Deacon's Challenge

No 172 - Answer

A patient has the following results:

Serum copper	*12.5 µmol/L*	*(13-26)*
Serum caeruloplasmin	*155 mg/L*	*(200-450)*

Assuming that caeruloplasmin is the only protein in serum to bind a significant amount of copper, calculate the serum concentration of free (unbound) copper.

Copper content of caeruloplasmin	*0.3%*
Atomic mass of copper	*63.6*

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$$\text{Bound copper (mg/L)} = \frac{\text{caeruloplasmin (mg/L)} \times \text{\% copper content}}{100}$$

Multiply by 1,000 to convert from mg/L to µg/L:

$$\text{Bound copper (µg/L)} = \frac{\text{caeruloplasmin (mg/L)} \times \text{\% copper content} \times 1{,}000}{100}$$

To convert from µg/L to µmol/L divide by the atomic mass of copper:

$$\text{Bound copper (µmol/L)} = \frac{\text{caeruloplasmin (mg/L)} \times \text{\% copper content} \times 1{,}000}{100 \times \text{Atomic mass of copper}}$$

Substitute:

Cauruloplasmin = 155 mg/L; % copper content = 0.3%; atomic mass of copper = 63.6

$$\text{Bound copper} = \frac{155 \times 0.3 \times 1{,}000}{100 \times 63.6} = 7.3 \text{ µmol/L (2 sig figs)}$$

Total copper (µmol/L) = Bound copper (µmol/L) + Free copper (µmol/L)

Substitute: Total copper = 12.5 µmol/L and bound copper = 7.3 µmol/L

12.5 = 7.3 + Free copper (µmol/L)

Free copper = 12.5 - 7.3 = **5.2 µmol/L**

Question 173

A screening programme for Down's Syndrome has a screen positive rate of 2.5% and a detection rate of 82%. Calculate the probability that a pregnancy judged to be at low risk will result in an affected child, given that the incidence of Down's Syndrome at term is 1.84/1000 live births in the absence of selective abortion. State any assumptions made.

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