

# Assessing Plasma Zinc Concentration as a Reflection of Zinc Status in Aging Rhesus Macaques

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## Introduction

Ongoing research in human and animal populations indicates that aging greatly increases the likelihood of zinc deficiency<sup>1,2,3</sup>. Individuals deficient in zinc exhibit a wide variety of symptoms including decreased immune function, delayed wound healing, dermatitis, alopecia, enhanced inflammatory response and loss of appetite<sup>4</sup>. The remarkable similarities between the signs of zinc deficiency and the common health dysfunctions associated with the aged population often enables zinc deficiency to go undetected while continuously contributing to age related maladies.

Currently little data exists regarding the prevalence of zinc status and deficiency in rhesus macaques. Marginal to moderate zinc deficiency in older rhesus may contribute to the clinical signs often seen in aging macaques such as increased immune senescence, dermal lesions and wound healing time<sup>5,6</sup>. This study aims to establish plasma zinc concentrations in healthy adult and geriatric rhesus macaques at the California National Primate Research Center (CNPRC) and subsequently compare these values between age groups.

## Hypothesis

Geriatric rhesus macaques at the CNPRC will have lower plasma concentrations than their younger adult counterparts, thus putting them at a higher risk for marginal or possibly overt zinc deficiency.

## Materials and Methods

- Macaques with no recent history of injury or illness were selected for sample collection, female subjects were excluded if they were pregnant or lactating
- Blood was collected from fasted animals into K2 EDTA Royal Blue Top Trace Element Tubes
- Samples were centrifuged at 24°C at 1000G for 13 minutes
- Plasma was collected and analyzed via inductively coupled plasma mass spectrometry
- Data are reported as mean  $\pm$  SD. A p value  $\leq$  0.05 was considered significant

## Discussion

At this time a total of 20 of the 48 macaques enrolled in this study have been analyzed. Currently the linear relationship between increased age and decreased plasma zinc concentrations does not show a statistically significant demarcation from the horizontal (Fig 1). However, given that half of the total intended samples have been analyzed it is possible that additional data will result in statistical significance.

Unpaired t-test analysis shows significance in the difference between the mean plasma zinc concentrations of adult and geriatric rhesus macaques (Fig 2). Between the two groups 8.3% of adults fell within the range of zinc deficiency compared to the 37.5% of geriatrics. These results support the hypothesis that geriatric rhesus macaques have lower plasma zinc concentrations and are therefore at an higher risk for zinc deficiency.

Fortunately zinc deficiency is easily treated through dietary supplementation once diagnosed. Past studies involving zinc deficient rhesus macaques show that severely deficient subjects quickly reached optimal levels within a few days of zinc supplementation<sup>7</sup>. This would allow for a simple, efficient and economical means to improve geriatric colony health.

## Acknowledgements

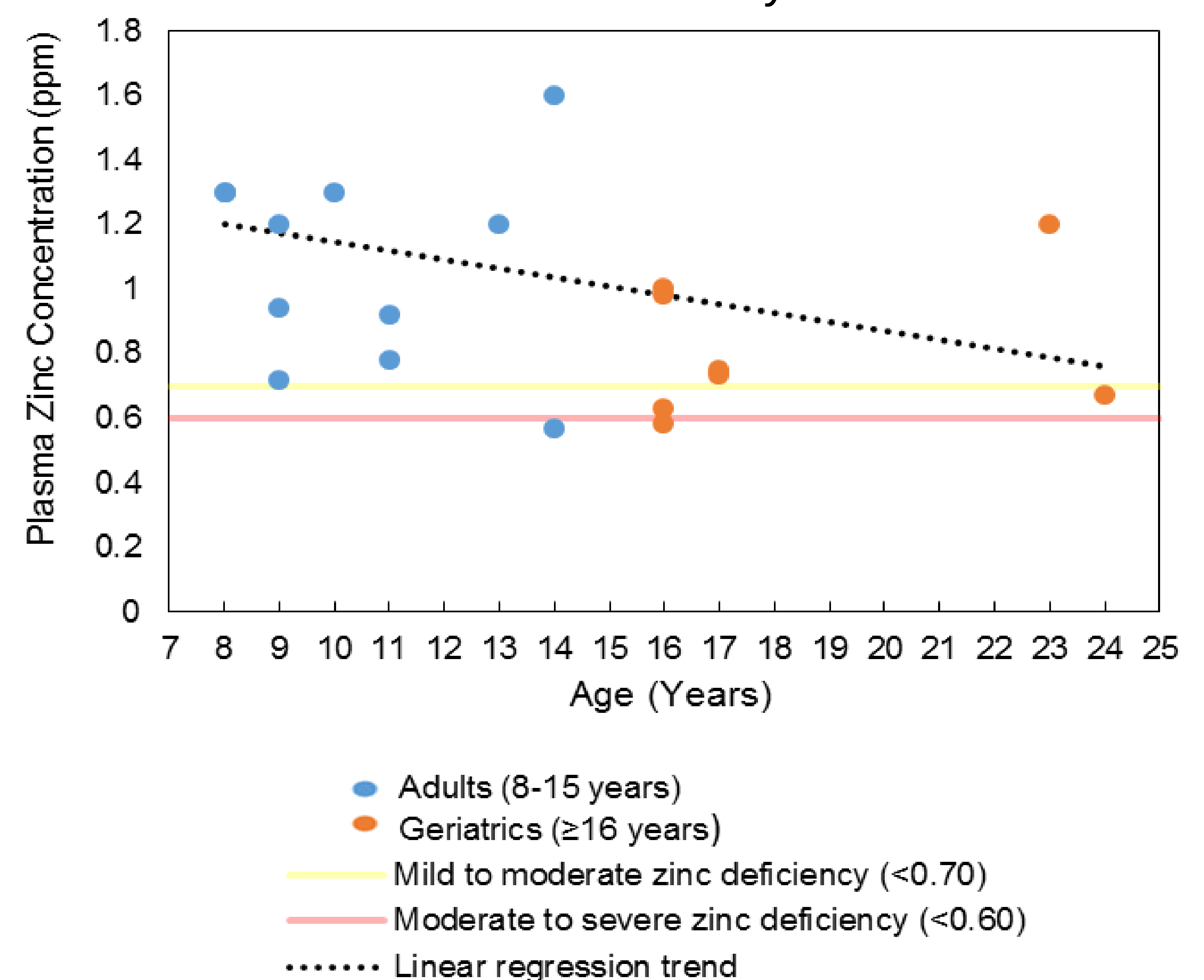
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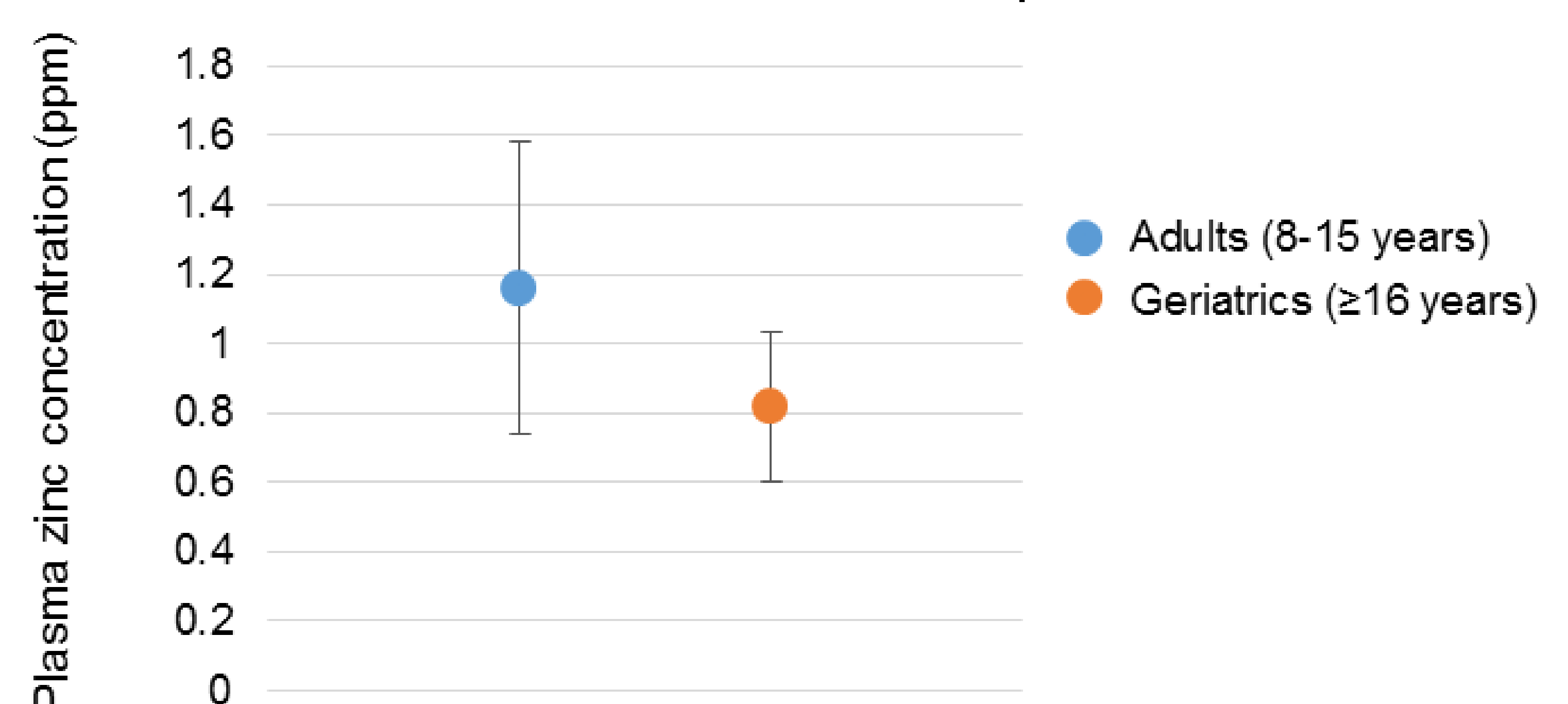
## Preliminary Results

### Plasma Zinc Concentrations of Adult and Geriatric Rhesus Macaques in Relation to Threshold Values for Zinc Deficiency



**Figure 1.** Plasma zinc concentrations of adult (n=12) and geriatric (n=8) rhesus macaques in relation to the threshold values for mild to moderate and moderate to severe zinc deficiency. Deficiency values based off of previous studies involving rhesus macaques and humans<sup>7,8,9</sup>. Linear regression analysis was not significant, p>0.05

### Mean Plasma Zinc Concentrations of Adult and Geriatric Rhesus Macaques



**Figure 2.** The mean plasma zinc concentration of adult rhesus macaques ( $1.16 \pm 0.42$ ppm; n=12) was significantly higher than the average of geriatric macaques ( $0.82 \pm 0.22$ ppm; n=8), p<0.05

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