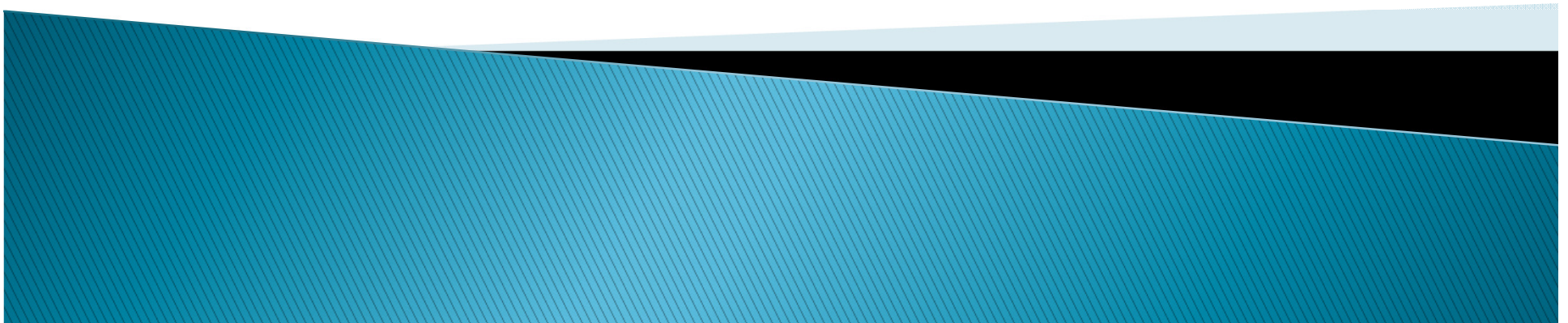


# Recommended Dietary Allowances( RDA) for Indians Report of the ICMR Expert Group 2010

## Protein requirements

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# Methods of determination

- ▶ Nitrogen Balance– FAO/WHO/UNU
- ▶ Obligatory Nitrogen Losses adjusted for efficiency of protein Utilization

# Protein Quality

In terms of their

- Essential Amino Acid Content– (8 EAAs)
- Digestibility and Absorption
- Compare with Reference – Egg Protein or
- Directly determined amino acid pattern

# Protein Quality

- Veg Proteins – poorer– Low digestibility and limitations of one or more EAA
- Cereals deficient in Lysine
- Legumes and Pulses in Methionine
- Cereals + Pulses – compensate each other
- Biological Value of Cereal + Pulse (5:1)= 65% or Ref egg protein

# Guidelines of the expert group

- ▶ Human protein requirements should satisfy the currently established AA requirements as recommended by FAO/WHO/UNO 2007
- ▶ Nitrogen balance data shall form basis of fixing minimal N requirements
- ▶ Daily requirements expressed as g/kg
- ▶ Safe level shall be given as mean + 1.96 SD
- ▶ Minimal level Mean – 1.96 SD
- ▶ Would be acceptable from 2.5 to 97.5th percentile of population

# Guidelines of the expert group

- RDA derived by 2 step process–

1. Level of requirement per Kg according to age

2. Actual daily requirement by multiplying by standard Weight for Age

- Adolescents RDA in addition as per gender

# Quality of Protein

- ▶ Absorption and Biological Value
- ▶ Digestibility=  $\frac{\text{N Intake} - \text{fecal N lost on test diet}}{\text{N Intake}} \times 100$
- ▶ True protein Digestible =  $\frac{\text{N Intake} - (\text{Fecal N lost on test diet} - \text{Fecal N lost on protein free diet})}{\text{N intake}} \times 100$
- ▶ High level of Dietary fiber would decrease Protein Digestibility

# Examples of AA scores

- ▶ Wheat 60
- ▶ Rice 78
- ▶ Millet 50
- ▶ Vegetables 96
- ▶ Legumes and Animal Protein > 100



# Biological Value and AA score

- True Protein BV % =  $\frac{I-F-U}{I-F} \times 100$   
I = Nitrogen intake  
F = (fecal N on test diet- Fecal Nitrogen on protein free diet)  
U - Urinary Nitrogen

Amino Acid Score =  $\frac{\text{mg of AA in 1 G of test protein}}{\text{mg of AA in 1G of reference protein}}$

Protein Digestibility Corrected AA score ( PDCAAS)= Protein Digestibility X Amino acid Score

Protein Digestibility in mixed Veg Diets is usually 85%

Quality of a mixture of proteins to be considered instead of individual scores

# Cereal – Pulse–Veg–Milk Diets

- ▶ Proteins from different sources complement each other
- ▶ PDCAAS of cereal pulse based diets will be more than that of cereal proteins
- ▶ AA composition of protein from balanced Cereal+ Pulse+ Veg+ milk will be more than the RDA in all respects except lysine which is 97%
- ▶ Veg proteins are less digestible– 85%
- ▶  $PDCAAS = 97( \text{AA index}) \times 85 ( \text{digestibility}) / 100 = 82.5\%$

# RDA for Indian Cereal– Pulse– Veg– Milk diets

Even by Factorial method based on Obligatory losses from Feces, urine , skin

Daily requirement for an adult will be 1 g/Kg

# Protein Requirement for Pregnancy

- Assessed by factorial method with additional factors of
  - 1. Fetal growth
  - 2. Expansion of maternal tissuesand
- Nitrogen balance studies using Total Body Potassium measurements (2.5mEq / g N)

# Pregnancy gains

- ▶ Total Protein deposited was – 686 g
- ▶ In well nourished GWG= 13.8Kg ( protein deposition 1.9g/day in 2<sup>nd</sup> trimester, 7.4 g/day 3<sup>rd</sup> trimester
- ▶ Ref woman with pre pregnant weight of 55kg and a GWG of 10Kg – protein deposition 1.4 g/day and 5.4 g/day (2<sup>nd</sup> and 3<sup>rd</sup> TM)
- ▶ Many women may have PPW of 47Kg and GWG of 7–8Kg

# Pregnancy gains

- ▶ Additional Requirement( for 8Kg GWG) – 0.4, 5.6 and 18.1 g/day.
- ▶ For 10 – 12Kg weight gain– 1, 7 and 23 g/day
- ▶ Protein source– normal varied diet –not from commercial high protein supplements

# Protein requirements during lactation

- ▶ Protein in breast milk– 9.4 g/day 0 – 6 months
- ▶ 6.6 g/day 6–24 months
- ▶ The NPN in breast milk has been excluded for protein in milk calculations
- ▶ Protein requirement for lactating women with a cereal–pulse veg– milk diet with PDCAAS of 82.5% would be 22.9g/day (upto 6months PP) and 15.2 g/day– 6– 12 months

# Protein and AA requirements for infants and children

- ▶ Average protein requirement(APR)
- ▶  $APR = \text{Maintenance} + (\text{Deposition} / \text{efficiency of utilisation})$
- ▶ Requirements for boys and girls same till 10 yrs
- ▶ After 10 yrs Boys and Girls have different growth patterns and their needs are different



# Protein requirement for children up to 10 yrs

Age in yrs	Safe level of protein g/kg B wt/day
0.5	1.69
1	1.47
2	1.25
3	1.16
4	1.11
6	1.15
8	1.18
10	1.18

# Protein requirement for adolescent Boys and Girls 11– 18 yrs ( protein deposition based on total body potassium)

Age in yrs	Safe limit of protein g/ kg B wt/d
Boys	
11	1.16
13	1.15
15	1.13
18	1.09
Girls	
11	1.15
13	1.13
15	1.09
18	1.05

# Protein Energy Ratios(PER)

- ▶ Protein Utilization dependent on energy intakes
- ▶ Energy from CHO and Fat needed to utilize AA to make body proteins
- ▶ Nitrogen balance improves by 1 mg/Kg/Day for every 1 Kcal/ kg/ day
- ▶ PER : Ratio of protein energy to Dietary Energy requirement
- ▶ Differs with age and physical activity

# PER

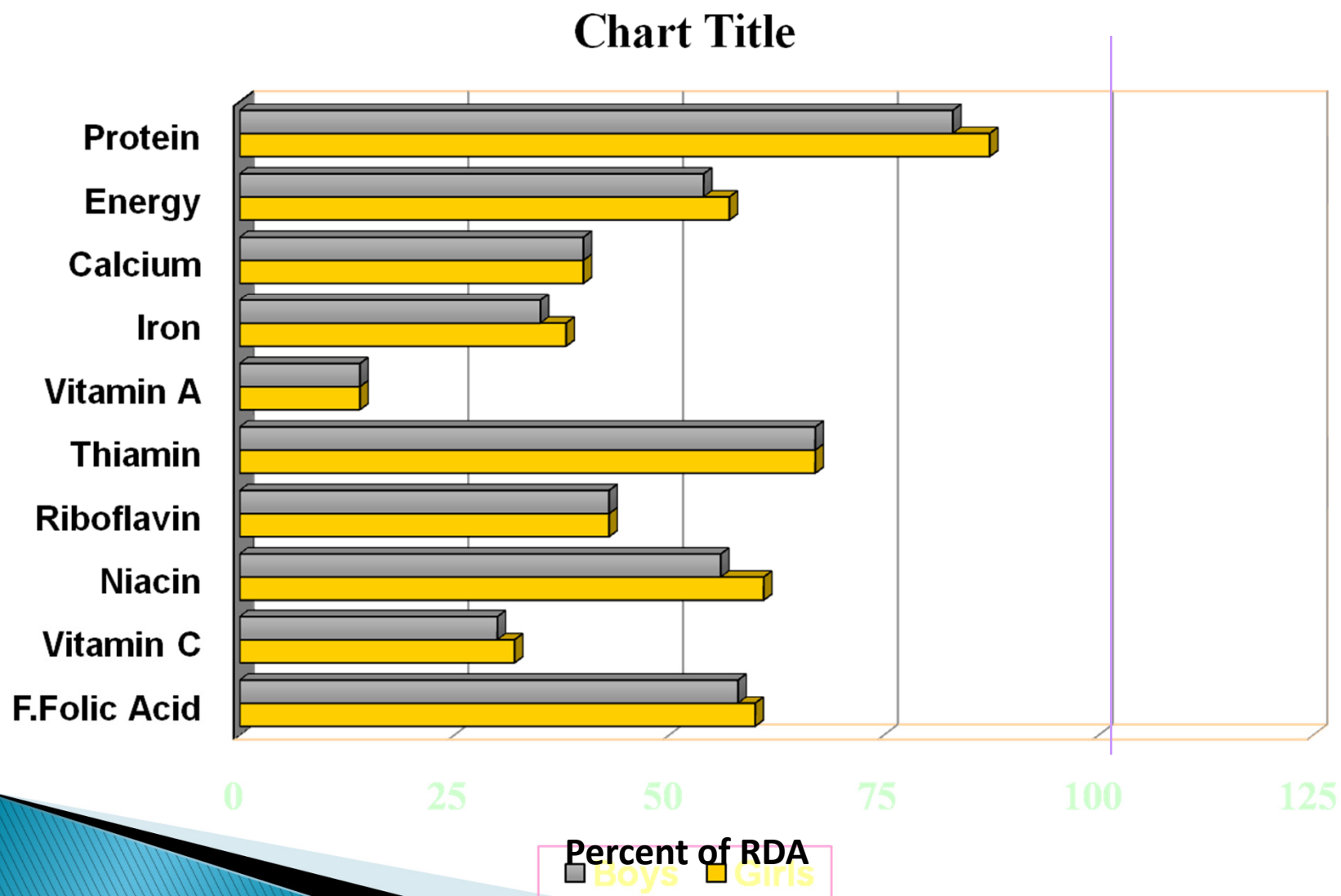
- ▶ Protein requirement is constant at different levels of activity – energy need changes
- ▶ PER is higher with reducing energy requirement ( activity)
- ▶ PER should be adjusted for protein quality ( PDCAAS corrected PER)
- ▶ Unnecessarily High protein diets with PE ratio > 15% is not recommended

# PER

- ▶ Protein intake alone will not increase muscle mass without exercise
- ▶ Recommended protein intakes should be achieved through balanced diets with adequate micronutrients

# Median Intake of Nutrients (as % RDA) Among children : By gender

1-3 year





***Thank you***