

## McMEEKAN MEMORIAL AWARD 1997

### Neville D. Grace

B. Ag. Sc., M.Ag. Sc. (Massey), Ph. D. (Missouri)

The McMeekan award recognises an outstanding contribution to New Zealand animal production over the past five year period. This prestigious award for 1997 has been awarded to Neville Donovan Grace.

Neville is regarded as one of New Zealand's foremost authorities on macro-element and trace element requirements of farm animals, especially ruminants. He has acquired this reputation over 25 years of research development and application, culminating in the publication of his definitive book for farm consultants "Managing Trace Element Deficiencies" in 1994. During the last 5 years, as his publication list supports, he has maintained his prolific research output together with his enthusiasm, and continued to extend his understanding of the diagnosis and prevention of trace element deficiencies in grazing livestock, with new work with dairy cows (selenium and iodine), horses (copper), and even llamas, as well as his more traditional focus on sheep and beef cattle requirements.

Neville's contributions have especially focused on the four trace elements that are most likely to cause problems in grazing livestock in NZ viz. cobalt, copper, iodine and selenium. His work has emphasised the need for good planning in developing procedures to overcome deficiencies in these elements, and in particular, avoiding indiscriminate administration of supplementation, both in terms of cost and in minimising the risk of overdosing with regard to animal health and acceptable concentrations in product for human consumption. In addition, Neville has had a major impact on the development of new animal remedies using novel controlled release technologies in treatment of trace element deficiencies such as selenium and cobalt (Vitamin B<sub>12</sub>). The long acting vitamin B<sub>12</sub> formulation has an effective treatment period substantially longer than anything else available (10 months compared to 4 - 6 weeks). The cobalt studies are now moving towards full patent protection and commercialisation with applications not only in the veterinary arena but also potential for biomedical and clinical applications. Neville has also had vital input into the development of a range of intraruminal devices for selenium and cobalt which, with one dose per year, will have a major impact on the management of trace element deficiencies in pastoral agriculture. In the validation trials for all these devices Neville has, as in all his experimental trial designs, insisted on applying rigorous monitoring criteria that demonstrate their efficacy and behavior under normal field conditions. In additional work, Neville has also maintained a strong interest in deleterious elements, notably cadmium, making a contribution to the AgResearch/Massey University team which has led New Zealand research in integrated studies of cadmium cycling in grazed systems and animal responses.

Neville's contribution to New Zealand animal production has been, and continues to be, based on research

which attacks the issues of trace element nutrition at many levels: fundamental metabolism together with strategies for improved farm management practice in relation to requirements; understanding of the role of individual elements, and the integration of this understanding to explain trace element interactions in traditional farming species, as well as novel and alternative species, e.g., the llama and the horse. In the last 5 years Neville has published 1 book, authored or co-authored 10 papers in refereed journals, and 7 New Zealand conference proceedings (including 6 to the New Zealand Society of Animal Production). He is in demand overseas as a speaker on trace elements in pastoral systems and in the last 5 years has published 5 papers in international conference proceedings. The most recent of several invited key note addresses was given at the 9th International Conference on Production Diseases in Farm Animals held in Berlin in 1995, on 'Use of biochemical criteria to diagnose trace element deficiencies in sheep and cattle'

Although this award specifically focuses on Neville's recent contribution to animal production, to do justice to the impact that he has had on trace element nutrition in New Zealand pastoral agriculture it is pertinent to briefly background some snippets from his lifetime work - work that has not just been a career but a passion. After graduating with a Bachelor and Masterate in Agricultural Science from Massey University, Neville obtained his Ph.D. degree in 1968 from the University of Missouri, where he explored the intricacies of the interaction between magnesium and potassium in the Guinea Pig under the guidance of Boyd O'Dell. It was during his time at Missouri that Neville was to have his first encounter with atomic absorption spectroscopy and the new dimension that this powerful analytical technique was bringing to trace element research. The opportunity he had to work with Pickett and Koirtyohann, both internationally recognised spectroscopists, instilled in Neville the appreciation and need for high quality analytical data. This was later to greatly benefit his work on compositional analysis of animal tissues, especially potentially difficult matrices such as bone. In particular, the sheep carcass composition data obtained by Neville and his colleagues for a wide range of elements, in a wide range of tissues, set many bench marks and in the face of new techniques and methodologies the data has stood the test of time and is widely referred to. This data, much of which was obtained from a series of systematic studies during the 1980's at what was the then the DSIR, was invaluable background information essential for the development of criteria to assess trace element requirements for a range of sheep classes. This work received international recognition. More recently, the information has also been of paramount importance for the development of controlled release systems.

Apart from two sabbatical periods, Neville has worked continuously in Palmerston North, initially with the DSIR

and then, with the formation of the Crown Research Institutes, AgResearch. His sabbatical at the Moredun Institute, Edinburgh, in the late 1970's is worth mentioning as this visit was also to inspire Neville in his later work and was to set up lasting associations. During his 18 month visit Neville worked with Alec Field and Neville Suttle, two internationally recognised authorities in trace element metabolism of ruminants, and as part of an extremely active group, worked on aspects of the much studied sulphur and molybdenum interaction on copper metabolism. Both Field and Suttle, besides having high outputs, were also great critiques of trace element research of the day, and Neville fondly recalls the regular extended coffee break discussions, with Field in particular spontaneously airing a plethora of new ideas. It was during this time that Neville was first introduced to the use of radioisotopes and associated techniques that have proved invaluable in many of his later trace element metabolic studies. Also at the time Bernard Smith, another member of the Moredun group, first discovered the so-called TCA insoluble copper fraction in plasma, using Mo-99 as a tracer - we now know this to be formed from the interaction of thiomolybdates and copper with proteins and has significance in our understanding of the copper-molybdenum interaction. Much of this work has come full circle and Neville and colleagues are still actively involved in extending this research, as even today copper deficiencies in many areas of New Zealand remains a problem, especially in cattle.

Neville plays a very active role in transfer of his knowledge to the rest of the scientific community, and he has a vital concern to get his research across to the broader pastoral agriculture industry; both through consultancy groups and directly to farmers. His activity in this area is outstanding for a scientist who maintains such a strong strategic research profile and output. His ability to explain

research issues at a practical level is a particular strength and the envy of many other scientists. This means that he is in demand to present to a wide range of farming and industry groups - for example, in the last few months he has been contracted by LandCorp to present a series of talks around New Zealand on "Animal production from pastures; nutrient requirements of grazing ruminants". Neville also consults on a regular basis to the Animal Remedies Board on practical trace element matters.

As shown by the regularity of his publications in the NZSAP proceedings Neville regards the Society as pre-eminent for both presenting his own results and interacting with other members of the agricultural community. His contributions stretch back over most of his 32 year research career. He is consistently loyal to the Society, particularly to the concept of the conference as a meeting place of the spectrum of interests, from research scientists through to farmers, and direct application of ideas. Neville is currently the Society's publication manager on the APS management committee. He has obtained a number of other honors including Massy Senior Scholar in Agriculture, Fulbright and Nuffield scholarships. He has been on the Nutrition Society Council and is an active member of the NZ Trace Element Group.

Notwithstanding his already longtime research effort, Neville remains as active and enthusiastic in his science today as he was as a '*fresh faced*' graduate. Despite the seemingly never-ending changes in science strategy and funding, Neville remains steadfast in his pursuit of new goals and achievements. The attainment of this prestigious award by Neville is especially appropriate as it is given to a scientist who has already achieved much, but also remains very active today and will continue to offer much to animal production in New Zealand in the future.

Julian Lee  
Tricia Harris