CSAR

c/o Scientific Generics Limited
Harston Mill
Harston
Cambridge CB2 5GG
Telephone: +44 (0) 1223 875200
Facsimile: +44 (0) 1223 875201
(Organising Secretary's Home Number: 01799 525 948)
email: richard.freeman@genericsgroup.com
CAMBRIDGE SOCIETY FOR THE APPLICATION OF RESEARCH

'Man's Best Friend'

Selenium in the diet and its importance to human health

Dr Margaret RAYMAN
Senior Lecturer and Course Director of the MSc Programme in Nutritional Medicine,
University of Surrey

Monday, 16th February 2004 ***7.30 p.m. - 9.00 p.m.***
The Wolfson Lecture Theatre, Churchill College, Cambridge

Chair: Professor Lisa Hall (University of Cambridge, Dept of Biotechnology)
Vote of Thanks: Professor Laurie Hall, FCS (Can), FRSC
(Herchel Smith Laboratory for Medicinal Chemistry, University of Cambridge)

Both the Chair and the VoT are CSAR Members of Council

Dr Rayman writes:

The essential trace mineral, selenium (Se) is of fundamental importance to human health. As a constituent of selenoproteins, it plays both structural and enzymic roles, in the latter context being best known as an antioxidant and catalyst for the production of active thyroid hormone. While Se-deficiency diseases have been recognised for some time, evidence is mounting that less-overt deficiency can also cause adverse health effects and furthermore, that supra-nutritional level of Se may give additional protection from disease. In the context of these effects, low or diminishing Se status in some parts of the world, notably in the UK, is giving cause for concern.

Se is needed for the proper functioning of the immune system. It appears to be a key nutrient in counteracting the development of virulence: thus in a Se-deficient host the benign coxsackie virus becomes virulent, causing heart damage, the influenza virus causes more serious lung pathology, and HIV infection progresses more rapidly to AIDS. Long recognised as essential for successful animal reproduction, Se is required for human sperm maturation and sperm motility and appears to reduce the risk of miscarriage and pre-eclampsia. Conditions such as asthma and rheumatoid arthritis that involve oxidative stress and inflammation are negatively associated with Se intake or status.

There is persuasive epidemiological evidence that Se reduces cancer risk. A recent double-blind placebo-controlled study in the US showed that in those taking a Se supplement, there was a 50%

reduction in cancer mortality, and a 37% reduction in cancer incidence with the risk of prostate, colorectal and lung cancers being reduced by 63%, 58% and 46% respectively. Mechanisms of the anti-cancer action of Se may include: - the production of anti-tumorigenic Se metabolites; the induction of programmed cell death of cancer cells; the inhibition of new blood vessel formation; the increase in tumour-supressor protein, p53, and the enhancement of the immune response.

New evidence also suggests that single-nucleotide polymorphisms (SNPs) in genes for selenoproteins such as glutathione peroxidase and the prostate epithelial selenoprotein may also affect cancer risk and may influence the ability of additional Se to alter that risk in individuals carrying these polymorphisms. We are currently investigating whether selenoprotein SNP genotype determines the risk of prostate cancer. If so, this will lead to the development of personalised nutritional advice, based on selenoprotein SNP genotype, as to the level of selenium intake required to reduce a man's risk of prostate cancer.

About the speaker:

Dr Margaret Rayman graduated from Queen's University Belfast with a 1st class honours degree in Chemistry and completed a D. Phil. in Inorganic Biochemistry at Oxford University. She then worked as a postdoctoral research fellow at the Institute of Cancer Research and Imperial College, London. Following some years in France, Dr Rayman returned to the UK and was awarded a Daphne Jackson Fellowship (for woman returners to Science) in the Chemistry department at the University of Surrey in 1994. She later moved to the School of Biomedical and Molecular Sciences where she is now a Senior Lecturer and Course Director of the MSc Programme in Nutritional Medicine that she initiated. She has published many articles on the importance of selenium to human health. She is a magistrate on the SW Surrey Bench.

Current research interests include:

- ◊ Se in cancer prevention: PI of the UK PRECISE pilot study
- ◊ Investigation of the link between selenoprotein gene polymorphisms (SNPs) and prostate cancer risk
- ◊ The effect of selenium on mood and thyroid function
- ◊ Current clinical trial investigating the effect of selenium supplementation in asthmatics
- ◊ Selenium deficiency as part of the aetiology of the pregnancy disease, pre-eclampsia

Organising Secretary's Notes:

Selenium is believed to reduce the incidence of some cancers. Once a commonplace mineral in our diet, modern farming practices mean that we don't get much of it in our diet any more (which applies to most other minerals, too).

The incidence of prostate cancer is believed to be reduced significantly if 200ug of selenium is ingested daily. Alternatively, you can eat Brazil nuts, which contain 840ug Se per ounce (that's about 3% of their weight.

Since this cancer has a similar mortality and incidence to breast cancer in women, I christened the talk 'Man's Best Friend'.

Dr Richard Freeman FRSA
CSAR Organising Secretary