The 7th International Conference On Rabbit Production In Hot Climate, 8-12 September, 2014, 315-320

NOTE ON RABBIT FEED - SOLVING THE ERE CONUNDRUM WITH A TWO-COMPONENT FEED?

Robert Mc Croskey

9043 184 St. Surrey BC Canada V4N 3T7, bobmc@uniserve.com

ABSTRACT

Following years of digestive problems an attempt was made to create a novel two-component feed consisting of normal alfalfa-based feed pellets combined with flatted barley resulting in an essentially complete solution to the problems of ERE and similar conditions.

Key words: ERE (epizootic rabbit enteropathy), fibre, two-component rabbit feed.

INTRODUCTION

The world of science can perhaps be compared to the educational system, or an extension of the educational system, in that it allows the younger generation to gain an understanding of the ever-increasing body of knowledge in an orderly manner. Scientific knowledge is advanced step-by-step by the experimental process which attempts to isolate the variables so that an experimental result is as close as possible to a yes-no answer. However, on occasion it might be useful to advise the younger generation with the lifetime experience of an old retiree, so I offer these comments on how an improved feed was developed, and some suggestions for future research topics.

Solving the "brown wave": A 'brown wave" has been spreading over Europe since the mid-1990's, in the form of ERE (epizootic rabbit enteropathy), described in Licois (2008). The basis for the Licois paper is to find a medical answer to the problem. But what if rabbits actually have an immune system (Drouet-Viard & Fortun-Lamothe, 2002), and humans have simply been "flying the rabbit outside the envelope", meaning outside the rabbit's envelope of adaptability? What if the path of research following the "high fibre" doctrine has been an experimental dead end?

The propensity to rely on hard fibre or high fibre to solve digestive problems gained momentum around 1980 with two studies, Pote *et al*. (1980) and Cheeke & Patton (1980), and culminated in the final extreme measure of employing hardwood (alder) sawdust at this location and at Oregon State University. The sawdust was employed as an attempt to increase the supposedly desirable lignin level (Gidenne, 1998).

However, such treatment of the rabbit overlooks (details below): **A** - the possibility of damage to the delicate digestive tract of the very young rabbit as it begins to eat pelleted feed, **B** - the normal actions of the bacteria in rabbit digestion,

C - the physical characteristics of the caecal contents and **D** - the role of VFA's in handling gaseous digestive by-products and energy flow in the digestive system.

A - Perhaps the very young digestive tract can be damaged by a feed that appears to be suitable for a post-weaning rabbit. In Gidenne 2000 the author states: "*...little is still known about the digestion and nutritional requirements of the young rabbit before weaning."* I have found, at this location (McCroskey, 1996) in raising a coccidiosis-free herd since 1975, a feed evaluation of at least six weeks is necessary to fully evaluate a feed change. Perhaps this amount of time allows for a full generation of young rabbits to consume the feed from the time of their first meals to beyond the weaning stage.

B - Often, along the pathway of knowledge in rabbit nutrition, some important pointer is overlooked, such as the Lelkes (1987) review which states: *"...intestinal flora provides the signal for normal stool formation (Syed et al., 1970); it appears that the impactions seen in ME are directly attributable to a misplacement of normal colonic flora as an outgrowth of dysbiosis."* As well as informing the digestive system regarding type of stool to excrete, the microbial population is critical in converting gaseous digestive by-product into VFA's because the rabbit has no means of expelling digestive gases, either orally or rectally. If there is a failure in the microbial function, the entire digestive tract can become bloated with gas, as is seen in ERE.

C - There seems to be a disconnect between observed functions of the digestive system physiology and nutritional strategies. Some of these aspects could be topics for further research projects. The action of rabbit's teeth is overlooked - the teeth produce sharply cut fibre (**Figure** 1) compared to a hammer mill's "fuzzy" particles. Do the physical characteristics of the fibre particle affect transit? When a rabbit ingests a fresh blade of grass, it begins at one end of the blade and the action of the teeth and tongue fold the grass blade into an accordion-like block, which is swallowed whole, perhaps providing the full length of the grass blade's fibres to the digestive system. In the old days, before 1955, rabbit feed was made from grass pellets and the feed, the feces and the urine all had a characteristic smell which has never been duplicated since, and the rabbits were healthy. With the rise of alfalfa production, the grass pellet became relics of history.

Regarding the positioning of the caecum in relation to the body, it appears that rabbit mobility (or lack thereof) would necessarily affect caecal motility. Caecal content appears to be a thick fluid of small particles suspended in a matrix of hair (McCroskey, 1999b) - what comes first in digestive problems - a lack of swallowing hair or a sick feeling that terminates grooming? Note that if a litter is weaned, it may be significant that the litter is being taken away from the two biggest sources of hair - the nest and their mother.

Figure 1 . Rabbit-chewed straw particles (Mc-Croskey, 1999a)

D - There have been various attempts to increase VFA's (volatile fatty acids) especially butyrate, by employing feed additives, probiotics, etc., while overlooking Dr. Morisse's report that the resident VFA level is the amount <not absorbed> (Morisse, 1982), and that perhaps an increasing VFA level reduces motility of the caecum and colon (Gidenne & Pérez, 1993). The production of VFA's is critically important to the conversion of gaseous by-product to liquids while providing an important energy source for the rabbit. An important research project would be to illuminate the hydrogen pathway and energy flow in the rabbit.

In the past two years, I have made some changes to the feed, resulting in the problem of ERE being controlled from many losses to almost none. This herd of rabbits has over the years been sensitive to digestive malfunction, including the gaseous bloating of ERE and the related conditions of mucoid enteropathy and caecal impaction. These malfunctions seem to increase with attempts to increase fibre level, including feeding of supplementary wheat straw (actual straw, free choice, not pelleted). As a last resort, the attempted remedy described here was made by adding flatted barley grain to make a two-component feed. I will leave it to the research community to produce the required data sets.

If the rabbits are having trouble with ERE, it is possible that the fibre level is too high. Note that fibre which has been ground too fine is perhaps wasted space in the feed formulation (Mc Croskey, 1999a). To remedy an ERE situation, start with the same formulation that is causing the problem and add some flatted barley to the pellets. In our case, it was an alfalfa-based formulation with (as-fed basis) CP 18%, Crude Fat 3.5%, Crude Fibre (18% maximum and 14% minimum). To repair this feed flatted

barley was added at about 12% (10 -15%) of the total batch weight. Flatted barley means barley that is steamed then rolled in a crimped roller. This preparation of the grain preserves most of the particle structure of the grain, avoiding excessively fine starch particles which are perhaps inappropriate for rabbit (Gidenne & Pérez, 1993). The flatted barley and oil are added in the "tex line" at the top of the feed mill, the barley also gets the oil sprayed on it. **Figure 2** illustrates the two-component feed. There is no sorting out of either pellets or barley by the rabbits, they eat it all together. It is also possible to add the flatted barley into the mixer with the other feed ingredients, is does not create a break in the pellet.

Figure 2 . Two-component rabbit feed

Addendum - The above text was written in June 2013. In September 2013, there was an error at the feed mill and a batch of the two-part feed (normal pellets plus flatted barley) was made with the extra addition of 32% dairy protein supplement pellets at the inclusion rate of about 12% by weight, to make a three-part compound feed. The addition of the protein pellets would not alter the fibre level by much, but would significantly increase the total protein level. This three-part feed was fed from mid-September 2013 to the end of April 2014. There was no change at all with any aspect of the adult rabbits while consuming this three-part feed. However, if the three-part feed was fed to young rabbits, the same digestive problems again appeared as before the flatted barley was added. Therefore the young rabbits were fed a separate batch of the original two-component feed and they returned again to good health. This result could indicate that the digestive problem might be more related to the protein level than to the fibre level. The flatted barley could be providing an energy input necessary to assist in the

digestion of the protein content. If that is the case, and rabbit eats to satisfy both energy and protein requirements, it might be advisable to meet the energy requirement ahead of the protein requirement, which would provide the additional benefit of reducing nitrogen output from the rabbitry. Furthermore, the addition of fat as an energy source could be questioned because it supplies only energy and alters digestive transit time without providing complex carbohydrates.

***Additional recommendations for making a better rabbit feed*:** Never use the batch-to-grinder method; ingredients should be ground separately, for at least two reasons. The particle size in commercial alfalfa pellets is very close to the particle size generated by rabbit's teeth when they are chewing fibrous material (see **Figure 1**). Therefore, it is important that the commercial alfalfa pellets be broken down with minimum further reduction in particle size. The other main reason against using batch-to-grinder is that the natural pectins in the alfalfa can be employed as a pellet binder. I learned this from a retired nutritionist who spent his career at a number of feed mills. To allow the pectins to develop as an effective binder, the ground alfalfa has to be the first ingredient into the mixer. This is followed by about 20 litres of water per 400 kg of alfalfa. Other ingredients such as molasses and salt / mineral premixes can also be added at this time. It is important that the water be added as early as possible in the feed manufacture process - no amount of added steam in the conditioner can make up for not adding water to the alfalfa in the mixer - there just isn't enough time for the pectins to be developed at that later stage.

The benefits of adding this water are multiple - better quality of feed pellet with less fines generated, faster pelleting time and less wear on the extrusion die. Any other ingredients are added to the mixer after the water, molasses, etc., are mixed into the alfalfa. It is always better to not add fat or oil in the mixer. It is common practice here to use re-refined restaurant grease in animal feed, but you get better-tasting fat on the rabbit by not using that material. Make the pellet with no added fat, and then spray some good vegetable oil on the finished pellet following the cooling stage, at the rate of about 1% on as-fed weight basis. We use a good-quality corn oil resulting in very tasty rabbit fat, compared to an unpleasant greasy taste using re-refined fat.

In Conclusion, if your rabbits are having the digestive problems of ERE or mucoid enteropathy or ceacal impaction, try this two-component feed for the next batch of young rabbits as they begin to eat, this feed is simple to make and is safe to use and your level of losses should reduce.

REFERENCES

Cheeke P.R., Patton N.M. (1980). Carbohydrate overload of the hindgut, a probable cause of enteritis. *J. Appl. Rabbit Res.*, 3(3), 20-22.

Drouet-Viard F. and Fortun-Lamothe L. (2002). Review I - The organisation and functioning of the immune system: Particular features of the rabbit. *World Rabbit Science*, Vol. 10 (1), 15-23 and Review II - Diet and Immunity: Current state of knowledge and research prospects for the rabbit. *World Rabbit Science*, Vol. 10 (1), 25-39.

Gidenne T. (1998). Evolution nycthémèrale des produits de la fermentation bactérienne dans le tube digestif du lapin en croissance. Relations avec la teneur en lignines de la ration. *Ann. Zootech*., 35(2) 121-136.

Gidenne T. (2000). Recent advances in rabbit nutrition: Emphasis on fibre requirements. A review. *World Rabbit Science*, Vol. 8(1) 23-32.

Gidenne T., Pérez J.M. (1993). Effect of dietary starch origin on digestion in the rabbit. 2. Starch hydrolysis in the small intestine, cell wall degradation and rate of passage measurements. *Anim. Feed Sci. Technol*., 42, 249-257.

Licois D. (2008). *Domestic Rabbit Enteropathies*, In: 8th Congress, World Rabbit Science Assoc., Pueblo City, Mexico pp 385-403

Lelkes L. (1987). A review of rabbit enteric diseases: A new perspective. *J. Appl. Rabbit Res*., 10 (2), 55-61.

McCroskey R.A. (1996). *Raising Rabbits in Coastal British Columbia*. In: Proc. 6th Congress. World Rabbit Science Assoc., Toulouse, France. Vol. 3, 397-400.

McCroskey R.A. (1999a). Feed particle size and caecal function - A review. *Pan-American Rabbit Sci. Newsletter* ,Vol. 3(2), 6-39.

McCroskey R.A. (1999b). *Feed particle size and caecal function. Some new perspectives*. In: The First International Conference on Indigenous versus Acclimatized Rabbits. Sept. 1999, El-Arish, Egypt.

Morisse J.P. (1982). Taille des particules de l'aliment utilisé chez le lapin. Hypothèse de relation nutrition-pathologie digestive. *Rev. Méd. Vét*., 133 (10), 635-642.

Pote L.M., Cheeke P.R., Patton N.M. (1980). Utilization of diets high in alfalfa meal by weaning rabbits. *J. Appl. Rabbit Res*., 3 (4), 5-10.

Syed S.A., Abrams G.D., Freter R. (1970). Efficiency of various intestinal bacteria in assuming normal functions of enteric flora after association with germ-free mice. *Infect. Immun*. ,2, 376-386 (cited in Lelkes 1987).