

A pilot study to determine the normal level of VITAMIN B12 among Palestinian adolescents

Dr Ayman Hussein

Faculty of Medicine An-Najah National University

Outline

- **Background about vitamin B12**
- **Significance and Aims**
- **Methodology**
- **Results**
- **Summary and conclusion**

Vitamin B12 history

In the 1850s the English physician Thomas Addison described a **lethal (pernicious)** form of anaemia which was related to pathological gastric mucosa and associated with the absence of acid in the stomach.

In 1926, at a meeting in Atlantic City, Georges Minot and William Murphy reported the sensational finding that 45 patients with pernicious anaemia had been **cured by ingestion** of large quantities of raw liver.

3 years later William Castle postulated an “intrinsic factor” was necessary for the normal absorption of the “extrinsic factor”.



Thomas Addison 1795 - 1860

– Minot, Murphy and Whipple received the Nobel Prize for Medicine in 1934.

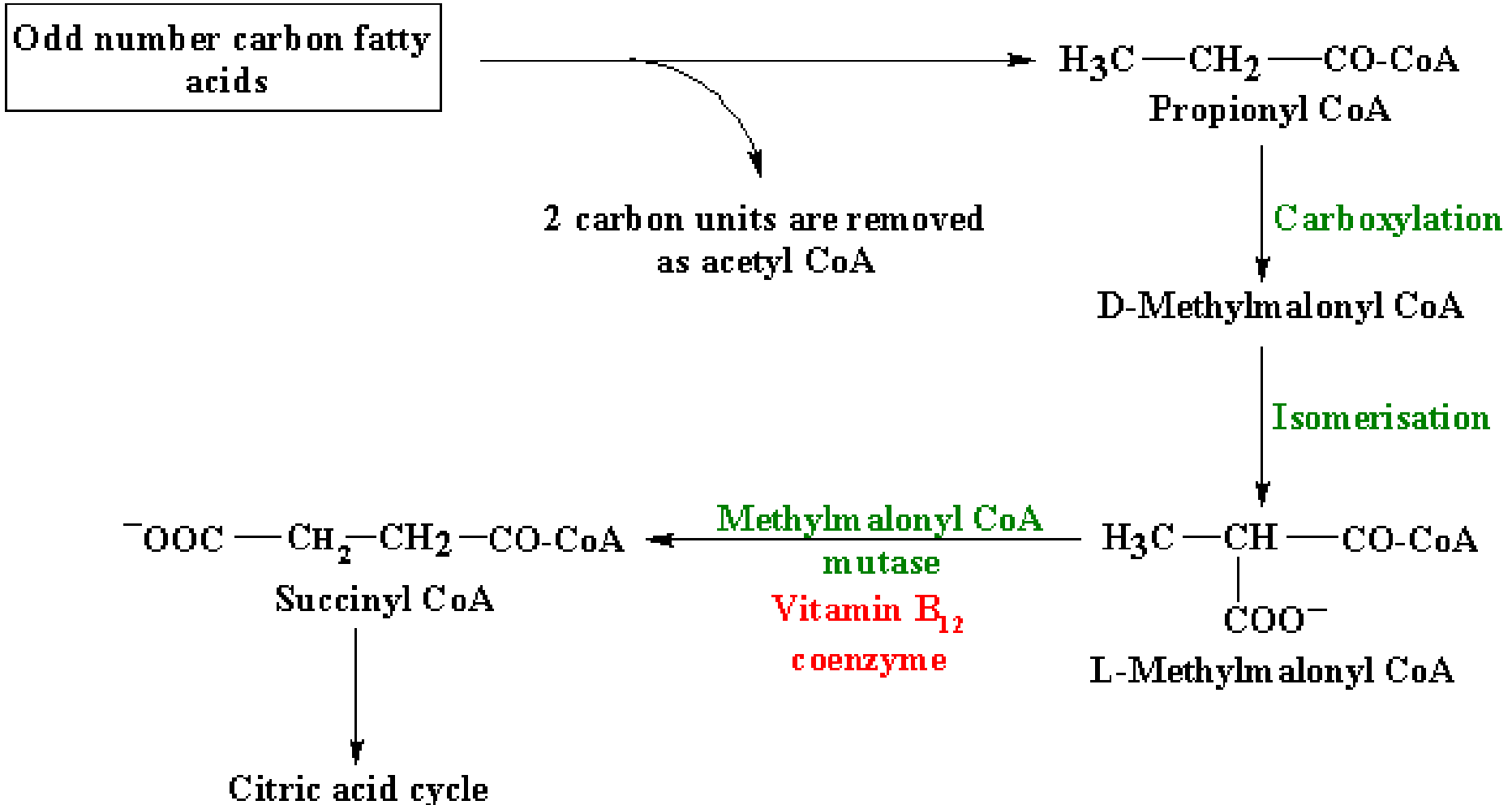
Vitamin B12 is essential

Vitamin B12 is **essential** for normal nervous system function and blood cell production.

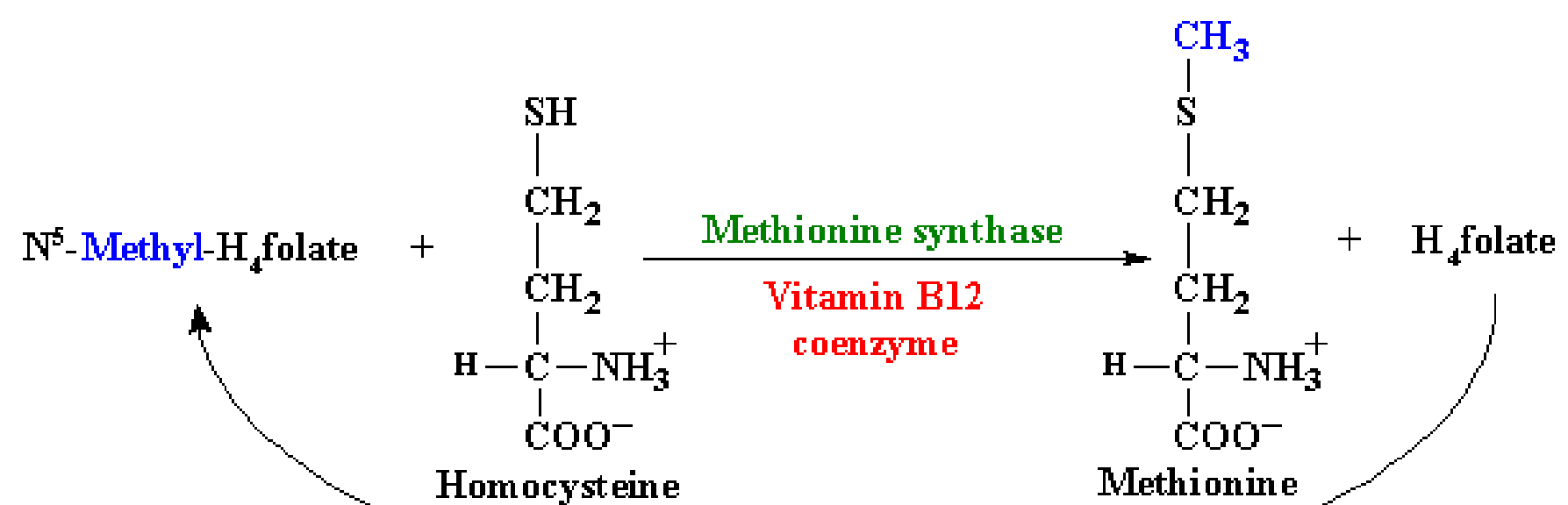
- Vitamin B12 is not manufactured in the body and must be absorbed from dietary or supplement intake.
- The main sources of vitamin B12 include meat and fish (75%), dairy products (20%), and eggs (4%).
- For vitamin B12 to be absorbed by the body, it must bind to intrinsic factor, a protein secreted by cells in the stomach.

Function of vitamin B₁₂

1) Vitamin B₁₂ (as deoxyadenosylcobalamin) is a co-enzyme methylmalonyl CoA mutase.



2) Vitamin B₁₂ is also a coenzyme in a reaction involved in methionine Metabolism.



H₄folate accepts methyl groups in a number of different reactions and is converted back to N⁵-Methyl-H₄folate

H₄folate is converted to N₅-methyl-H₄folate in a number of different reactions as it accepts methyl groups. **The methyl group can only be removed and the H₄folate regenerated by the above reaction.**
(See folic acid)

Common causes of Vitamin B12 deficiency

1. A diet low in vitamin B12

- ie. a strict vegetarian diet that excludes all meat, fish, dairy products, and eggs

Chronic alcoholism

2. Abdominal or intestinal surgery that affects intrinsic factor production or Absorption

3. Crohn's disease

4. Intestinal malabsorption disorders

- Elderly persons are at risk of developing a vitamin B12 deficiency.
- Age-related, often asymptomatic atrophic gastritis is common and may be enough to cause a patient to slide slowly into a negative vitamin B12 balance with depleted stores of the vitamin, giving rise to vitamin B12 deficiency.

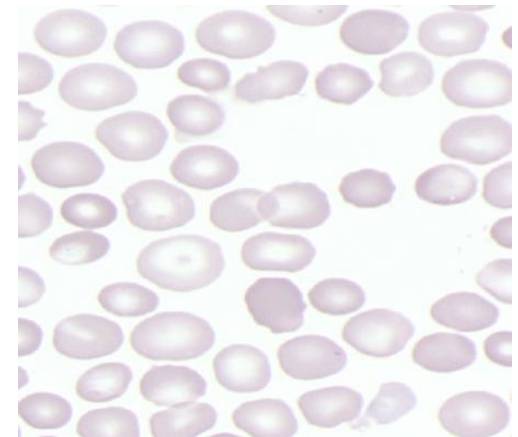
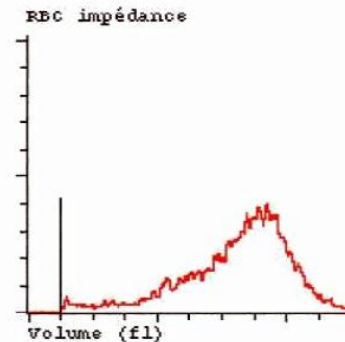
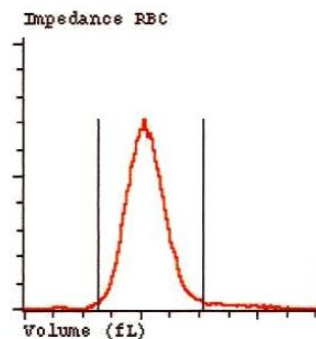
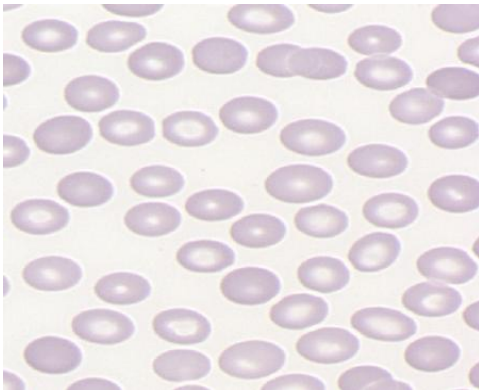
5. Fish tape worm

6. Pernicious anemia, which is caused by a lack of intrinsic factor

Vitamin B12 deficiency and anaemia

Lack of Vitamin B12 (or folate) can cause megaloblastic anaemia

- Lack of B12 is the secondary reason for megaloblastic anaemia, due to B12 deficiency blocking the transformation of methylTHF to THF and to intracellular folate polyglutamates



Normal Red Blood Cells

- ***Top: Normal Red Blood Cells as seen in microscope, MCV 88 fl.***
- ***: Typical CELL-DYN®Sapphire™ RBC Impedance histogram of a normal sample***

Megaloblastic anemia:

- ***Top: large, dense, oversized, red blood cells as seen in microscope.***
- ***Typical CELL-DYN® Sapphire™ RBC Impedance histogram of a sample with megaloblastic anaemia***

Symptoms of Vitamin B12 deficiency

The initial symptoms are insidious and could easily be overlooked.

The classical symptoms of **anaemia** may not be present.

Diffuse **neuropsychiatric** symptoms may often be the earliest symptoms.

The commonest **neurological** symptoms are

- Paraesthesia of the hands and feet
- Diminished perception of vibration and position
- Absence of reflexes
- Unsteady gait and balance (ataxia)

Symptoms of Vitamin B12 deficiency

The **psychiatric** symptoms associated are also varied:

- Confusion and memory disturbances are the commonest
- Depression, with or without psychotic components, and cognitive decline.
- Swings in mood and personality changes may be early signs of what may later be manifested as psychiatric disease.

These kinds of vague symptoms of vitamin B12 deficiency may easily be overlooked, **especially as the serum concentration of vitamin B12 can lie within the reference range.**

Significance of the study

- Prevalence of Vitamin B12 deficiency among Palestinians is not studied yet
- Cut-off point of the normal level among Palestinians may be not real

Aim of the Study

Determination the normal level of Vitamin B12 among Palestinian adolescents

Methodology

- Area: Tulkarm and Qaliqilia districts
- Population: School children aged 10-18 years old
- Sample Size: 404 (Stratified sample)
- Instrument: Questionnaire including demographic and food habits alongside blood sample collection
- Main tests: CBC and B12 determination

Levels of Hematological Parameters among Palestinian adolescents

	Male		Female		Total		P-value
	N	%	N	%	N	%	
B₁₂ level (pg/ml)							0.850
< 200	88	43.3	90	44.8	178	44.1	
≥ 200	115	56.7	111	55.2	226	55.9	
MCV level (ft)							>0.05
<92	199	98.0	201	97.0	394	97.5	
≥ 92	4	2.0	6	3.0	10	2.5	
RBC level							0.996
< 3.5 (x10 ⁶ /ul)	0	0%	1	0.5%	1	0.2%	
≥ 3.5 (x10 ⁶ /ul)	203	100%	200	99.5%	403	99.8%	
Hgb level (g/dl)							0.760
< 12	35	17.2	38	18.9	73	18.1	
≥ 12	168	82.8	163	81.1	331	81.9	

Is the high prevalence of B12 deficiency among Palestinians real or fake????

Levels of MCV may indicate that high level of vitamin B12 deficiency is not real among participants

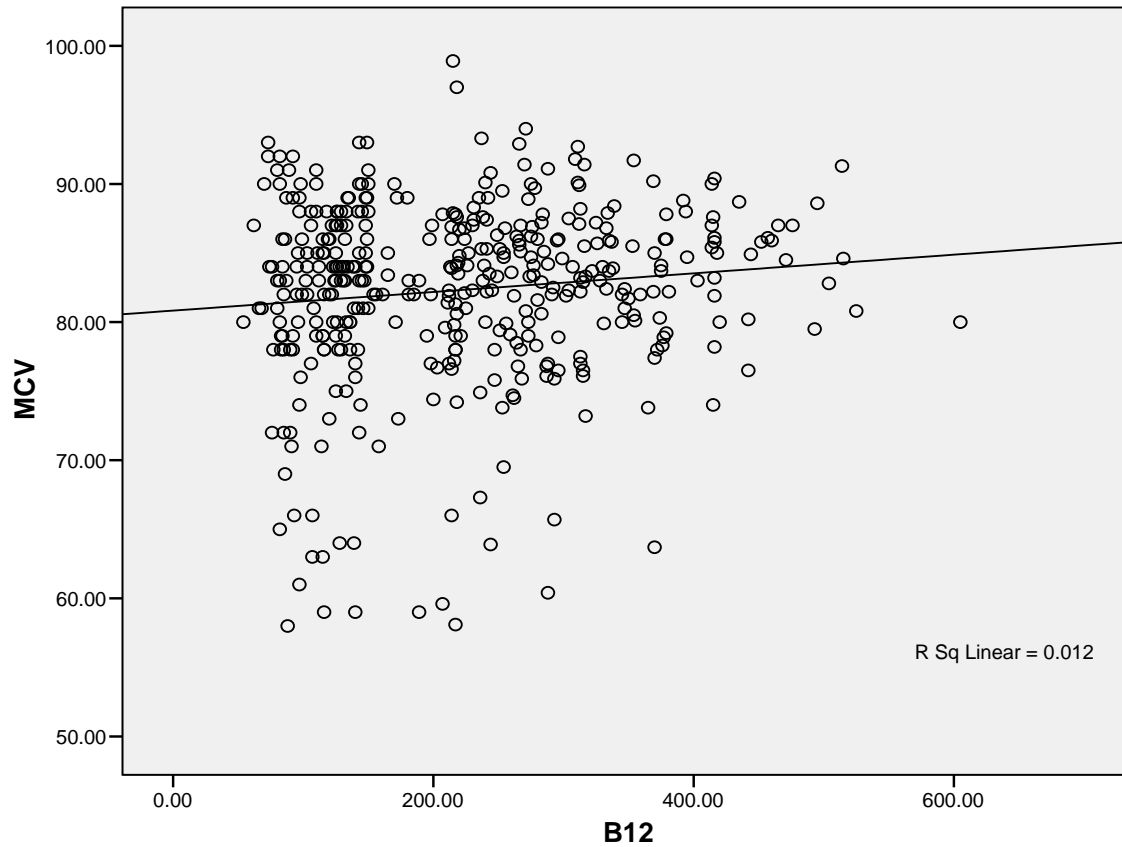
BOYS

B ₁₂ (pg/ml)	Hgb (g/dl)			Mcv (fl)			
				<92		≥ 92	
< 200	No.		%	No.	%	No.	%
	<12	17	19.3	17	79.2	<u>4</u>	<u>0.02</u>
	>12	71	80.7	69	19.8	0	

GIRLS

B12 (pg/ml)	Hgb (g / dl)			Mcv (fl)			
				<92		≥ 92	
< 200	No.		%	No.	%	No.	%
	<11.5	12	13.33	12	86.4	6	<u>0.03</u>
	>11.5	78	86.67	76	13.6	0	

MCV level tends to increase as B12 level increases: Is this real



What Is the mean of B12 among study participants!!!

Parameter	Mean \pm 2SD	min-max
Vitamin B12 (pg/ml)	223.2 \pm 218	54-605
MCV (fl)	82 \pm 13.2	58-98
Hb (g/dl)	13.47 \pm 11.8	6-18
RBC $\times 10^6$	4.5 \pm 0.8	4-5

Summary and Conclusion

- About 40% of school children have B12 level < 200 pg/ml (According to WHO recommendation are considered deficient)
- With reference to other hematological parameters and the fact that there is no symptoms, **all of participants are normal**
- Cut-off point of B12 level is 223 ± 118 pg/ml (Range: 54-605)
- There is a need for further study with bigger sample and more areas to draw a better conclusion

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Thank You