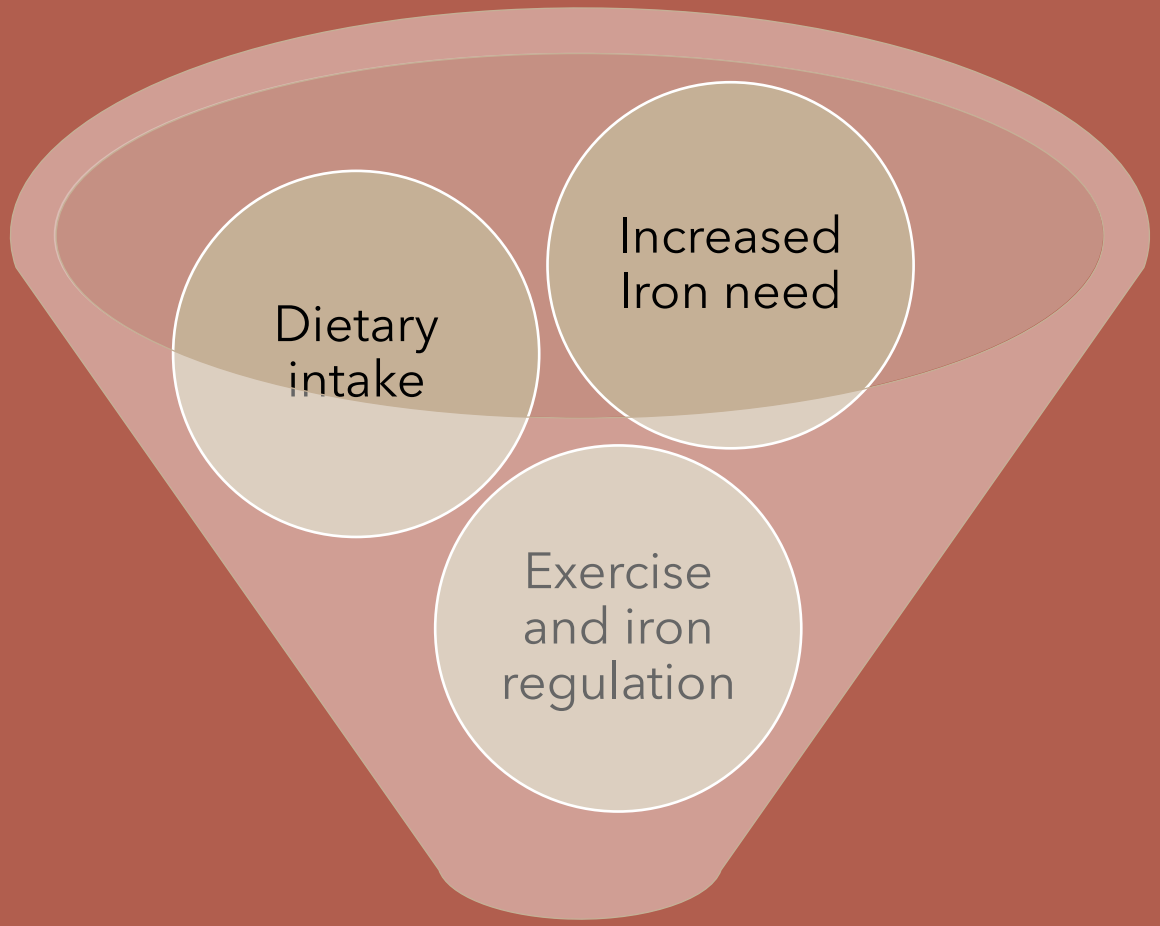
	Stage 3: Iron deficiency Anaemia	**Stage 2: Iron Deficiency**	**Stage 1: Iron depletion**	**Normal Ranges for Iron**	**Iron Overload**
Serum Ferritin (Iron stores)	<12ug/L	12-20ug/L	<35/30 ug/L	35-300ug/L	>300ug/L
Haemoglobin (Hb)	F<120 M<140	F>120 M>140	F>120 M>140	F>120 M>140	F>120 M>140
Transferrin Saturation (%)	<16%	>16%	16-20%	35±15%	>60%

How do I feel?

Symptoms

- Fatigue/Lethargy
- Increased perception of effort during exercise/activity. Poor motivation to exercise
  Sever ID: declines in exercise performance
- Poor concentration/ declines in work productivity, poor mood, increased irritability
- Poor immune function

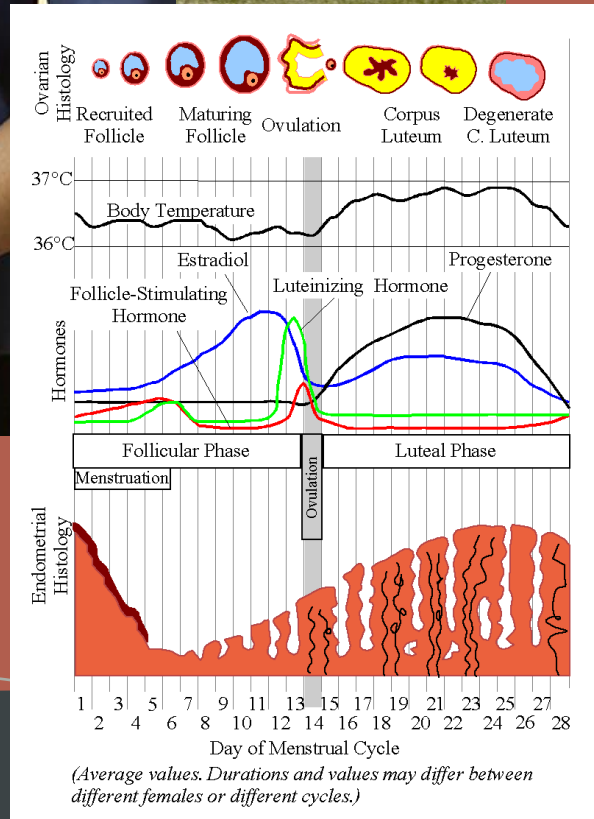
Challenges to our iron status



Negative iron balance

Increased Iron need

- Growth and Development:
  - Adolescences (Males and Females)
  - Children
- Menstrual Cycle:
  - Females starting their cycle
  - Premenopausal females
  - Perimenopausal females



Dietary intake

- Adequate dietary iron intake
  - Meeting RDA's on iron for all genders and age groups
- Changes in dietary pattern
  - Veganism/vegetarian growth in popularity

Current NZ Iron intake recommendations

Recommended Dietary Allowance (RDAs) for Iron in New Zealand			
Age	**Female**	**Male**	**EAR- estimated average intake**
1-13 years	~8 mg		~6mg
14-18 years	15 mg	11 mg	~8mg
19- 50 years	18 mg	8 mg	6-8mg
50 + years	8 mg		5-6mg
Athletes	~17.5mg Females runners up to 23mg		

Haem vs Non-Haem Iron foods

Haem iron

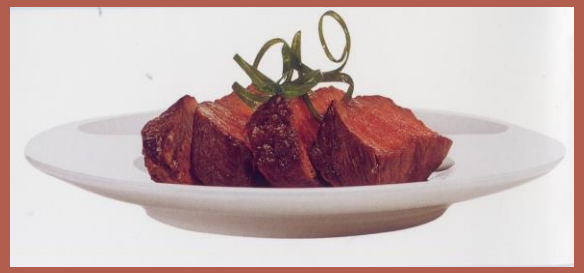
Meat, fish & poultry

25% absorbed – constant

Non-haem iron

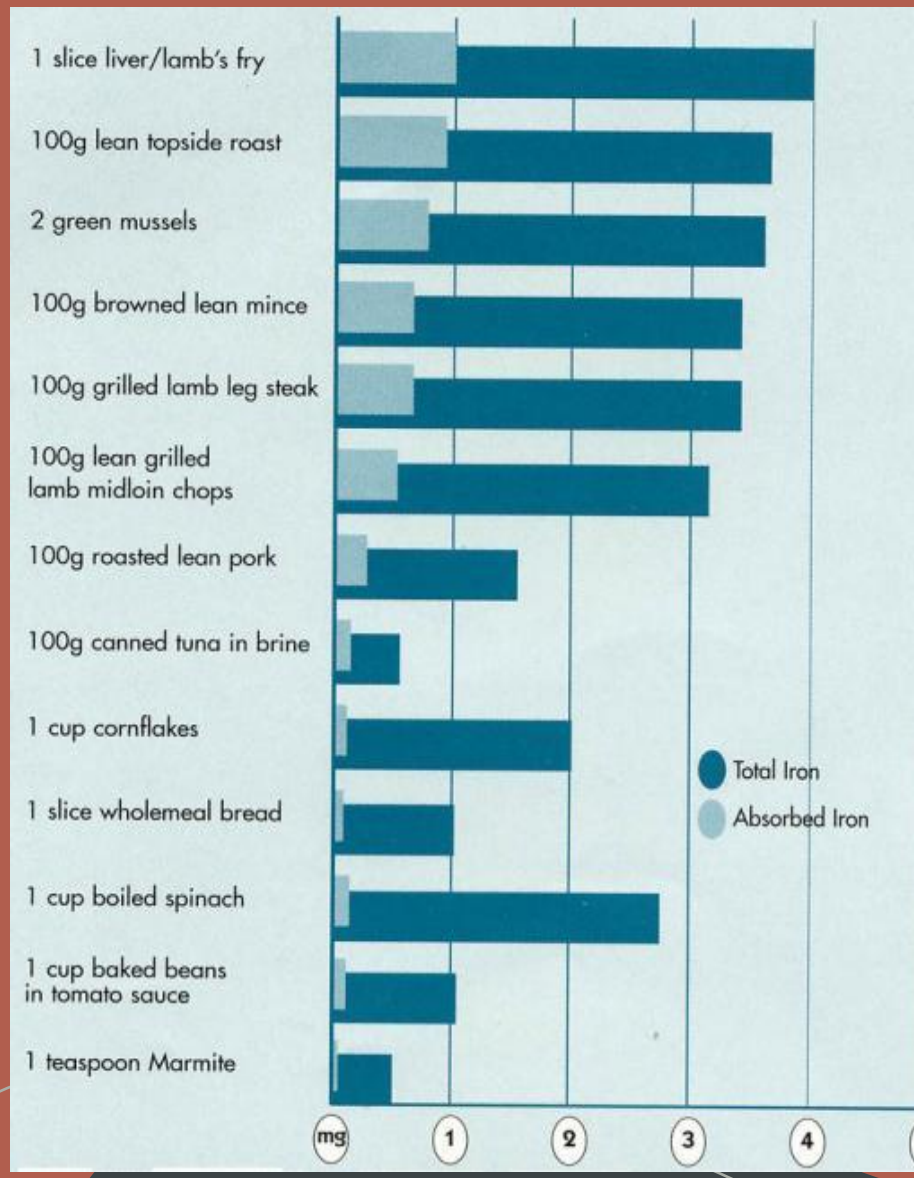
Cereal, pulses, legumes, fruit & vegetables

Absorption variable (2-20%)



Absorption example:

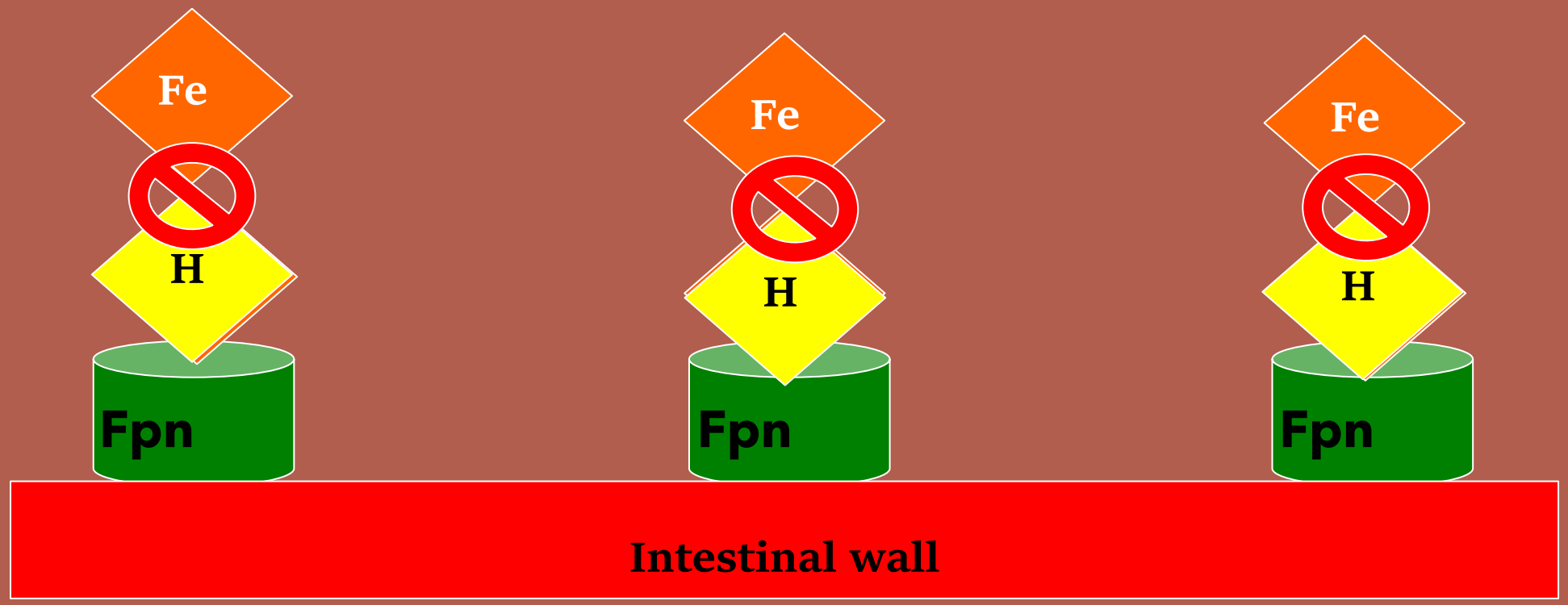
For a women to get half her daily iron needs (~9 mg iron) she either needs to eat 140 g of steak or 3.3 kg of spinach



Exercise: accelerates iron loss

- Exercise induced mechanism:
  - Sweating
  - Haematuria
  - Haemolysis
  - GI bleeding
- Exercise induced increases in the iron regulatory hormone hepcidin

Hepcidin: Iron commander



Homeostatic regulation in the body via Hepcidin

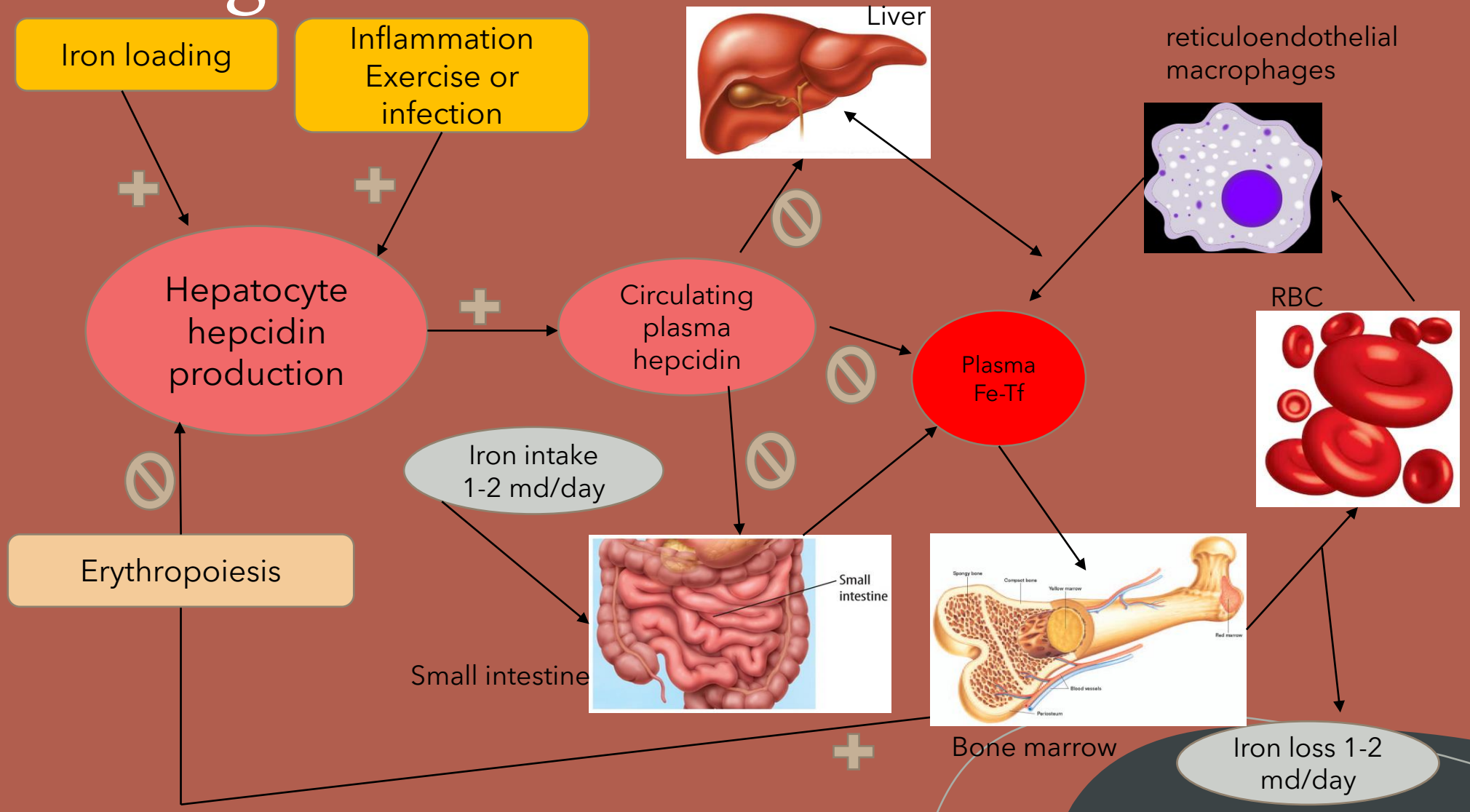
Iron regulatory hormone

Degrades ferroportin export channels:

- Duodenum
- Macrophages/reticuloendothelial system
- Liver/Hepatocytes
- Adipocytes

(Nemeth et al., 2004)

Iron regulation in the body: an intricate balancing act



Factors that influence hepcidin everyday

Current iron status	Dietary iron intake and time of day	Exercise and Inflammation
• Blunted if iron deficient • HFE: genetically low levels	• If healthy iron levels will increase to prevent XS iron absorption • Lowest in the morning, increases throughout the day	• Increases with exercise ~3-6 h post exercise • Increases during illness to prevent infection development

Preventative and Treatment strategies

1

Dietary iron

Initial/conservative approach
Conducted by accredited dietician

1) Full dietary assessment
2) Provision eating plan to increase daily iron intake
3) Address bioavailability (haem vs non haem sources)
4) Assess presence of inhibitor vs enhancers

2

Iron supplements

Oral or liquid
In ferrous form (fumarate, gluconate, sulphate)
Ferric form → GI disturbance
GI-discomfort: iron polymerase prep or enteric table coating

Every 2nd day: increase fractional absorption of iron from dose
8-12 weeks → 40-80% increase ferritin

3

Parental iron

Intramuscular injections to IV iron
1-42 days → 200-400% increase ferritin
High speed of restoration and minimal GI upset
Used sever cases
Decision made sports physician and in line anti doping agencies of sport

Tips to increase iron absorption

- Meat, fish or chicken - 3 – 4 serves / week
- Plant foods with high iron contents – legumes, green leafy vegetables, iron fortified cereals & bread
- Vitamin C with meals
- Limit inhibitors at meal times, or give it 1 hour
  - Tea & coffee
  - Excessive unprocessed bran intake
  - Calcium?
- Morning iron rich foods or supplement ingestion
- Morning supplement within 30 min after completing exercise session
- Combined approach

Questions and comments for discussion

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