against radiation injury and late effects like induction of leukaemia, cancer or nephrosclerosis. Since the majority of radioprotectors are effective only for a limited duration, this situation may have to be improved by pharmaceutical combination to ensure prolonged retention of the protective compounds in the human body.

Successful exploitation of radiosensitizers and protectors in radiotherapy depends on selective effect of these compounds on tumours and normal tissues respectively. Whereas certain radiosensitizers have reached the stage of clinical trials, the development of radioprotectors is not so far advanced. More basic research is needed on radioprotectors before clinical trials can be attempted.

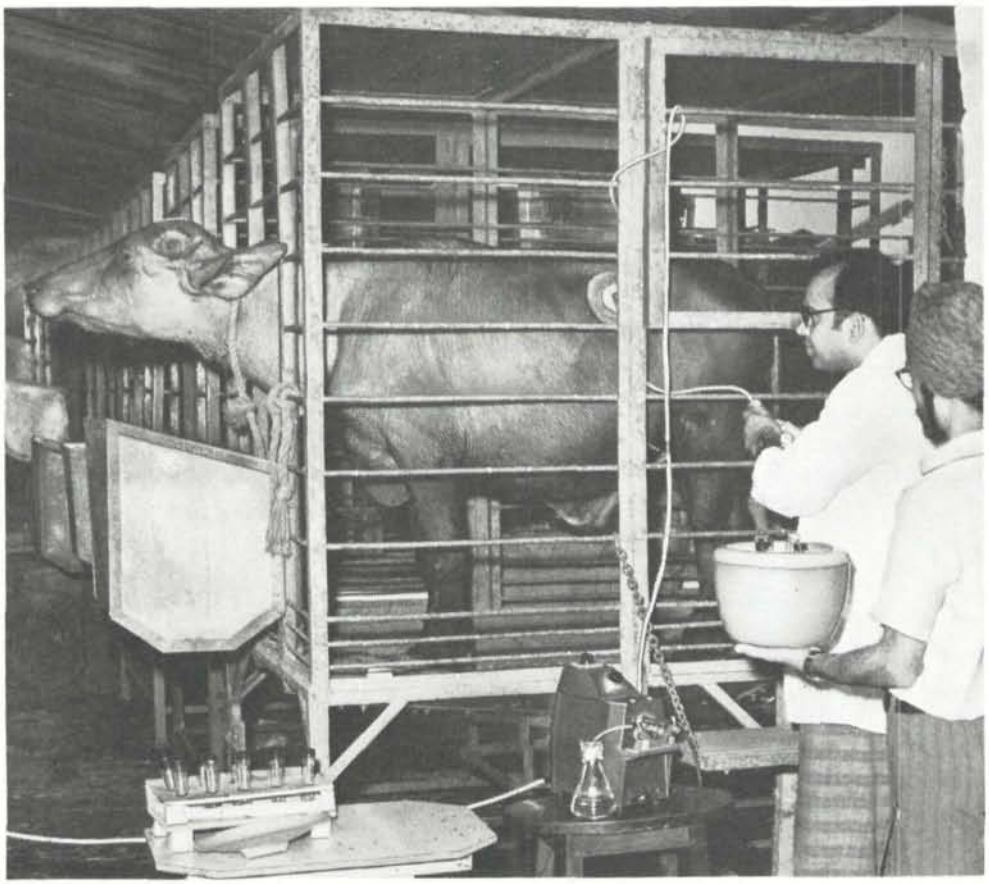
It is planned to hold another Advisory Group Meeting in 1977 to review the progress made on clinical trials with some selected radiosensitizers and protectors. The Agency has also initiated a Coordinated Research Programme in this field, in which 10 institutes from 9 Member States, the Federal Republic of Germany, India, Japan, Poland, Romania, Sweden, the United Kingdom, the United States of America, and Yugoslavia, are participating.

INTERNATIONAL SYMPOSIUM, VIENNA, 2–6 FEBRUARY

The meeting on "Nuclear Techniques in Animal Production and Health as Related to the Soil-Plant System" was attended by 90 participants from 28 countries and representatives from 9 international organizations.

Improvement of Animal Production through Research using Radioisotopes and Radiation

High birth rates coupled with greater longevity continue to increase the world's population, especially in the less developed countries. The prevention of undernutrition and ultimately starvation will only be averted by increased food production and more efficient use of that food. At the same time people who have largely subsisted upon plant food diets and whose standards of living are rising, want to increase the use of animal products in order to upgrade their diets. To provide this high quality food animal scientists must find ways of increasing the supply especially in the less developed countries. Since most of the available pasture lands are presently being fully utilized or overgrazed, improved efficiency of the present herds and use of agro-industrial wastes are the only methods left to increase production significantly.



The use of radioisotopes and radiation in research are making major contributions to the understanding of the processes necessary to achieve better animal production. This cow serves for rumen metabolism studies. Photo: Gukka

The use of radioisotopes and radiation in research are making major contributions to the understanding of the processes necessary to achieve better animal production. In order to provide a forum for exchange of information in this field, the FAO/IAEA Joint Division of Atomic Energy in Food and Agriculture organized an international symposium, held in Vienna, from 2–6 February, on the use of nuclear techniques in animal production.

Among the topics discussed at the symposium were:

- Soil-plant-animal relations regarding minerals
- Trace elements in animal nutrition
- Calcium, phosphorus and magnesium metabolism
- Protein (nitrogen) metabolism – ruminants
- Protein (nitrogen) metabolism – non-ruminants
- Nuclear techniques in the control of parasitic infections
- Animal endocrinology with special emphasis on radioimmunoassays.

Few of the advances of trace element research have found universal application to practical problems of animal nutrition in the field. Environmental or man-made imbalances of trace elements can result in significant reduction of animal performance resulting in substantial economic loss and, indirectly, in a poorer nutritional status of human populations. Extrapolation of existing data suggests that wide areas of the world will be found to have considerable problems of animal trace element nutrition. Once diagnosed, correction of existing imbalances is feasible and inexpensive, with a resulting improvement of animal productivity and of human health.

The efficiency of utilization of essential trace elements ingested with the food depends upon its chemical form, interactions with other trace elements and other dietary ingredients of their metabolic products. Any one of these factors may influence the extent of absorption and metabolic utilization after absorption.

The determination of the activity of enzymes in which the trace element is an essential constituent is a more reliable criterion to evaluate the state of supply. On the basis of the usually high dynamics, it is possible to detect even suboptimal supply. The enzyme analysis provides an important means to determine the metabolic efficiency of utilization and the total availability of the trace element.

The development of radiation-attenuated vaccines against economically important parasitic diseases of farm animals has met with mixed success. Examples presented ranged from the highly effective and much used commercial vaccine against cattle lungworm to the almost completely unsuccessful attempts to immunize sheep against liver fluke. The results presented emphasize that this approach is likely to be successful only if there is evidence of a strong degree of acquired immunity to the natural infection. The extension of immunological control to those systems where the parasite provokes only a modest resistance by the host will probably depend on a much greater understanding of the mechanism of the immune response. Such fundamental studies are likely to rely heavily on nuclear techniques, e.g. in the labelling of antigens, antibodies and parasites with radioactive isotopes.

Radioimmunoassays and related isotope techniques have provided a new area in hormone analysis. Due to the new dimensions of sensitivity in the nanogram and picogram range it became possible to elucidate for many hormones their levels in peripheral blood plasma. Since some steps of the assay procedures could be automatized and the evaluation computerized, the efficiency for example to run several thousand determinations per week in one laboratory can hardly be met by other non-isotopic hormone-analytical techniques. Application in animal husbandry concerns mapping of physiological phenomena, diagnostic approaches in clinics, control of biotechniques, residue studies of exogenous hormones and attempts to use hormonal parameters as guidelines in connection with breeding programmes.

There are still gaps concerning the development of radioimmunoassays for important hormones. For the present status and foreseeable future of endocrinology in animal production radioimmunoassays are indispensable.