

## Concurrent Session 12: Animal Nutrition

### Improving human antioxidant status via increasing selenium levels in food products from animals supplemented with organic mineral sources

LATucker<sup>1</sup>, P' Spring<sup>3</sup>, P Surai<sup>2</sup>

<sup>1</sup>Waiti Hill Ltd, PO Box 307, Feilding 4740, New Zealand

<sup>2</sup>Alltech Biotechnology Centre, Catnip Pike, Nicholasville, KY, USA

<sup>3</sup>Swiss College of Agriculture, Zollikofen, Switzerland

**Background** – Selenium deficiency has become a major problem in animals and humans, and is linked to many diseases, including infertility and cancer. Se is involved in key antioxidant systems, performing a protective role in cells and tissues in all species, and comprises not only a functional ingredient for animals, but also allows the production of value-added functional foods for humans. Inorganic Se is associated with toxicity, but forms produced within yeast are safer, more bio-available and more efficiently transferred into tissues.

**Objective** – To review the research concerning the transfer of Se from animals fed Se-enriched yeast into milk, meat and egg products, and to discuss how this can be used to supplement human diets, especially in regions with Se deficiencies and high oxidation exposure, such as New Zealand.

**Design** – Data from replicated research and commercial trials on dairy cows, pigs and chickens where feeds were supplemented with Se-enriched yeast was collated. Responses in the levels of Se expressed in meat or eggs as a result of this supplementation were quantified and compared, and related back to human recommended daily intakes for Se. The opportunities for increasing Se status in humans by producing meat and eggs with higher Se profiles were assessed.

**Outcomes** – Supplementation with Se-enriched yeast significantly increased levels of Se in meat and eggs and improved antioxidant status. Milk Se improvements varied from five to sixteen fold, depending on cow status and dietary inclusion levels. In meat, chicken breast Se increased by 25% to 0.3 ug/g, beef enrichment was two fold, reaching 0.22 ug/g, and pork loin content increased by nearly 4 times to 0.33 ug/g. An average of 31 ug per egg (around 50% of the RDI recommended by the EU (65 ug), USA (55 ug) and NZ/AUS (70 ug)) resulted from hens fed 0.4 mg/kg Se. Inorganic Se did not realise the same improvements.

**Conclusions** – Feeding organic Se to animals and producing enriched food materials as a result can provide a route to improving the Se intake in humans, allowing the RDA to be ingested in a highly form an thus reduce the risk of deficiencies and associated diseases.

### Colonic selenoproteins increase with level of dietary selenised yeast in finisher pigs

R Uglietta<sup>1,2</sup>, SD Jayasooriya<sup>1,3</sup>, JR Pluske<sup>3</sup>, DJ Cadogan<sup>4</sup>, EN Ponnampalam<sup>1</sup>,  
GH McIntosh<sup>5</sup>, FR Dunshea<sup>6</sup>

<sup>1</sup>Department of Primary Industries, 600 Sneydes Road, Werribee, VIC, 3030

<sup>2</sup>Swinburne University of Technology, Hawthorn, VIC, 3123

<sup>3</sup>School of Veterinary and Biomedical Sciences, Murdoch University, Murdoch, WA, 6150

<sup>4</sup>Feedworks, Pty Ltd, Romsey, VIC, 3434

<sup>5</sup>Department of Medicine, Flinders University of South Australia, Bedford Park, SA, 5042

<sup>6</sup>Faculty of Land and Food Resources, The University of Melbourne, Parkville, VIC, 3010

**Background** – Selenoproteins are Selenium (Se) dependant enzymes, which protect against oxidative damage in the gastrointestinal tract. The expression of glutathione peroxidase 2 (GPx2) and selenoprotein P (SeIP) rely on the Se status, with Se deficiency being associated with decreased GPx activity and increased risks of colon cancer. This study examined the effects of 0, 3 and 9 ppm of selenised yeast with 0, 100 and 1000 ppm of iron supplements on the colonic expression of GPx2 and SeIP in the pig, study funded by Pork Cooperative Research Centre.

**Objectives** – To determine the gene expression of important selenoproteins in the colon of the pig fed 0, 3 or 9 ppm of selenised yeast diets using Real-Time Polymerase Chain Reaction (RT-PCR).

**Design** – Crossbred finisher pigs (n=18 males and 18 females) were offered *ad libitum* access to one of six experimental diets: 1) Basal: 0.13 mg/kg sodium selenite + 50 mg/kg iron (II) sulphate; 2) 3 mg/kg Se as selenised yeast (Diamond V); 3) 9 mg/kg selenised yeast Se; 4) 100 mg/kg iron; 5) 1000 mg/kg iron; 6) 3 mg/kg selenised yeast Se + 100 mg/kg iron. Pigs were sacrificed after 28 days. Data was analysed using delta Ct and ANOVA.

**Outcomes** – Colonic expression of GPx2 was 138 and 195% ( $P<0.001$ ) of basal values in pigs consuming diets containing 3 and 9 ppm selenised yeast Se, respectively. Colonic expression of SeIP was 156 and 225% ( $P<0.001$ ) of basal values in pigs consuming diets containing 3 and 9 ppm selenised yeast Se, respectively. There was no effect of sex ( $P=0.80$  and  $0.63$ ) or iron ( $P=0.15$  and  $0.80$ ) on the expression of GPx2 or SeIP, respectively.

**Conclusion** – These data suggest that dietary selenised yeast can increase the expression of key biomarkers of Se status in a dose-dependent manner.