SUMMARY OF PRESENTATIONS ON NUTRITION

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In this section some 40 papers and posters were presented with contributions coming from 13 different countries. Canada, France and Germany followed closely by Sweden, the United Kingdom and Finland contributed the bulk of the presentations. A wide range of topics was covered with presentations fairly evenly distributed among ruminants, swine and poultry as the animal species targeted in the investigation. Several presentations involved detailed digestion/balance studies with laboratory and/or conventional animals. These latter studies investigated both nutrients and antinutrient factors with the results having application for a number of species. There was a notable lack of studies relating to human nutrition which perhaps attests to the high acclaim canola oil has received worldwide from health professionals in the past few years.

Significant advances have been made to our understanding of the nutritive quality of rapeseed meal and oil since the congress in Poland. Although many of the presentations at this conference touched on these advances they will not be outlined in detail. Rather some of the trends in research on the nutritional characteristics of rapeseed will be highlighted and an attempt will be made to speculate as to the future direction of this research.

Low-glucosinolate rapeseed has become more available since the Poznan conference hence it is understandable that a large number of papers and posters at this conference dealt with the nutritive value of low-glucosinolate meal. Research in this area was especially prominent for swine. Presentations in this area covered comprehensive studies on the influence of diets varying in glucosinolate content on growth performance and the response of target organs. In studies with diet glucosinolate levels ranging from 2 to 10 μmoles per g diet, effects were noted on the weights of thyroids, livers and kidneys. Thyroid hormone levels, in general, were unaffected in growing pigs fed low-glucosinolate diets although one study emphasized the importance of dietary iodine in maintaining normal thyroid status. In a study with pregnant gilts the fetus was found to be more sensitive to the goitrogenic effects of glucosinolates than the dam although the uterine wall of the dams was thinner. With the advent of very-low glucosinolate canola, further work in this area should be forthcoming to confirm these observations. Similarly, future studies with very-low glucosinolate meal should prove useful in discerning the role, if any, that glucosinolates play in palatability of diets containing rapeseed meal.

Interest in the use of rapeseed oil as a source of energy for swine was indicated by presentations on the use of whole seed in pig diets and on the digestibility of canola oil. The importance of studying carcass quality and the sensory characteristics of meat products was demonstrated in these investigations. With the current emphasis on the importance of omega-3 fatty acids in human health, the information on carcass composition has added significance. Further work will undoubtedly be conducted in this area along with studies to confirm the nutritive quality of low-glucosinolate rapeseed products.

As with swine, several of the studies with poultry concentrated on the influence of glucosinolates on meal quality. These studies included information on the nutritive quality of recently developed very-low glucosinolate canola. Investigations with broiler chickens and laying hens showed very promising results with this new cultivar. Information on glucosinolate composition indicated that indole glucosinolates are likely to be the dominant glucosinolates in future low-glucosinolate products. It is expected that research will turn to these compounds and at this conference data was presented on the potential antinutritive effects of indole glucosinolates either as intact glucosinolates or as aglucones produced by thermal degradation during meal preparation. These studies demonstrated that the indole glucosinolates were relatively free of antinutritive effects in poultry and rats. The effects, however, of the total glucosinolate complement on the development of liver hemorrhage in

laying hens has not been totally resolved and further work involving detailed metabolic studies will need to be conducted in this research area.

In other areas of poultry research, information was presented on the high quality of canola meal as an alternative protein supplement for turkeys. Information also was presented on the amino acid availability of canola seed and meal.

Studies on glucosinolate degradation and/or disappearance in the GI tract were conducted in two separate investigations with poultry and swine. In both instances significant hydrolysis of glucosinolates occurred in the hindgut. Some hydrolysis also occurred in the upper GI tract and in the study with poultry the effects on glucosinolates in the upper tract as opposed to those in the hindgut were implicated in subsequent antinutritive effects of the glucosinolates or glucosinolate-derived compounds. Further studies are needed to substantiate and explain these results.

Studies were presented on attempts to delineate the role played by intestinal microflora in the toxic effects of rapeseed glucosinolates. These studies involved the use of conventional, axenic and gnotobiotic animals as well as detailed work on liver microsomal metabolism of glucosinolates and glucosinolate-derived compounds. The results of these studies indicated a very significant role for intestinal microflora in the manifestation of the antinutritive effects of glucosinolates. Further such studies would appear to be critical to the understanding of the varied effects of glucosinolates, both within and among species.

The degradation rate of protein in the rumen was emphasized in several experiments presented in the ruminant nutrition area. Ways of reducing the rumen degradation rate of protein were evaluated as were the factors that influence the disappearance of amino acids in the lower GI tract of the ruminant. It is interesting to note that heat treatment appeared to have more influence on microbial hydrolysis of protein in the rumen than on host-animal enzymatic degradation of protein in the lower gut. Further studies will undoubtedly determine the processing conditions that will allow for optimum utilization of rapeseed protein by the ruminant. Whether or not these same conditions will result in products with optimum protein quality for the monogastric animal needs to be assessed. Future processing may be geared to the production of separate products for different classes of animals.

Other studies in the ruminant area concentrated on the use of whole seed as a high-energy feedstuff for the high-producing dairy cow. Processing conditions were of concern as were influences on rumen fiber digestion and milk fat content and composition. As with the carcass composition in swine studies, the composition of milk fat has implications in human nutrition.

Rapeseed as a forage crop received attention in two of the presentations in the ruminant area. Animal behavior information in grazing experiments implicated glucosinolates as an important determinant of voluntary feed intake. This observation also may have implications in studies on the use of whole seed as a speciality product for the high-producing dairy cow.

In addition to studies dealing with the production performance of conventional animals, considerable attention was given to nutrient availability studies. Digestibility studies are important in determining the overall nutritive value of rapeseed meal and have gained more prominence due to the advent of low-glucosinolate meals. Alterations to the carbohydrate complex whether by changes in processing technology or by genetic selection are likely to represent the next major advancement in meal quality. The interaction of the fiber components with nutrients in the meal is of major importance and in a study with rats specific water-insoluble carbohydrates were found to affect the absorption of low molecular weight compounds and to adversely affect protein digestibility. Several studies on amino acid availability also were reported and one study documented the important relationship between essential amino acids and crude protein content of rapeseed meal.

Three presentations dealt with the health implications of the use of

rapeseed oil in human diets. In one study histological examination of human heart samples on autopsy from three regions in India revealed no histological damage that could be attributed to the consumption of mustard oil. Another study reported on the effect of rapeseed and canola oil on the fatty acid composition of plasma phospholipids and the final study indicated the effect of level and ratio of n-3 and n-6 fatty acids on oil stability and its nutritive value for the growing rat. Further research will undoubtedly be conducted to substantiate and clarify the nutritional implications of fatty acid composition of the oil. In this regard, the relatively low content of saturated fatty acids, high level of oleic acid and relatively high level of linolenic acid are the attributes of the oil that have recently received considerable attention by health professionals. While rapeseed/canola oil is important in animal nutrition as a high-energy dietary ingredient the secondary effect of tissue deposition of fatty acids, particularly the omega-3 fatty acid and its derivatives, may have implications in human nutrition.

Although only 40 presentations were made in the nutrition section, they represented some significant and very exciting developments since the last international congress.