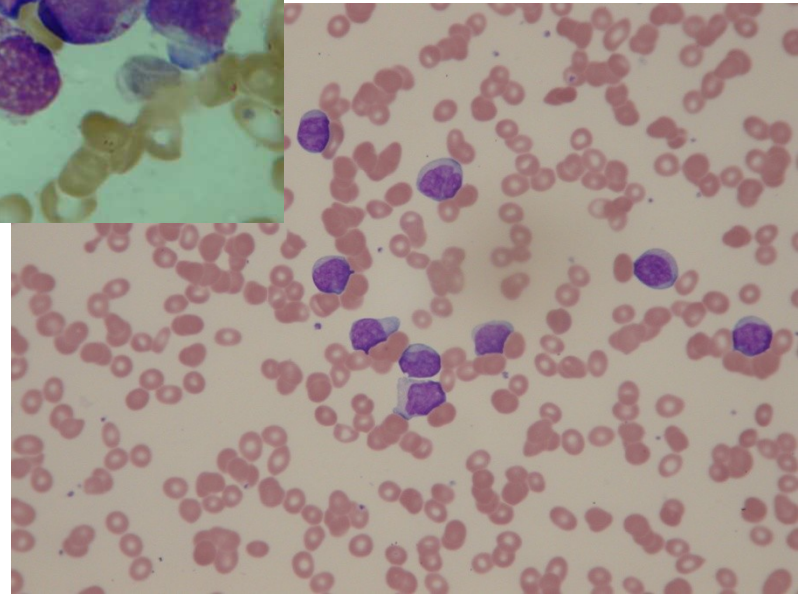
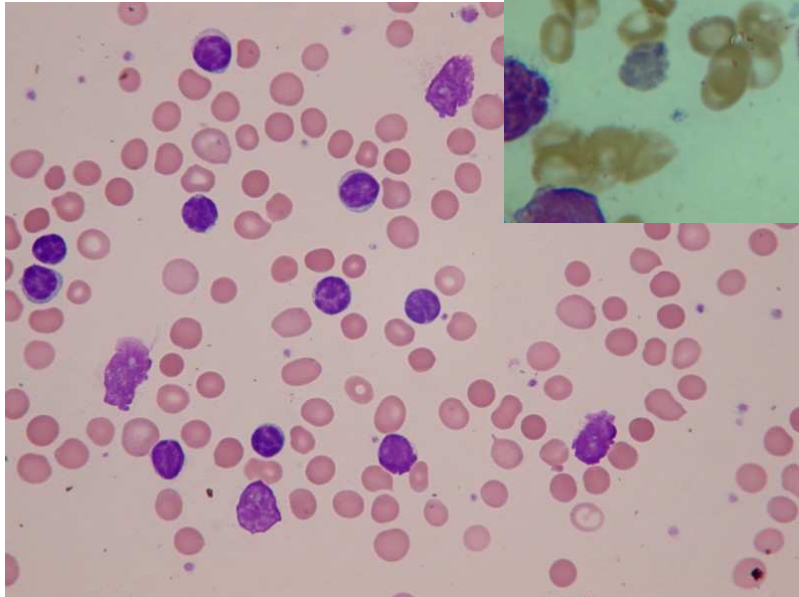
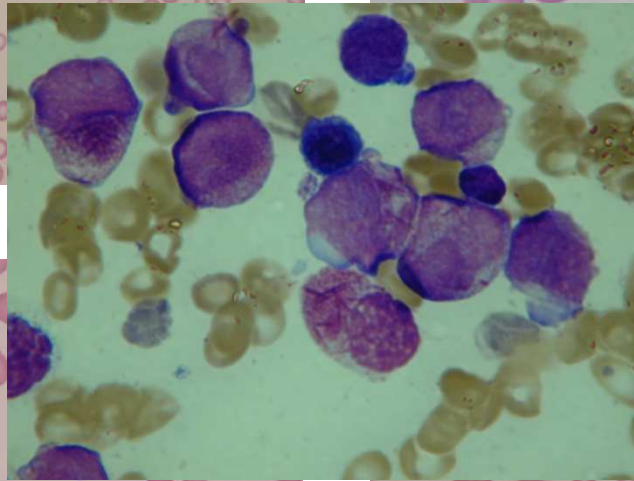
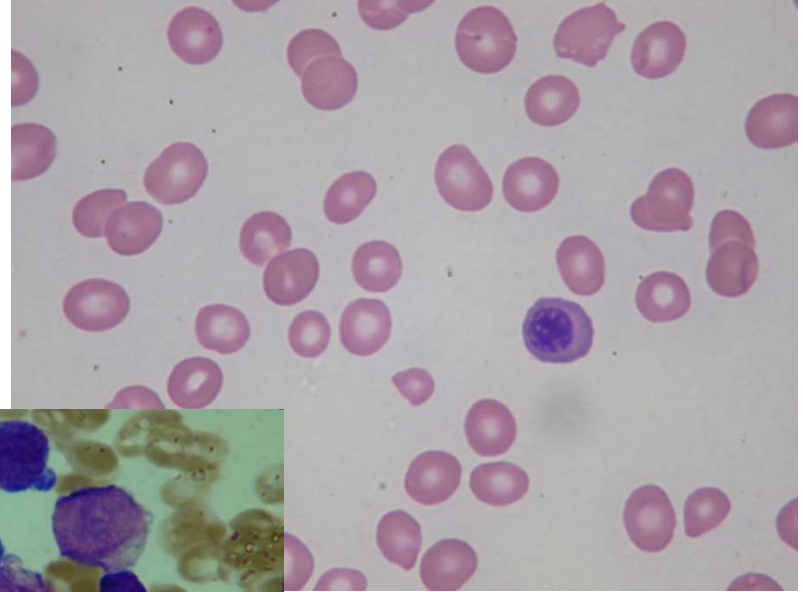
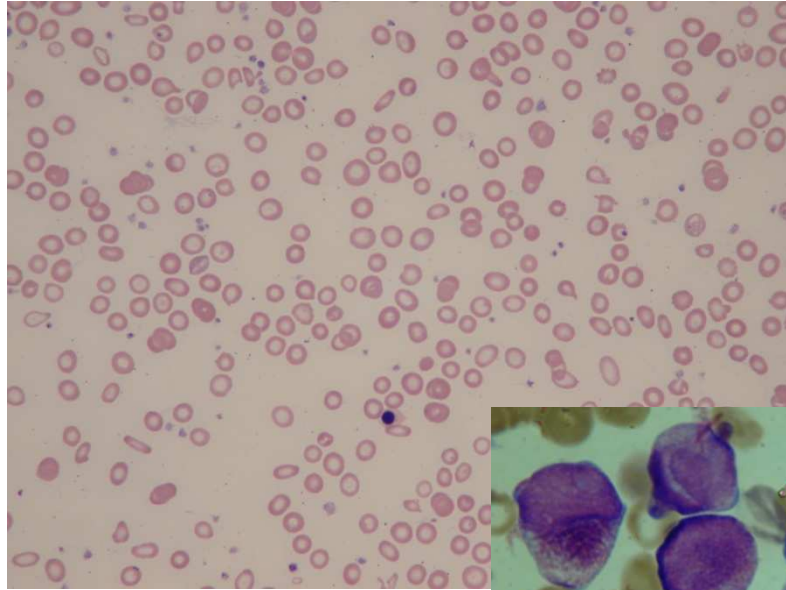


A microscopic view of a blood smear. The field is dominated by numerous red blood cells (erythrocytes) that appear pale pink and somewhat irregular in shape, consistent with microcytosis. A single white blood cell (leukocyte) is visible in the center, characterized by a multi-lobed, dark purple nucleus. The background is a light pinkish-purple hue.

Anaemia in Pregnancy

Patrick Roberts

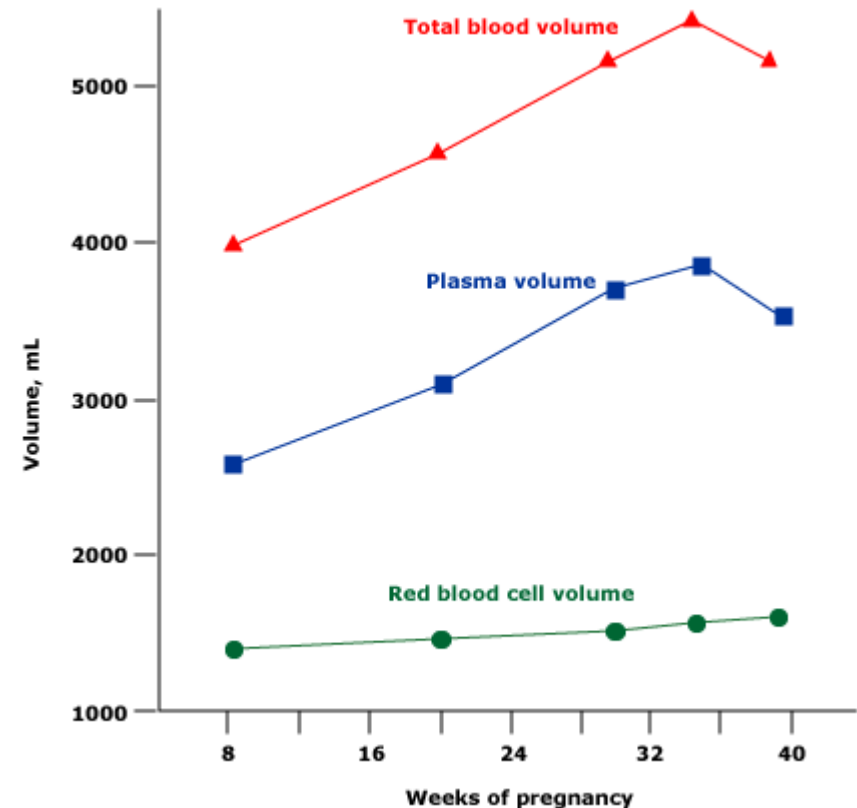


Haematological changes in normal pregnancy

• Plasma volume	Increases 30 to 50 percent
• Red blood cell mass	Increases 20 to 30 percent
• Hb	Decreases
• Red cell lifespan	Slightly decreased
• Erythropoietin	Increases
• Mean corpuscular volume (MCV)	Increases slightly
• Platelet count	No change to slight decrease
• White blood cell count	Increases (neutrophilia)
• Prothrombin time	Slight decrease
• Bleeding time	No change
• Protein S (total/free/activity)	Decreases
• APCR	Increases
• Fibrinogen, factors II, VII, VIII, X, XII, XIII	Increases 20 to 200 percent
• Antithrombin, protein C, factor V, factor IX	No change to slight increase
• Von Willebrand factor	Increases
• Thrombin activatable fibrinolytic inhibitor	(TAFI), PAI-1, PAI-2 Increases
• D-dimer	Increases

Physiological Changes in Pregnancy

- Plasma Volume:
 - ↑10-15% at 6-12wks
 - 30-50% by 30-34wks
 - Systemic vasodilation
 - Normal by 6wks PP
- Red cell mass
 - Increase Epo (50%)
 - RCM 20-30% by term



Definition of Anaemia in Pregnancy

- WHO definition
 - Anaemia Hb <110 g/l (Hct <0.33)
 - Severe Hb <70 g/l
 - Emergency Hb <40 g/l

- BCSH guideline (2011)
 - 1st trimester Hb <110 g/l
 - 2nd/3rd trimesters Hb <105 g/l
 - Post partum Hb <100 g/l

Causes of Anaemia in Pregnancy

- Iron deficiency (physiological, blood loss, coeliac disease)
- Folate deficiency
- B12 deficiency
- *Haemoglobinopathies* (HbSS, HbSC, thalassaemias)
- Haemolysis eg Hereditary spherocytosis, HE (autoimmune, HELLP)
- GI blood loss
- Leukaemia eg AML
- PNH



Does anaemia matter?

- Maternal iron deficiency associated with
 - Maternal morbidity (infections, fatigue, cognitive and emotional problems)
 - Preterm delivery
 - Low birth weight
 - ?Placental abruption
 - ?Peripartum blood loss
 - Neonatal iron deficiency (impaired psychomotor / mental development, ?social / emotional problems ??problems in adulthood)

IDA During pregnancy

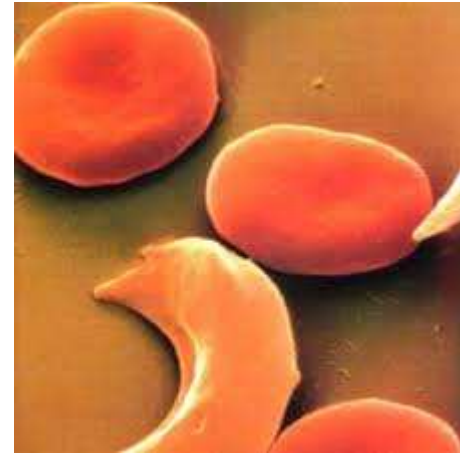


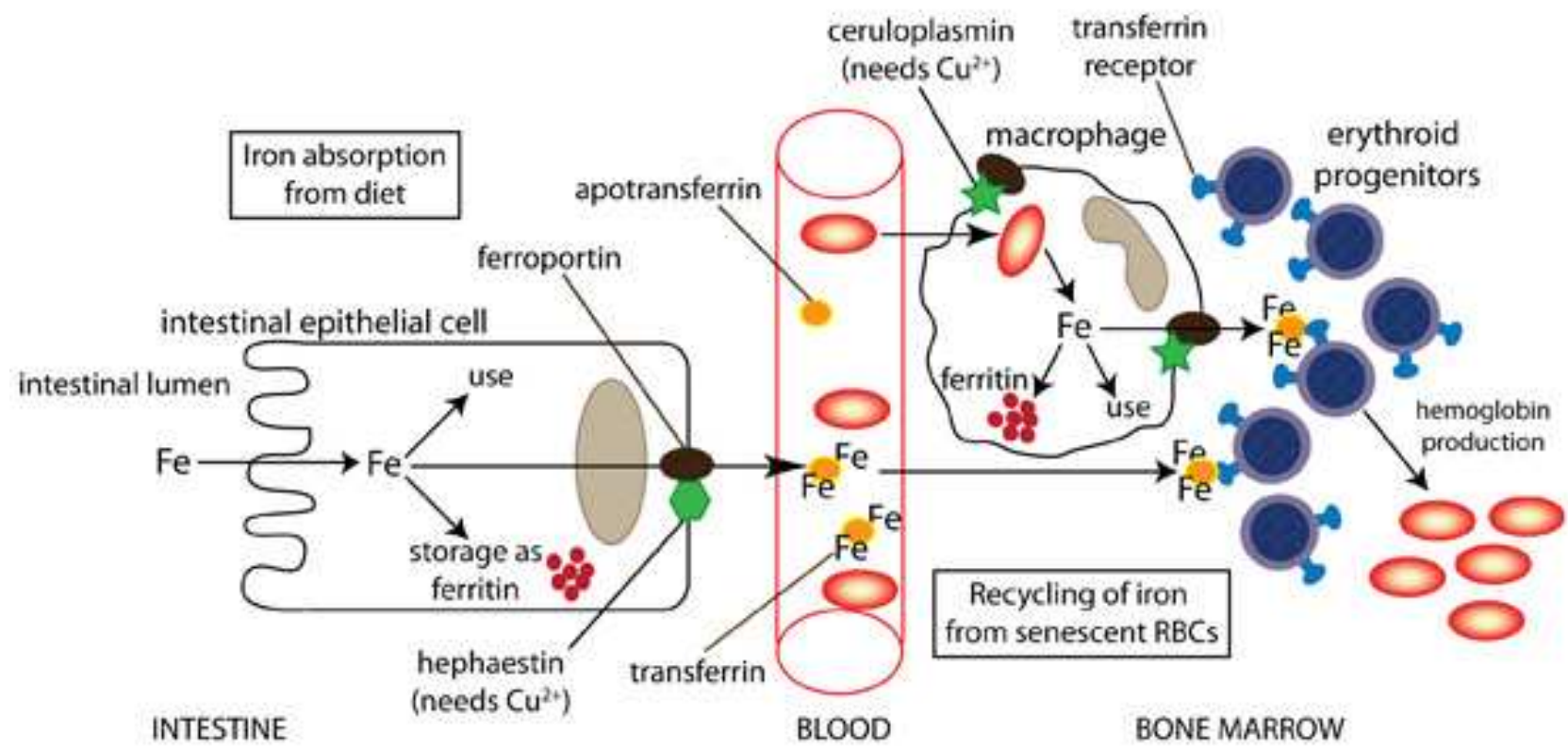
Assessing for Anaemia

- FBC at booking and 28 weeks
- Dietary information to improve iron intake and absorption
- Unselected ferritin screening not recommended
- Routine iron supplementation not recommended

Selected ferritin screening

- Known haemoglobinopathy
- Before trial of iron
- Previous anaemia
- Consecutive pregnancy (<1yr)
- Vegetarian
- Teenage pregnancy
- High bleeding risk (eg VWD)
- Jehovah's witnesses



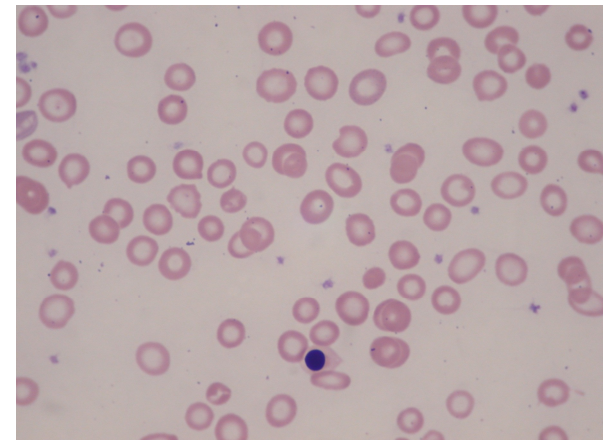


Iron deficiency in pregnancy

- Up to 23% pregnant women in developed countries
- Average iron intake – 10.5mg/day
- RDA 30mg / day
- Iron absorption increases x 3
- Women often start pregnancy with depleted stores – menstruation (?blood donors)

Diagnosing Iron Deficiency

- FBC: MCH <27. MCV <80. Fall in MCV
- Ferritin:
 - Best lab test but acute phase reactant (?CRP)
 - Level <15 98% specificity 75% sensitivity
- Serum Fe / TIBC: Wide fluctuations eg diet
- ZPP: Good test but ?available
- sTfR: Not acute phase reactant, changes late, expensive ?available
- Reticulocyte haemoglobin by flow
- Bone Marrow Iron
- Trial of Iron therapy



Recommendations (BCSH)

- Trial of iron as first line diagnostic test for microcytic or normochromic anaemia
- An increase in Hb at 2 weeks is diagnostic
- Check ferritin if known haemoglobinopathy before starting
- For HBO screening start iron but do not delay screening (although HbA2 can be reduced)
- Ferritin levels <30 suggest treatment needed, levels <15 are diagnostic of established deficiency

Avoiding Iron deficiency

- Dietary advice
 - Good sources: Meat, fish (oily), poultry, eggs, fortified cereals, pulses (eg baked beans), nuts, brown rice, wholemeal bread, tofu, leafy veg, dried fruit
- Factors enhancing absorption: Haem iron, ferrous iron, Vitamin C
- Factors inhibiting absorption: Ca / Mg rich foods, antacids, tannins (tea / coffee), phytates (cereals)

Managing Iron deficiency

- **Once iron deficient, dietary manipulation alone is not sufficient**
- Oral iron in first instance eg Ferrous Sulphate 200mg bd
- Empty stomach, 1 hour before meals with OJ
- Higher doses just increase SEs (indigestion, constipation, diarrhoea)
- If not tolerated, try lower doses (not EC/slow release) or preparation with lower elemental iron (eg Ferrous Gluconate)

Managing Iron deficiency

- Hb should rise 10 g/l per week.
- Recheck FBC at 2 weeks then 2-4 weeks until normal Hb
- A further 3 months is then needed to replenish stores
- Consider referral to secondary care if Hb<70 or late gestation (>34 weeks) or fails to respond

Failure to respond to oral iron

- ?Compliance
- ?Refer secondary care
- Check ferritin, B12, folate, tTG levels (coeliac)

Parenteral Iron

- Demonstrated iron deficiency (low ferritin)
 - Intolerance to oral iron
 - Failure to respond to oral iron
 - Malabsorption
 - ?Clinical need for rapid response
-
- Contraindications: Hypersensitivity to IV iron, patient not iron deficient, iron overload, liver disease, active infection (bacteraemia).

Ferinject (Iron III carboxymaltose)

- Avoid in first trimester (?affects skeletal development)
- Dose based on pre-pregnancy weight, target Hb 110 g/l
 - Hb 35-70kg ≥ 70 kg
 - <100 1500mg 2000mg
 - ≥ 100 1000mg 1500mg
- Single dose of 1000mg (20ml) over 15 mins
- 15mg/kg undiluted
- Give rest of dose 1 week later
- If Hb ≥ 100 , start at 500mg and review response
- Recheck Hb after 2 weeks (avoid oral iron until then)

Ferinject (Iron III carboxymaltose)

- Side effects:
 - Headache (3%)
 - Nausea, abdo pain, constipation, diarrhoea
 - Rash / Injection site reaction
 - Hypersensitivity (<1%)
 - Flushing, hypertension, hypotension
 - Transient increase in ALT/AST

Delivery

- Choice of location:
 - ? Hospital if Hb<100,
 - ? Obstetrician-led unit if Hb<95
- IV Access
- G&S for potential blood transfusion
- Reduce blood loss eg active management of 3rd stage of labour

Blood Transfusion

- Patient Blood Management
- Massive Obstetric Haemorrhage
 - IOCS
- Many post partum transfusions may be inappropriate
- Consent

Folate deficiency

- Pregnancy increases requirement from 200 to 400 μg / day.
- Used to occur in 0.5% pregnancies
- Largely prevented by prophylactic doses in UK
- More common with iron deficiency (?diet)
- Causes megaloblastic anaemia (macrocytic red cells)

- Serum folate levels reflect recent diet
- Foods: Liver, yeast, spinach, other greens and nuts

Folate deficiency

- If levels low treat with 5mg folic acid / day PO until at least 6 weeks post partum
- Consider cause: Diet, malabsorption, haemolysis, drugs etc.
- If B12 low as well treat this first (or together)

B12 deficiency

- True deficiency can cause megaloblastic anaemia and neurological disease (eg subacute combined degeneration of the cord)
- B12 decreases in normal pregnancy – tests have low specificity for true deficiency
- Difficult to pick out who to treat
- Suggest give 1mg IM Hydroxycobalamin and check IF antibodies (for PA)

B12 Deficiency – Torbay protocol

• Risk	Low	High
• B12 (ng/l)	>110	<110
• IF antibody	Neg	Pos
• Hb (g/l)	>100	<100
• MCV (fl)	<100	>100
• Ferritin/Fol	Low	Normal
• Neurology	No	Yes

If Low Risk – give 1 x 1mg Hydroxycobalamin

If High Risk – give 1mg x 6 over 2 weeks then 3 monthly.

Reassess cases 6 weeks post partum

- 24 year old lady, presenting late 34/40
- Bilateral leg weakness and sensory loss
- O/E bilateral spastic paraparesis, Babinski sign positive
- MRI: T2 showed increased white matter signal in posterior columns
- Hb 56 MCV 117, Neuts 1.0, Plts 95
- B12 55