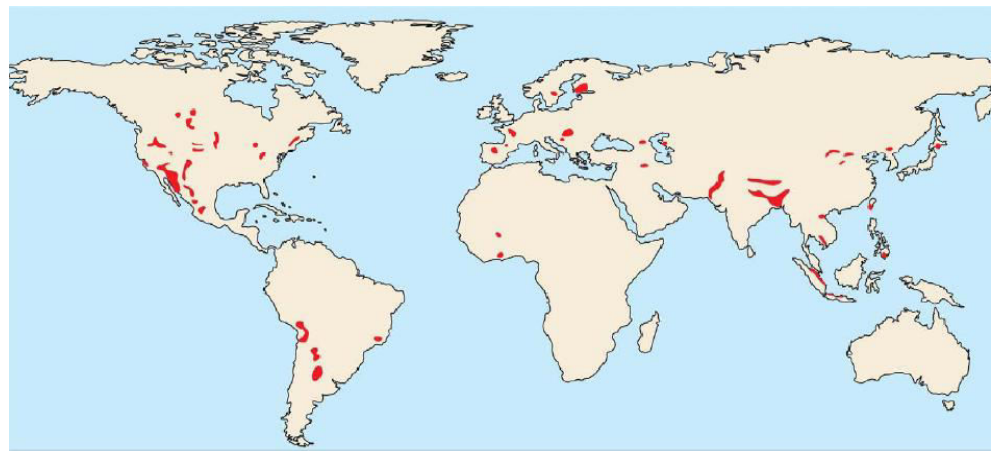


# Determining the effect of arsenic on micronutrients and proteins in rice.

Tasila Mwale

Niroshini Nirmalan, Gemma Lace-Costigan &  
Debapriya Mondal

# Background

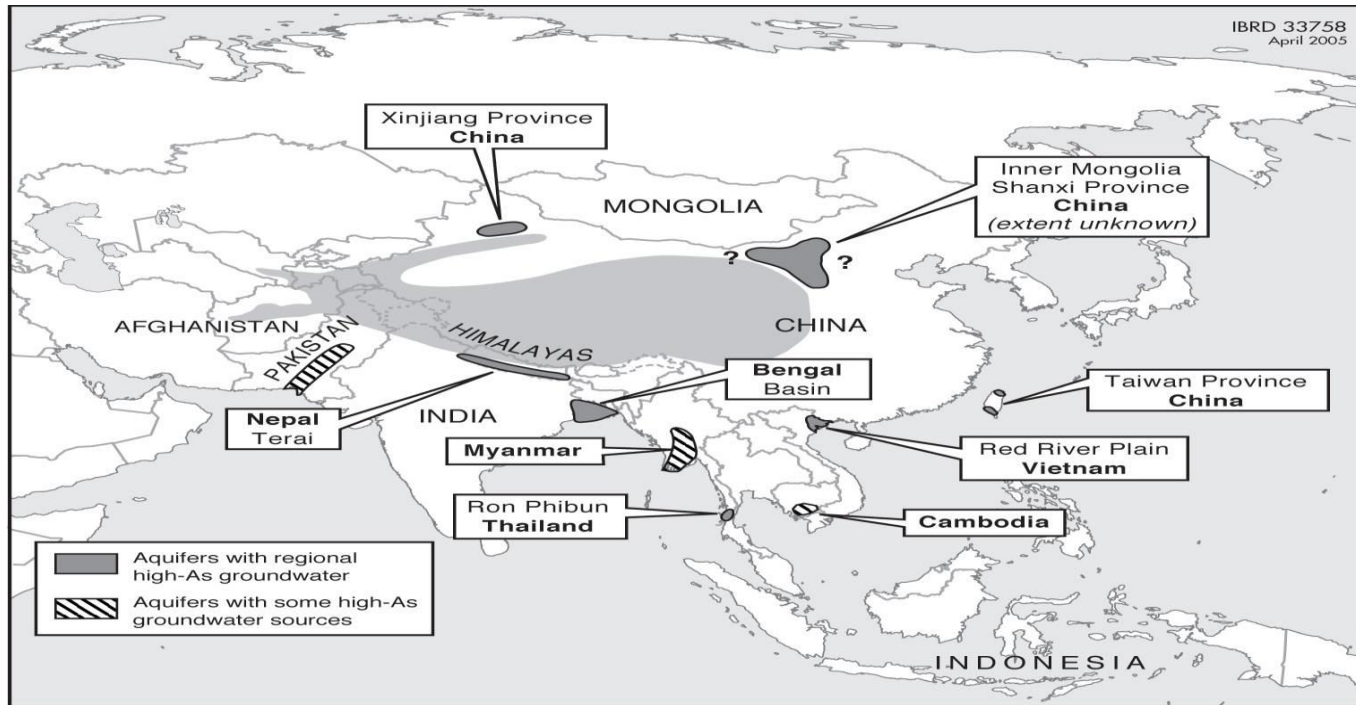


Polya, D.A., Mondal, D. And Giri, A.K. (2009) Quantification of deaths and DALYs arising from chronic exposure to arsenic in groundwaters utilized for drinking, cooking and irrigation of food crops in Preedy and Watson (Eds) Handbook of Disease Burdens and Quality of Life Measures, Springer-Verlag, ISBN: 978-0-387-78665-0, pp. 702-728.

- Arsenic (As)
  - Naturally occurring
  - Anthropogenic pollution
  - Organic and inorganic form
- As toxicity
  - Major public health issue
  - Cancer and other health disorders
- Exposure
  - Water



# Background



<http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/SOUTHASIAEXT/0,,contentMDK:22392781~pagePK:146736~piPK:146830~theSitePK:223547,00.html>

## As contamination

- Major problem in South East Asia
- Bengal basin – WHO “largest mass poisoning in history”
- Exceed limit of 50ppb in water
- Rice cultivated in high As water

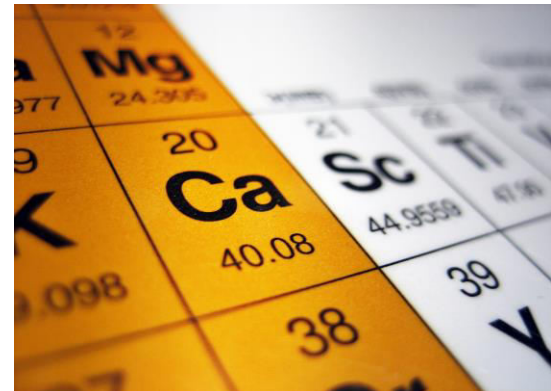
# Rice

- Staple for more than half of world population.
  - Source of multiple nutrients
  - 2<sup>nd</sup> most important source of arsenic exposure
  - Current As regulation is 200ppb
  - Research
    - Cooking method & As concentration in water affects As retention in rice
    - Arsenic limits trace mineral nutrition
- (Williams et al.,2009)

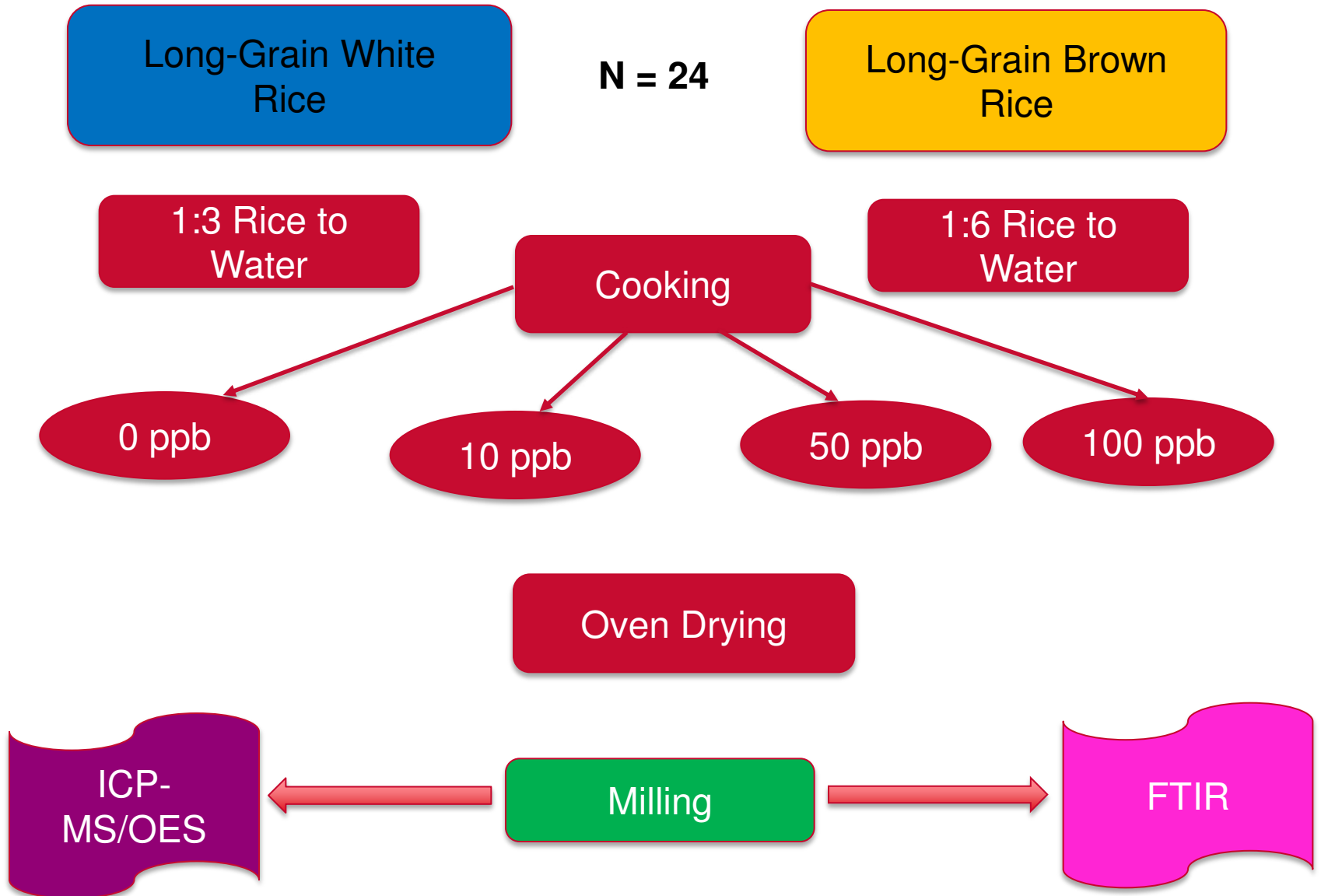


# Aim

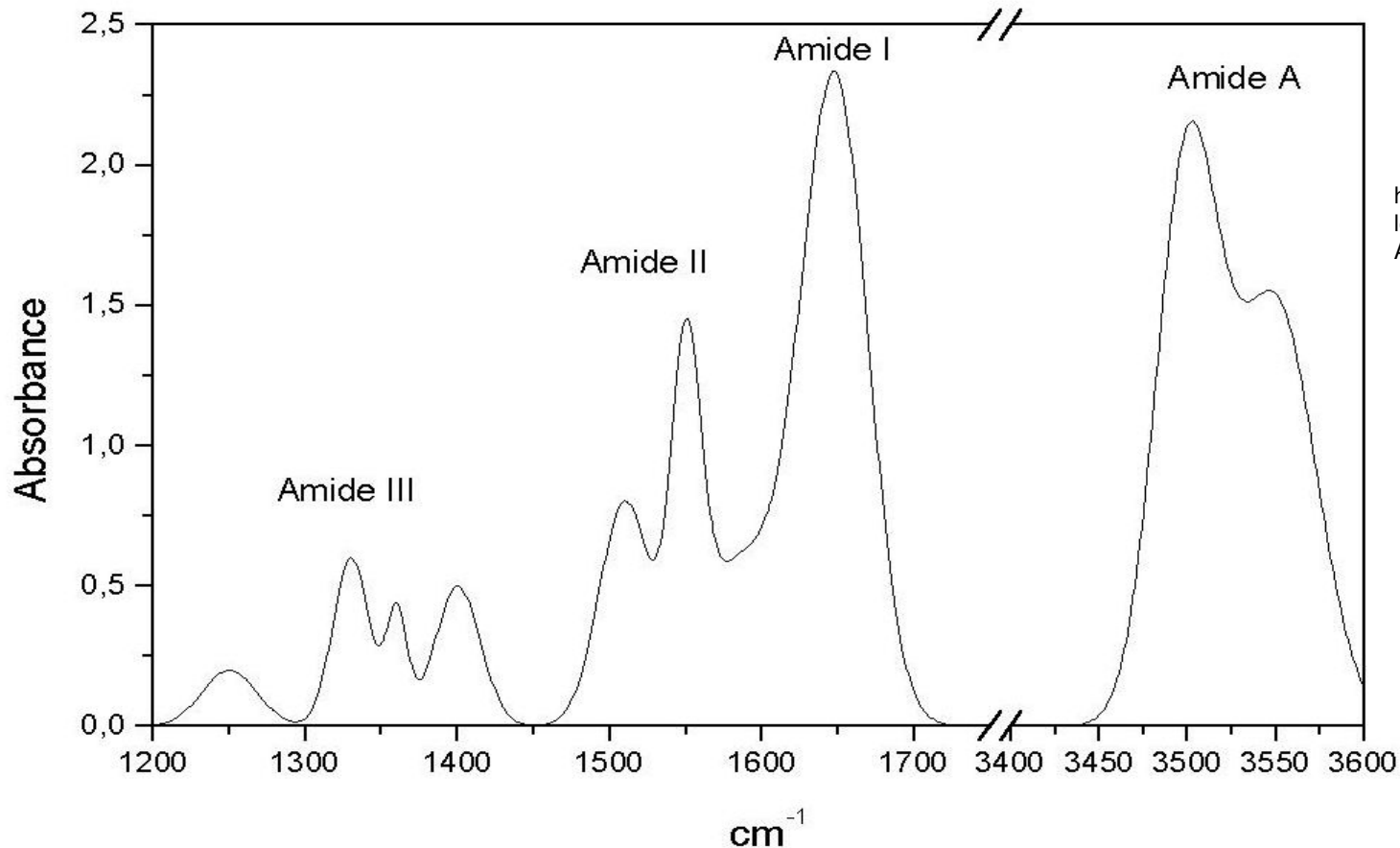
- To investigate changes in protein and micronutrients that might occur from cooking rice in arsenic contaminated water



# Methodology



# Amide I Band



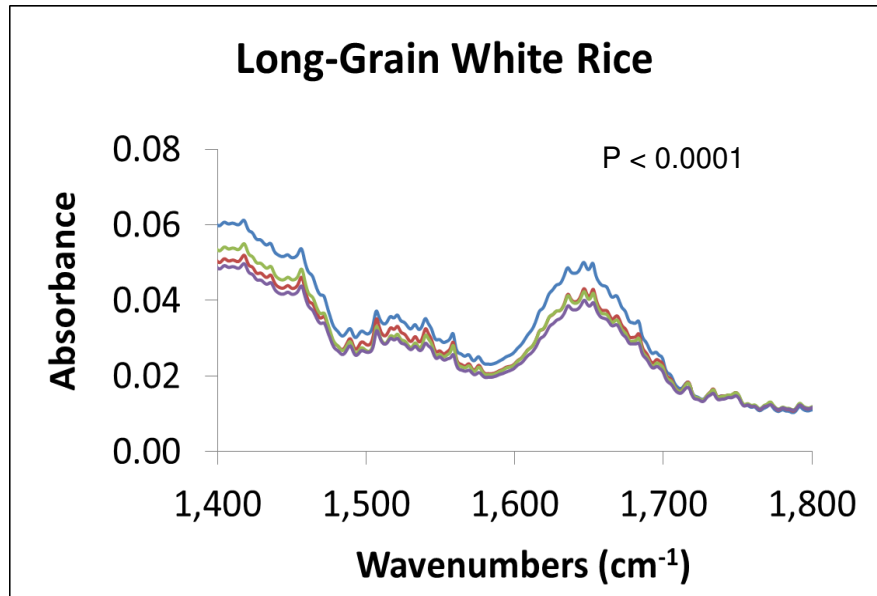
[http://jenalib.fli-leibniz.de/ImgLibDoc/ftir/IM AGE\\_FTIR.html](http://jenalib.fli-leibniz.de/ImgLibDoc/ftir/IM AGE_FTIR.html)

- 1600 and 1700 cm<sup>-1</sup>
- Most intense absorption band in proteins
- Stretching vibrations of C=O and C-N bonds
- Less interference from other bonds (Barth, 2007)

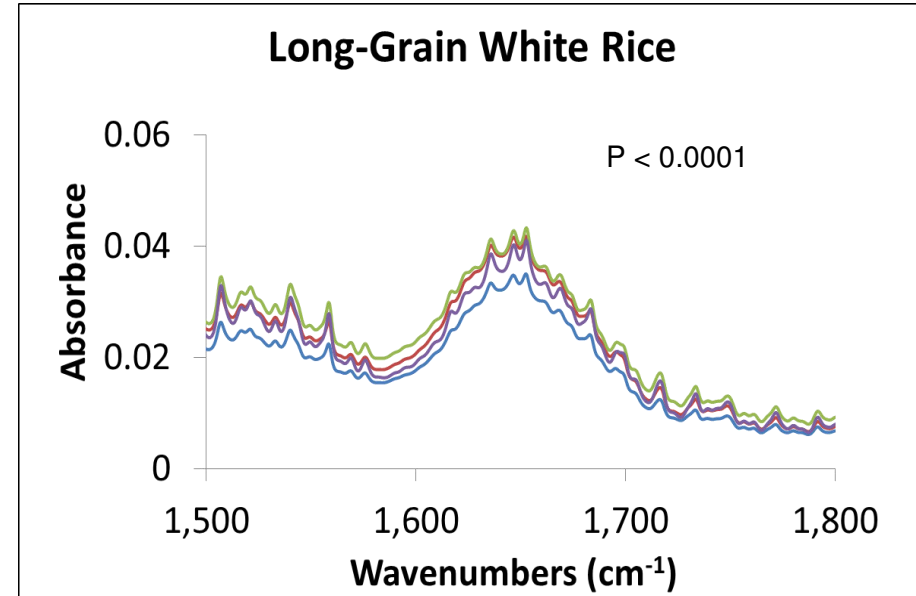
# Results

## FTIR

1:6



1:3



**0ppb**



**10ppb**



**50ppb**



**100ppb**



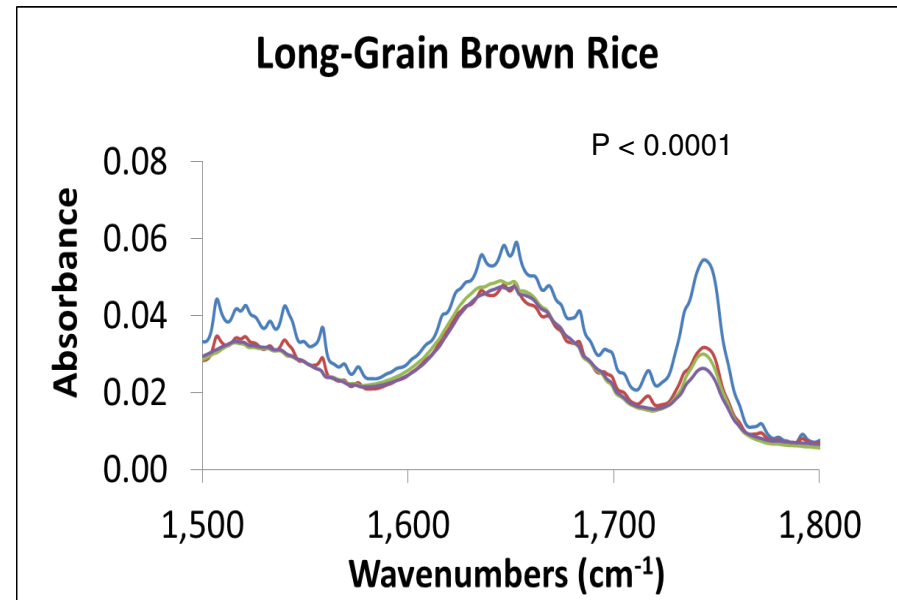
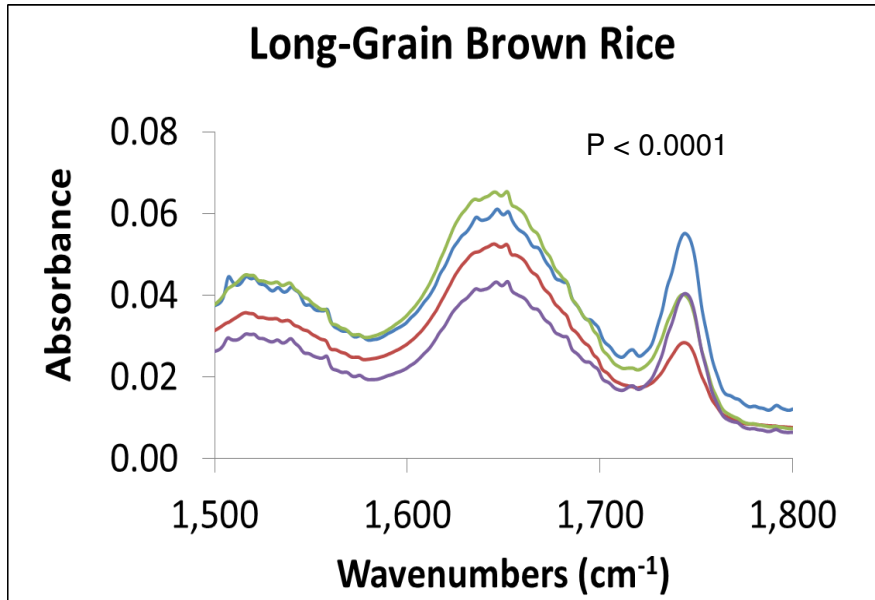


# Results

## FTIR

1:6

1:3



**0ppb**

**10ppb**

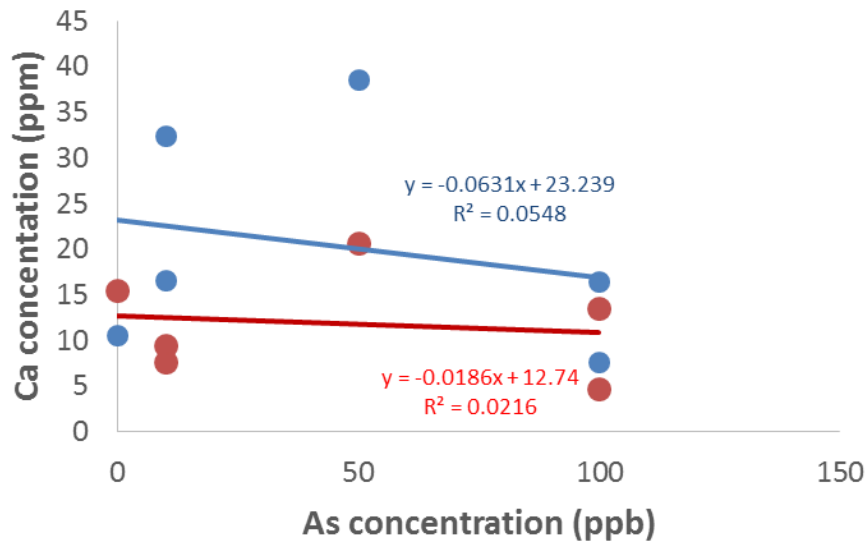
**50ppb**

**100ppb**

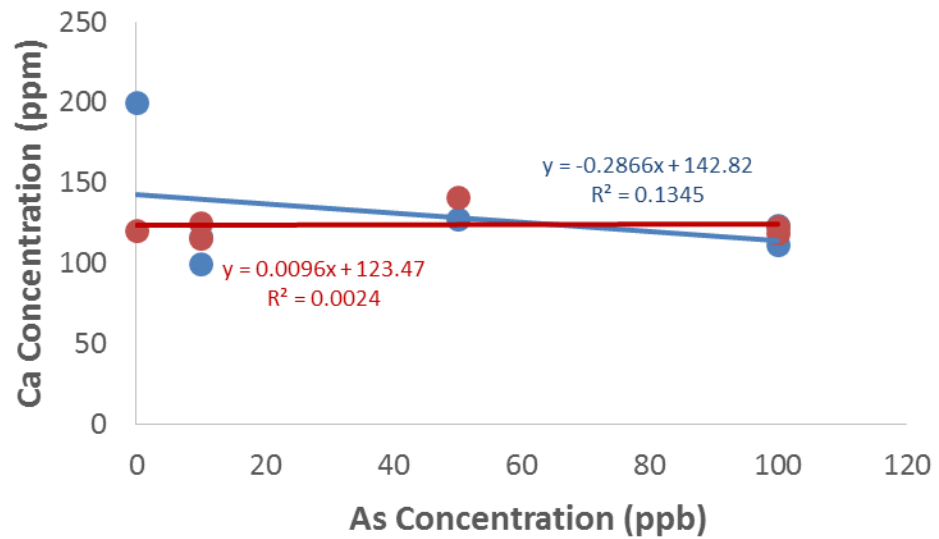


# ICP-MS

### Effect of As on Ca levels in Long-Grain White Rice



### Effect of As on Ca levels in Long-Grain Brown Rice



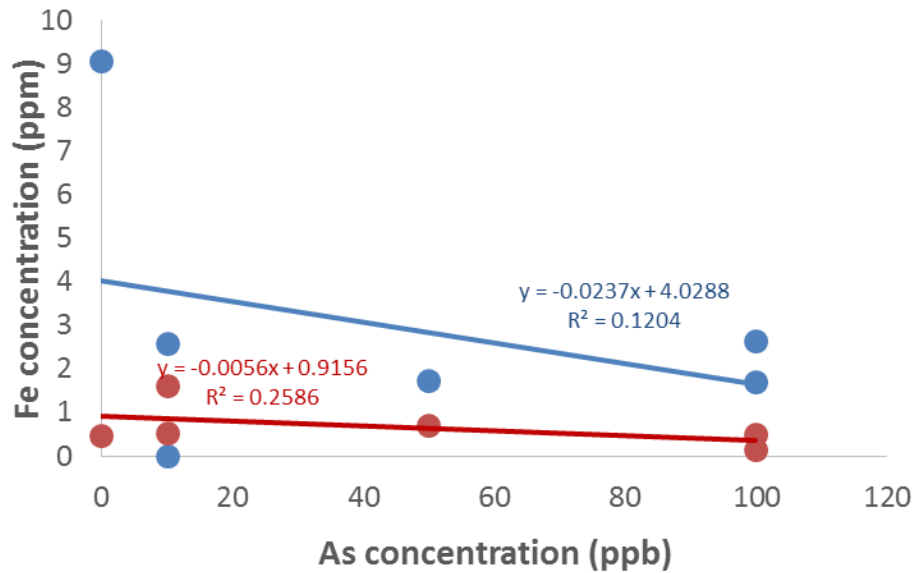
1:6



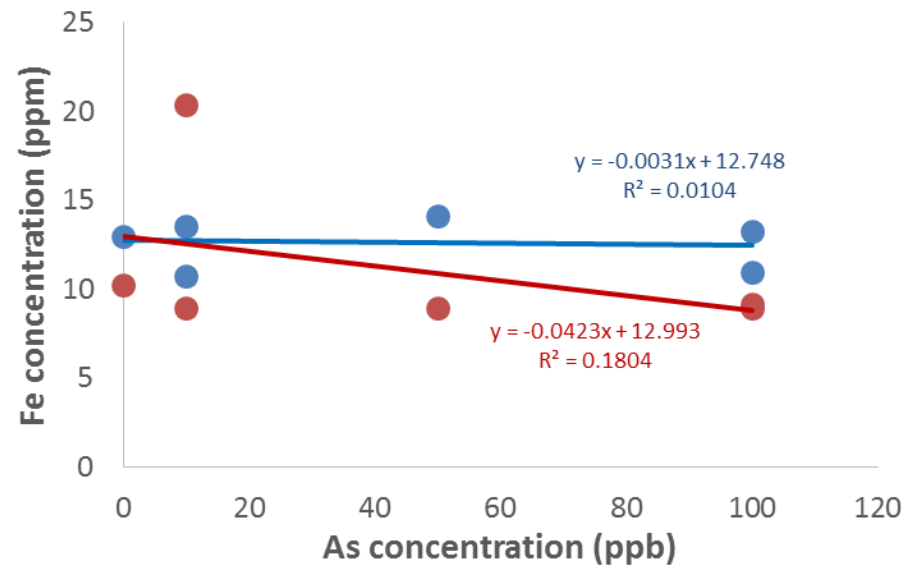
1:3

# ICP-MS

### Effect of As on Fe levels in Long-Grain White Rice



### Effect of As on Fe levels in Long-Grain Brown Rice



● 1:6

● 1:3

# Conclusion

- As had an effect on the amide 1 band in rice, represented by the difference in absorbance at different As concentrations.
- Cooking rice in As contaminated water affected the calcium and iron levels in rice negatively.
- Future studies will explore the effect of arsenic on protein concentration.

# Acknowledgements

University of  
**Salford**  
MANCHESTER



Thank you for making this study possible.



Any Questions?

