



# Nutritional zinc deficiency and cellular immune response to malaria



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<sup>2</sup>The Micronutrients and Child Health Group is a collaborative project led by Wageningen University between Dutch universities and the Kilimanjaro Christian Medical Centre, Moshi, Tanzania



# Objectives

- To measure associations between zinc deficiency and T-cell response to malaria in Tanzania children
- **Hypothesis:** Zinc deficiency leads to an impaired T cell response to malaria

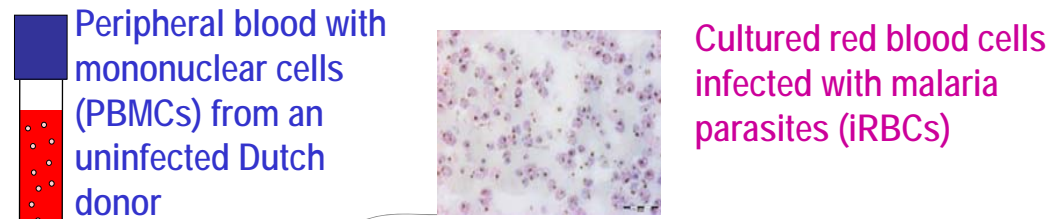
# Methods



- 305 PBMC samples Tanzania children aged 6 -72 months
- Stimulation of PBMCs with infected erythrocytes

## Outcome indicators:

- T cell proliferation
- Cell death
- Surface markers
- Cytokine concentration
- Intracellular staining



Add in various doses to achieve a range of PBMC:iRBC ratios

Culture for 7 days

Proliferating and differentiating PBMCs  
Measurements:

- Proliferation of T cells at days 5, 6 and 7:
- Supernatant concentrations of cytokines produced by PBMC populations at day 1, 4, 5, 6 and 7.

# Kinetics experiment: set-up



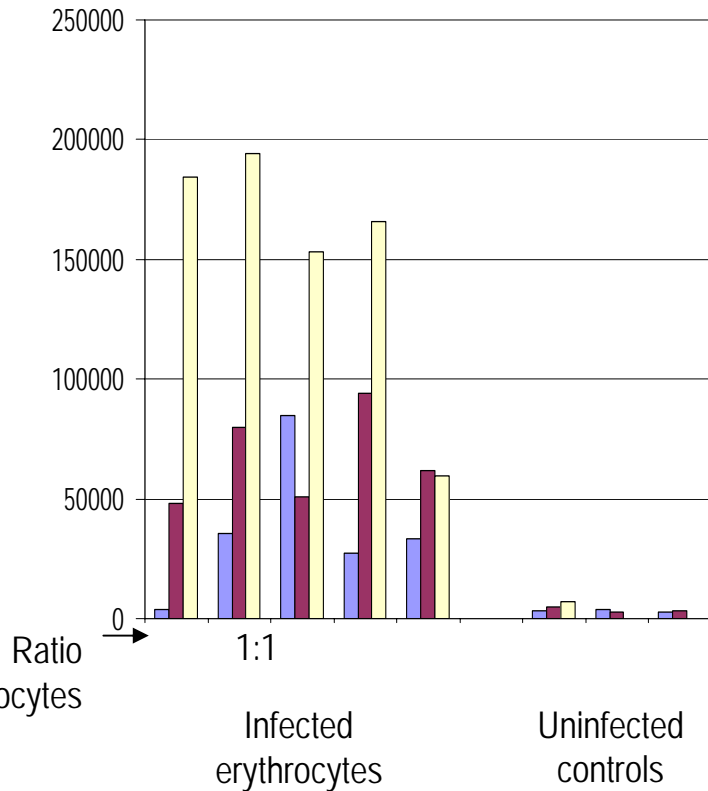
- Optimal PBMC:iRBCs ratio, #:# ? **1:0.5, 1:1, 1:2, 1:4 and 1:8**
- Culture time? **4-7 days**
- Negative control: uninfected erythrocytes
- Positive control: maximum response with anti-CD3/ anti-CD28



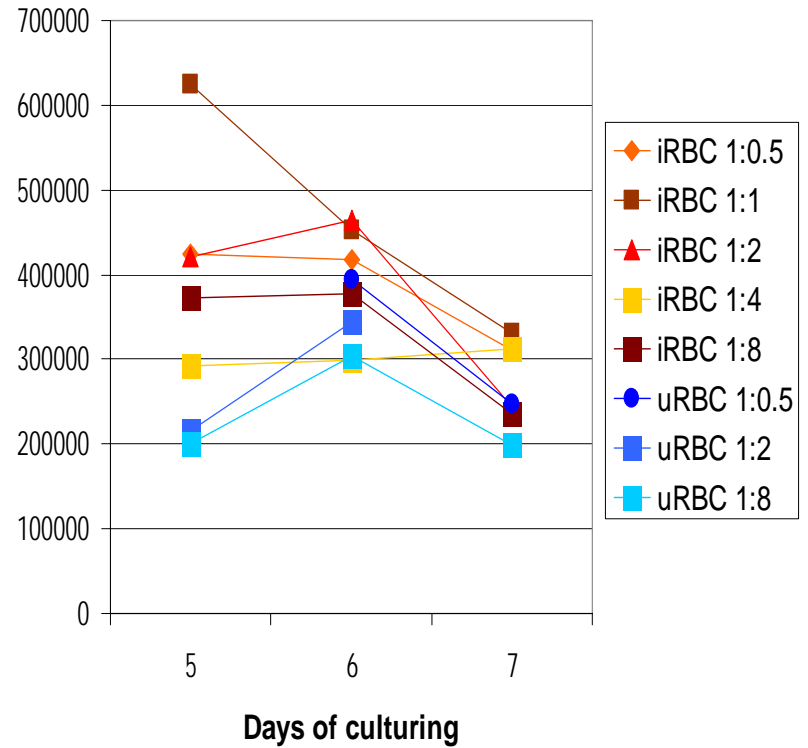


# Results-1

Results kinetics experiment: Proliferation



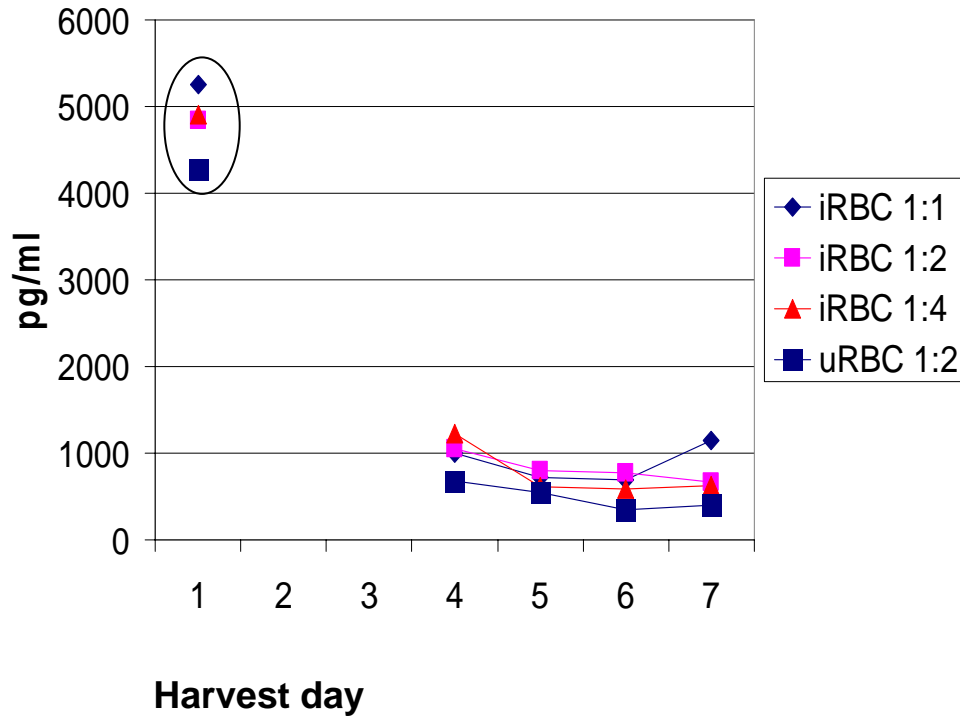
Results kinetics experiment: Cell death



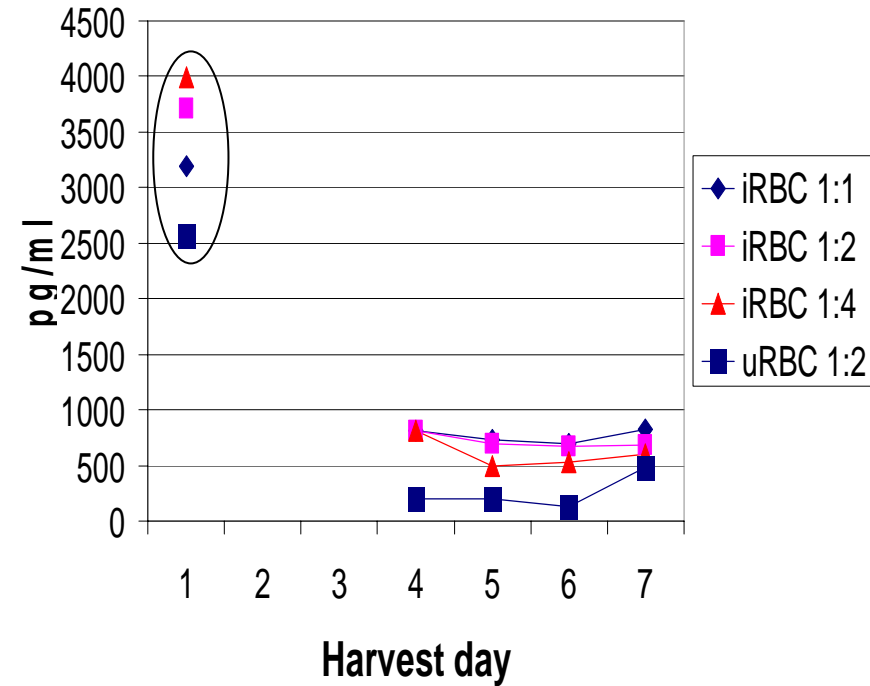


# Results-2: Cytokine Production

## IL-1beta

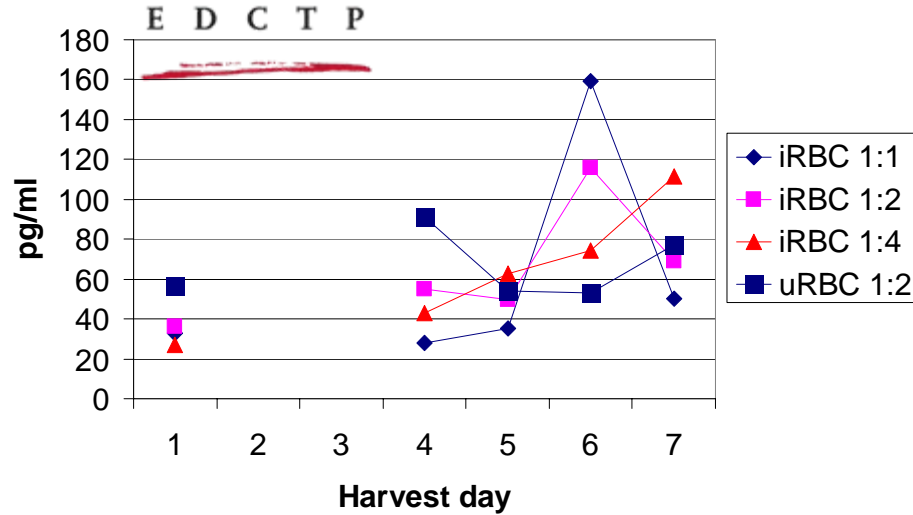


## TNF-alpha

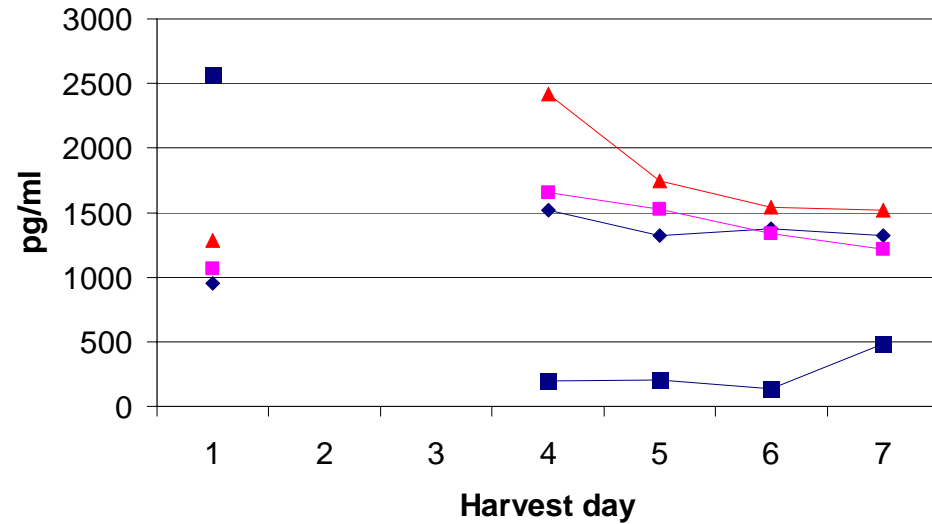




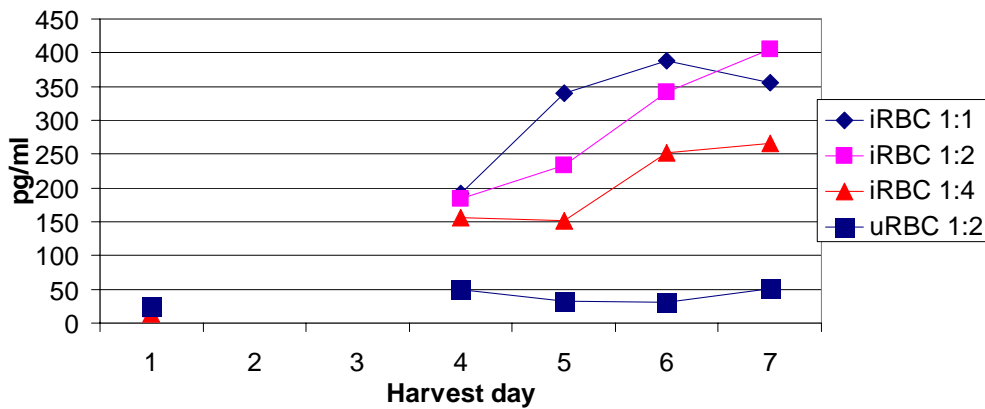
## IL-12



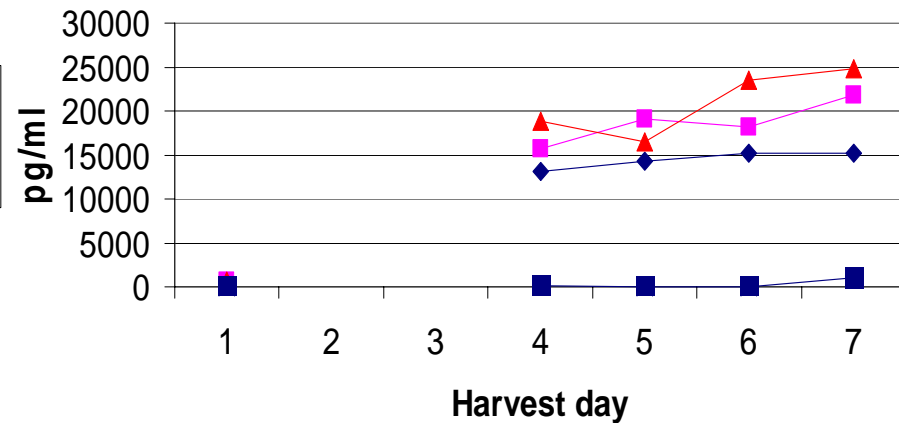
## IL-10



## IL-5



## IFN-gamma





# Conclusions kinetics experiment

- Malaria antigen is successfully presented to naïve T cells

Conditions for the stimulation experiment:

- Measure at day 7: optimal for T-cell proliferation and production of most cytokines
- Ratio of PBMCs : infected erythrocytes should be within range 1:0.5-1:2
- For practical reasons we prefer to use ratio 1:1

# Future plans

