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Introduction

During a time period when shortages, ecology, and conservation are routinely a concern to government, business, and individuals, there are renewed efforts to make food production more efficient. Recycling of animal wastes involves the refeeding of animal excreta to other or the same species of food producing animals usually as a fraction of the total diet. For centuries animal wastes have been recycled by allowing hogs to follow cattle and chickens to roam the barnyard. Animals will consume portions of their own feces when fed a diet deficient in certain nutrients.

The field of recycling animal wastes has really just become alive in the last five years and much more research is needed. Research to date has varied from analysis of the excreta to various methods of waste collection, processing, and refeeding. Research has not defined any one desired method of recycling, and the field is open to new ideas and practical research.

In this article we will attempt to give a broad over-view of recycling, including some general information on recycling, reasons for recycling, compositions of various animals' wastes, problems with recycling, and finally how the veterinarian needs to become involved with refeeding animal wastes.

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Need For Recycling

Refeeding animal wastes presents an opportunity to decrease the cost of meat-animal production. It is being proposed and research is supporting the idea that by substituting part of the animal's normal diet with excreta, we will reduce the amount of primary feed to produce a pound of meat. Recycling offers considerable advantage in finishing feedlot cattle where excreta can be used as a roughage factor. Wastes would be of considerable value in any ration where roughage is normally included. It may be possible to incorporate recycling in the least cost ration systems; however, there are some inherent problems. Some system of standards for collection and nutrient value needs to be developed before excreta can be accurately included in the least cost principle of ration formulation.

As our population continues to increase both in the U.S. and the world, we will need to produce more meat. Even with the great advances that crop production has made in recent years, it is difficult to imagine that continued strides can be made in the production of grain crops. It would certainly appear that this is another opportunity for the livestock industry to improve its production efficiency.

As we see periodic shortages and possible long term shortages of some nutrients along with rising costs, recycling would seem to be a logical and economical solution to part of the problem.

As the technology of synthetics increases, we will see our meat producing animals more and more in competition with textured vegetable proteins. Meat producing animals are very poor converters of vegetable protein and energy to edible meat products. It certainly would be much more efficient to use our grains as human food than it is to first feed the grains to animals and then consume the meat products. For example, here is a comparison of feeding 100 pounds of corn directly to a human with first feeding it to an animal and then feeding the meat, milk, or egg products to the human. The number of days refers to the number of days the product will feed one human.

Comparative efficiencies of 100 lb. corn:

Corn meal fed to humans	55.0 days
Dairy cattle (meat and milk)	17.7 days
Broilers	13.5 days
Layers	11.8 days
Hogs	11.0 days
Beef	5.1 days
Lambs	4.6 days

To further illustrate the inefficiency of beef, it takes 9 pounds of feed to produce 1 pound of body weight. One pound of body weight produces 0.6 pound carcass weight with 0.4 pounds as edible meat. Saying it another way, a beef animal, from the time it is conceived until slaughter at two years of age, will deposit in edible tissue only about 4 to 5 percent of the nitrogen it consumes. Even the high producing dairy cow has an efficiency of only about 25 percent. Therefore, we can see that meat, especially beef, is a luxury. It must be pointed out that our ruminants are in reality more efficient than the above table of comparative efficiencies would indicate. We must consider their ability to utilize roughages like grass, hay, corn refuse, and other cellulose containing plant products. It is also fair to say that some of the nitrogen excreted is recycled through the soil and back to the animal. By recycling, we would refeed many of the nutrients that our animals did not utilize on first ingestion and passage of the feed. As meat animals compete more with textured vegetable proteins, it will be most beneficial to be able to produce our meat more efficiently and allow a greater margin of profit.

Two other related factors that bolster advancement in recycling are the problems of waste handling and pollution. As labor costs increase and animal wastes are handled more by mechanized systems, it becomes much easier to implement recycling. The use of slats, paved lots, and liquid manure handling all lend themselves quite well to recycling the wastes. Recycling of the excreta would further economize those mechanized systems of waste handling. Since wastes do not become contaminated with bedding and dirt, recycling could be conveniently combined with those systems. For too long animal waste was thought of as a fertilizer and largely as a necessary evil; now, we can use it as an asset in meat production.

Wastes particularly become a problem in concentrated livestock production areas. In some operations where there is concentrated meat animal production, there may be little land for disposing of wastes; pollution may especially be a problem with this much specialization. These larger operations may more easily lend themselves to recycling if special equipment is needed or more sophisticated processing is desired. From early research, however, it appears that relatively simple methods of processing wastes may be able to be employed.

Composition Of Wastes

Essentially animal wastes are made up of feces and urine including undigested or residual nutrients of proteins, carbohydrates, lipids, and minerals, and another fraction consisting of the microbial mass formed in the intestines.

Considering all production-animal wastes, 28.8 million kilograms of total nitrogen are excreted each day. This is equal to about 70,000 tons of urea equivalent.

Large amounts of elemental phosphorous are excreted daily with about 40 percent of the total attributable to beef cattle and about one-third excreted via poultry.

Not even considering recovery of other nutrients, recovery of the nitrogen and phosphorous would be economically and ecologically significant. There are also significant amounts of energy still present in animal wastes that help make recycling favorable.

The composition of a particular sample of animal excretion will vary with the diet the animal consumes. Digestibilities of excreta also vary with the primary diet of the animal and with the animal to which it is fed. Also, the procedure of collection, handling, and processing will affect the nutrient composition.

Poultry Wastes

Poultry wastes tend to be the most consistent in composition. This is because production is mainly of the larger, more commercialized poultry operations and the more consistently high concentrate rations fed. Because of high digestibility, poultry wastes contain proportionately higher ash, about 28 percent. Of the ash content, eight to nine percent of it is phosphorous. With the high ration digestibility and ash content, poultry wastes are lower in energy. This low energy content limits the amount recyclable through poultry where a high energy diet is essential. The relative cost of phosphorous is the major factor determining the amount of waste that can be refed, economically.

The protein content of poultry wastes is about 34 percent, but this figure is significantly decreased with drying due to loss of valuable nitrogen compounds. About 35 percent of this nitrogen is in the form of true protein. With addition of litter and accumulation of wastes over time, more of the nitrogen will be true protein due to conversion of ammonia and uric acid nitrogen into microbial protein. It has been apparent that poultry house wastes contain significant quantities of essential amino acids. The amino acids in pure poultry wastes are apparently utilized by both laying hens and growing chicks. The non protein nitrogen (uric acid) is not utilized and may be toxic to poultry. As stated before, the primary deficiency in unadulterated poultry wastes is the low metabolizable energy present. The metabolizable energy content of poultry manure is about 487 Kcal M.E./lb. compared to yellow dent corn which is about 1550 Kcal M.E./lb. Poultry manure with litter can vary considerably in energy content due to the kind and amount of crude fiber that will be added through the litter.

Several conclusions can be drawn from the research conducted on recycling poultry manure to chicks. First, dehydrated poultry manure is deficient in metabolizable energy and if used in poultry feed formulation, the metabolizable energy value must be compensated by adding fat or other high-energy feeds. Secondly, the chick can apparently utilize non-essential amino acids which are found in the true protein portion of the dried poultry waste. Thirdly, the nitrogen present as uric acid in the waste is not utilized by the chick.

Dehydrated poultry waste can be used in rations for laying hens at levels up to 25 percent of the total diet without decreasing egg production. For longer term feeding, levels of 15 to 20 percent may be more advisable. Dehydrated poultry manure is a low-energy, low-protein material and appears to have a utilization of 30 to 35 percent when incorporated in laying hen diets.

Another more feasible plan of poultry waste utilization is the feeding of poultry excreta to ruminants. Digestibility of poultry wastes in sheep has been shown to be about 65 percent for rations containing up to about 57 percent dried poultry wastes. Dried poultry wastes have a protein digestibility coefficient of 55 to 75 percent depending if litter is contained. The nitrogen content of poultry wastes seems quite well utilized by ruminants.

Cattle Wastes

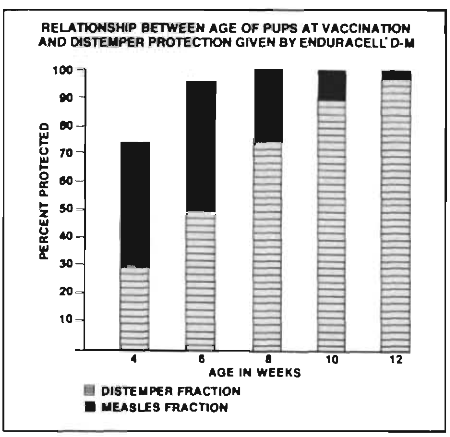
Ruminants produce about 24.0 million kilograms of nitrogen and about 4.2 million kilograms of P_2O_5 waste per day. Research has shown that digestibilities of 50 to 71 percent, respectively, can be expected for dry matter and crude protein even if the waste is contaminated with some feedlot dirt. The nitrogen present is fairly well utilized, but dry matter digestibilities drop considerably for manure from dairy

Susceptible to canine distemper?

Maybe yes, maybe no.

At six weeks of age, a puppy's maternal antibody level may still be high enough to ward off canine distemper, as well as override regular distemper vaccine. Or the pup may have lost his maternal immunity and be fully susceptible. There's no easy way to tell. One guess is as good as another.

Now there's Norden 'Enduracell D-M' especially for puppies . . . which helps put an end to the "when to vaccinate" guessing game. *This combination distemper-measles vaccine offers dependable protection at 6 to 12 weeks of age*— even when the level of maternal immunity is too strong for success with regular canine distemper vaccines. Since the two immunizing agents act independently, over 96% of all puppies will be protected at 6 weeks of age as compared to only about 50% with regular distemper vaccine.



The introduction of 'Enduracell D-M' means that a significant number of young puppies which otherwise might suffer or die from exposure to canine distemper prior to initial vaccination can now be protected.

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Corn-fed cattle feces seems to have a digestibility of only about 40 percent. It does not appear that animal wastes as an energy source for cattle should be a primary nutrient consideration. However, recycled waste replaces roughage quite well in many bovine diets.

Cattle wastes have a dry matter content of about 18.9 percent and ash content of about 14 to 16 percent. About 15 percent of the ash is calcium and phosphorous. About 52 percent of the nitrogen present in cattle wastes is alpha-amino-nitrogen. One third of the dry matter is made up of bacterial biomass. The percentage, however, will vary with the amount of roughage in the diet.

There are many different processing methods being developed to improve cattle wastes as a feed. It has been demonstrated that cattle will readily consume processed manure up to 40 percent of a basal ration; therefore, palatability does not appear to be a problem when processing is satisfactory.

One method being studied at the present is that of feeding animal waste nutrients from a cattle confinement oxidation ditch system. In this research the animal waste was pumped directly from the oxidation ditch and into a mixer wagon with regular ration material. For this aerobic oxidation ditch material, dry matter was about 6 percent, crude lipid 4.3 percent, ash 17 percent, calcium 2.8 percent, phosphorous 1.0 percent, fiber 34 percent, and crude protein from 36 to 40 percent. Of the crude protein, about half of it is alpha-amino protein of bacterial and plant origin. From the initial research on the oxidation ditch system, it would appear that this animal waste has an acceptable nutritional value and can be used as a partial protein and mineral supplement. The high moisture content (94 percent) precludes its use in the ration at a level sufficient to meet all the supplemental protein need, unless in this ration dry matter adjustments are made. However, from subsequent work done at Iowa Beef Producers in Denison, Iowa there appears to be some questionable negative effect on cattle performance, probably a palatability effect. So at this time, it appears that more research will be needed to determine optimum feeding levels and conditions. It will also be necessary to evaluate animal health factors associated with the oxidation ditch.

Besides other more sophisticated methods of animal waste preparation, ensiling of animal excreta has received considerable attention. About every three days excreta is collected from the feedlot floors and prepared in a "wastelage" combination to be ensiled. Approximate levels of 40 percent corn grain, 40 percent animal waste, 18 percent corn silage, and a balanced supplement are simultaneously added and ensiled. Research is being done on this procedure.

Swine Wastes

Research is being conducted on recycling swine wastes both as dried swine feces and fluid from an oxidation ditch. Dried swine feces have been added to swine diets up to 15 percent while sustaining performance. The other method of recycling has been through an oxidation ditch. The oxidation ditch is quite successful as a nonodorous means of waste management and works quite well as a fermentation vat for the biological enhancement of swine wastes. During this process, amino acids and vitamins are produced and minerals are recycled. Enough of the products from the ditch are refed, so that no effluent must be discharged from the ditch. Pollution is minimized while providing a source of nutrient recycling. This research has been conducted at the University of Illinois, primarily.

Problems With Recycling and the Veterinarian's Role

Before recycling of animal wastes can be used extensively, many basic questions must be answered and some serious problems must be coped with.

Probably one of the most basic problems is standardization of the wastes; that is, some sort of standard values for nutrients and materials contained in animal excreta. This will probably never be answered with just one set of standard values for different species, rations, environments, methods of collection, and methods of processing. Contending with this problem will probably require research on general type rations and then close surveilance when dealing with individual recycling situations. As far as this problem is concerned, veterinarians could assist with evaluation of animal wastes to determine what nutrients had to be added to balance a ration. This whole problem is related to the total management of the recycling operation. If not closely monitored and controlled, recycling could quickly become a deficit rather than an asset. So even more than now, the management and veterinarians will have to be concerned with quality control of the total operation. It is probably this whole area of management and nutrition that meat animal practitioners have been more deficient in the past. We must continue to bring ourselves up to date in management and nutrition if we are to help food animal producers employ recycling. It is proficiency in these areas that will make veterinarians better management consultants rather than only disease trouble shooters.

In many small communities where it is impossible to have nutrition experts as we have at our universities, the veterinarians will be some of the most educated and best qualified personnel to consult recycling operations. In these situations and even in more sophisticated operations, veterinarians will be able to couple the management of recycling and disease prevention to make recycling successful. But as previously stated, veterinarians must become more proficient in herd health, herd management, and nutrition to help recycling concepts succeed. With the cooperation of nutrition experts and well-informed veterinarians in the field, recycling has a better chance of succeeding at the family farm level.

Another very closely related problem is that of transmission of disease through recycling. Very little actual research has been done specifically on disease transmission; rather, the work reported is observation made while doing other work. The field of research is wide open for cooperation between animal science and veterinary researchers to do control research on the presence of pathogenic organisms and the possibility of disease transmission. Even after research has been done, it will be very much up to practicing veterinarians to apply research and deal with disease problems confronted by individual recycling operations. Just to mention some of the things we will have to consider in research and the field, study is needed on bacterial pathogens, a host of viruses, and possibly some species of parasites.

Toxicological and drug residue problems have also been suggested and experienced with some of the recycling that has already been completed. Copper poisoning in sheep and nitrate poisoning in swine have already been experienced. Drug residues in the feces and urine of animals on medicated diets can easily be foreseen as a problem. Work will need to be done to see what residues are present, which ones are harmful, and what will need to be done with wastes from treated animals.

In order to implement recycling, animals will have to be completely confined or at least semi-confined. This will involve some expense, but this confinement will also improve production efficiency, decrease pollution, decrease labor costs, and improve the aesthetics of beef production.

Aesthetics has also been discussed as a problem with recycling. In time, with cost consideration, consumers will probably accept the concept of beef fed recycled wastes. It is important, however, that the beef industry not have a confrontation on beef quality or human health safety concerning recycling.

Summary

The main advantage of recycling would be the potential conservation of nitrogen,

phosphorous, and essential mineral elements. As an energy source, the value of recycled wastes would be of limited value; however, it may be of some value in a situation of roughage replacement. Two other related advantages would be pollution control and waste disposal.

There are many disadvantages at the present time but with research and experience, recycling will certainly prove to have economic value. As stated in the article, cooperation among animal science people, nutritionists, and veterinarians will certainly be beneficial in implementing recycling.

In regard to disease control and making recycling available to the smaller operations, veterinarians have an excellent opportunity to be of service.

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Mandibular Sialoadenectomy

by
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The two indications for a sialoadenectomy are in cases where there is either a sialocele (cervical salivary gland cyst or mucocele) or a sialadenitis where medical treatment has not been successful. These two conditions will be discussed in depth separately.

Sialadenitis

Sialadenitis is an inflammation of the salivary glands. This condition is rare in dogs and cats, as the salivary glands rarely become infected.

Sialadenitis can be due to several different causes. It can be due to trauma to the head and neck, oftentimes due to bite wounds. Or the infection may spread as an ascending infection from the mouth, or it could be as a result of a migrating foreign object.[7]

The glands most commonly infected are the zygomatic, parotid and mandibular glands.

The clinical signs associated with a sialadenitis would be a swelling over the gland region with a corresponding increase in body temperature. Also noted would be pain when the animal eats.[3] If the zygomatic gland were involved, there would be a characteristic swelling of the eye region.

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