INTERNATIONAL SYMPOSIUM ON
Understanding the Double Burden of Malnutrition for Effective Interventions

# Assessing Maternal Body Composition during pregnancy

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# Background

- Body compositional changes during pregnancy are associated with maternal and infant health outcomes
- Accurate measurement of body composition can identify women at high risk of adverse pregnancy outcomes
- The common models used are 2 compartment (2C) and 3 compartment (3C).

# Methods

- Anthropometry and Skinfold Technique
  - Non-invasive field method
  - Accurate measures at same site are difficult across pregnancy, error in prediction equations
  - Recent advance - digital anthropometry; needs to be validated
- Bio-electrical Impedance
  - Practical and non-invasive
  - Valid estimates of Total body water (TBW) in early gestation
  - Increasing studies, but needs to be validated

# Deuterium Dilution Technique

- Uses stable isotope to estimate TBW and hence Fat Free Mass (FFM)
- Safe to use in pregnancy
- Newer portable devices for measuring isotopic enrichment are available
- Since the hydration of FFM changes during pregnancy , the week of gestation must be considered in the conversion from TBW to FFM.

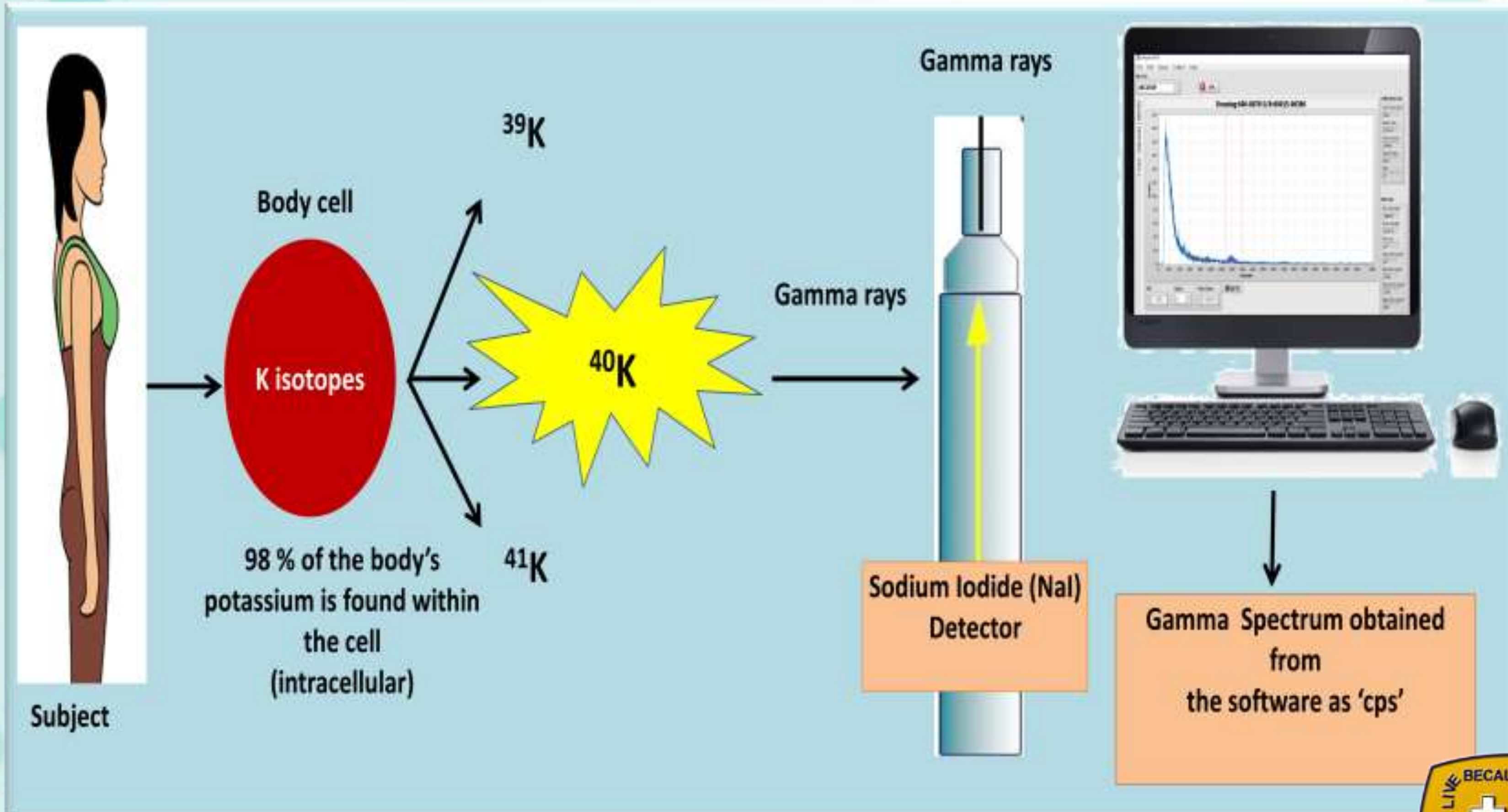
# Imaging

- Magnetic resonance imaging (MRI) and three dimensional photonic scanning (3DPS) are in exploratory stages for pregnancy
- No known risk for MRI at low field strengths
- Cost, technical expertise, time of measurement and fear of radiation limit the use
- Ultrasound measurements has been used in pregnancy to measure maternal regional subcutaneous and visceral fat, but has not been validated.

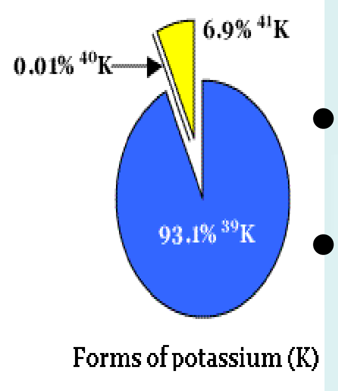
# Issues during pregnancy

- Available  methods cannot partition into maternal and foetal units
- Assumptions of common methods may not be applicable
- Hydration and density  of FFM
- Imaging techniques such as MRI can determine individual organ volumes
- Appropriate corrections for pregnancy can be made

# Whole Body Potassium Counter



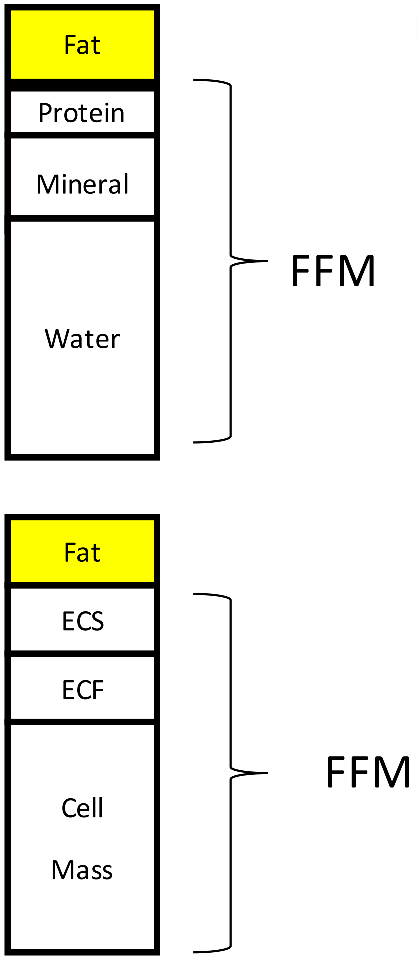
# PRINCIPLE



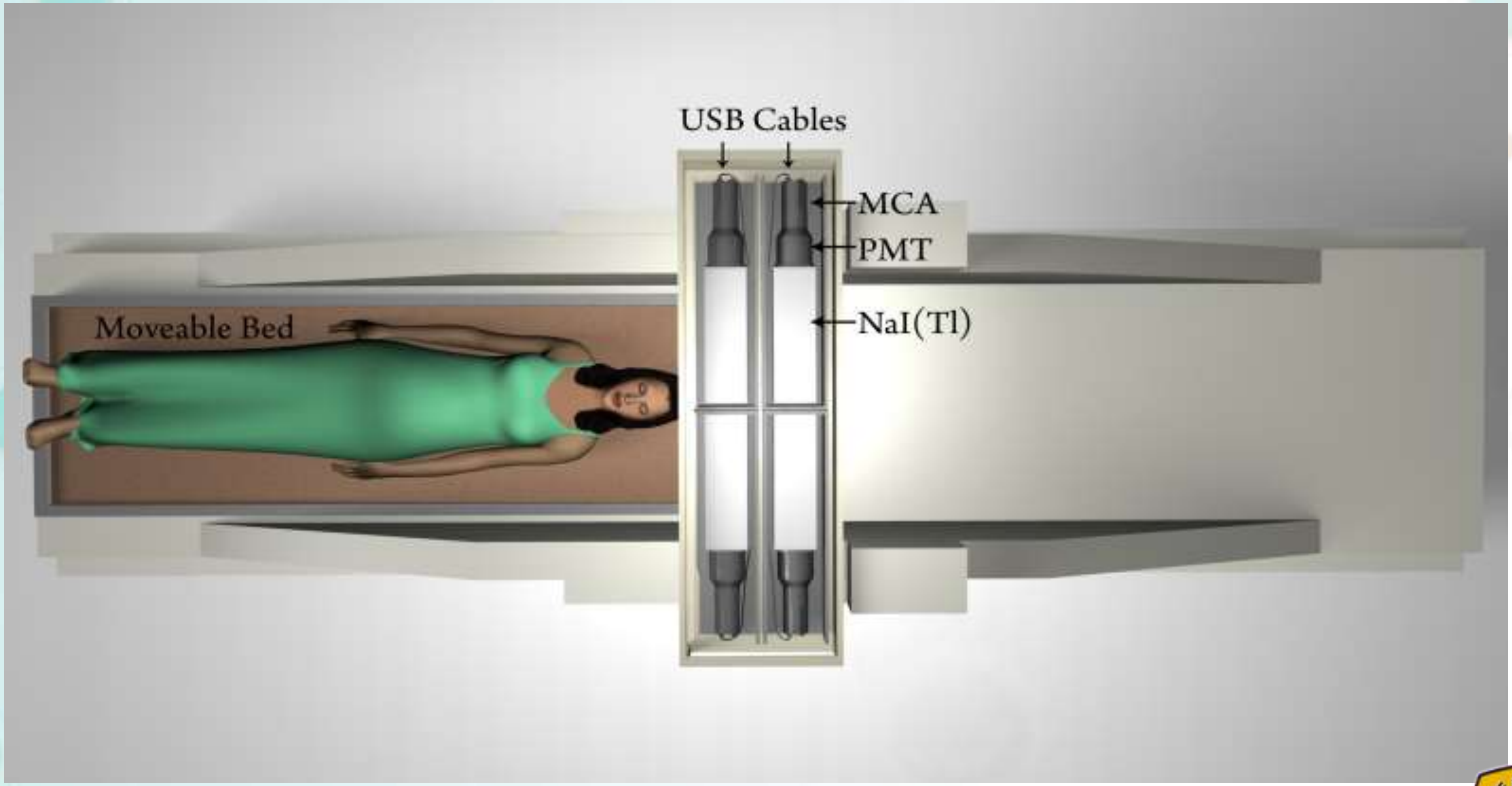

- $^{40}K$ is radioactive and decays and emits gamma rays.
- I gm K=200 gamma rays/minute
- Adult male has 140 g K (~28000 gamma rays/min)
- Infants ~ 3500 gamma rays/min (17.5 g K)
- The precision of the TBK is determined by
  - detector volume
  - position of subject relative to counter (geometry)
  - counting time.

# WHY DO WE NEED A K COUNTER?

- Measures body cell mass where most of intracellular K (98%) is primarily located
- Not affected by fluid accumulation/shifts.
- Non-invasive technique – useful particularly for pregnancy.



# Whole Body Potassium Counter



# Shadow Shield Design

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# CALCULATIONS

- Calculate body $^{40}K$ content

- 0.012% of total K is $^{40}K$ – calculate total body potassium (g)

- Body cell mass (kg)= TBK (mmol) * 0.0092
- Can also calculate FFM: assuming a ratio of 68.1 mEq of K/kg of FFM

FFM= K (mEq)/68.1

# Conclusion

- Challenges exist in the measurement of maternal body composition
- Hydration of FFM can be measured by combining measures of weight, body volume (ADP), and TBW (isotope dilution).
- Advances in MRI can help in understanding changes in the body composition of the mother and the fetus separately.
- Future research on understanding predictors of body compositional changes in order to improve maternal and offspring health.

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# THANK YOU!

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