

AGRICULTURAL EXPERIMENT STATION  
Oregon State College  
Wm. A. Schoenfeld, Director  
Corvallis

Circular of Information No. 282

August 1942

RABBIT PRODUCTION FOR MEAT

by

M. P. Chapman  
Research Assistant in Veterinary Medicine  
and  
R. E. Dimick  
Head, Department of Fish and Game Management

Introduction

Since the outbreak of war, there has been a marked demand in Oregon for information on the raising of rabbits for meat production. Although the Oregon agricultural experiment station has not extensively investigated rabbit problems, some general service work with these animals has from time to time been rendered the citizens of the State. Most of the important rabbit research work in this country has been done by the United States Fish and Wildlife Service. This federal agency has operated for a number of years the United States Rabbit Experiment Station at Fontana, California.

The domestic rabbit should serve an important role in the war effort in meat production, in the felting and fur industry, and in laboratory and experimental medicine. In Oregon the consumption of rabbit meat in the past has not been large as compared with some of the other sections of the country. Most of the rabbit production of the State has been limited to small backyard units of a few hutches each for home and local consumption. Several commercial rabbitries located in and near Portland have been in operation for a number of years.

Every pound of rabbit meat produced will aid in the war economy since this will make available a pound of some other variety of meat needed to feed the armed forces. Rabbit meat is highly nutritious, palatable and about 80 percent of the carcass is edible. Meat production is extremely high in relation to the amounts of forage fed the animals. Also, rabbits under proper management will increase in numbers more rapidly than many of the other domestic animals utilized for meat.

The normal importations of rabbit skins from foreign countries used extensively by the fur trade have been curtailed by war conditions. The demand for felt and fur linings has been greatly increased in supplying some of the necessary clothing and equipment needed by the armed forces. Rabbits are used in laboratories and hospitals in testing for certain human and domestic animal diseases and in the making of some biological products used in combating sickness.

## SOURCES OF RABBIT INFORMATION

Several excellent bulletins dealing with domestic rabbits have been published by the federal government which may be obtained from the Superintendent of Documents, Washington, D. C. Some of these are:

1. Rabbit Production, Farmers' Bulletin 1730. This publication is now out of print but copies are available in most public libraries.
2. Rabbit Parasites and Diseases, Farmers' Bulletin 1568. Price 5 cents.
3. Pseudopregnancy in Domestic Rabbits, Wildlife Circular 4. Price 5 cents.
4. Fryer Rabbit Production, Wildlife Leaflet 173.
5. Principles of Breeding Rabbits, Wildlife Research and Management Leaflet BS-101.

## RABBIT BREEDS

One of the first questions asked by a prospective rabbit raiser is what breed of rabbit should be purchased for meat production. There are a large number of domestic rabbit breeds and varieties, some of which are specifically useful for meat and others for fur and wool, laboratory animals, and fancy stock. Some of the varieties most commonly raised for meat production are the New Zealands, Flemish Giant, French Silver, American, and the Beveren. White rabbits are more desirable for their skins, usually bringing higher prices.

Care should be exercised in selecting breeding stock. Generally best results may be had by purchasing animals from reliable breeders in near by localities who will give a reasonable guarantee of the animals which they sell. The animals should be healthy, free from disease, and possess the ability to reproduce healthy offspring of desired quality.

The beginner with rabbits, like the beginner in practically all phases of the livestock business, should commence with a small number of animals as a foundation stock. As experience is gained the number of rabbits may be increased. However, the main place of rabbit raising in the war effort appears to be that of supplementing the family meat supply. This can be accomplished by keeping a few rabbits consisting of three or four does and a buck in the backyard. The novice with little or no experience with rabbits and in animal husbandry is very apt to fail in a large sized commercial undertaking in rabbit raising.

## HOUSING AND EQUIPMENT

Many types of rabbit houses called hutches are in use and have proved satisfactory. Construction should also be of a type that will facilitate the tasks involved in feeding, breeding, handling of the animals, and in keeping the structures sanitary. Rabbits should be protected from strong drafts and winds and from high temperatures. Hutches should be constructed and located in areas so that the rabbits will be protected from rain.

Usually the hutch contains a space of about  $2\frac{1}{2}$  feet deep, 3 or 4 feet long and  $2\frac{1}{2}$  feet high. Frequently hutches are constructed in double and triple tiers, but where space is not a factor, the single tier hutches are more desirable. One of the common types of hutches used in Oregon has the sides and back of wood, the front a wire door, and a projecting wooden roof covered with building paper. Some have sides of wire.

Hutch floors may be wooden slats spaced about  $\frac{5}{8}$  inches apart; galvanized hardware cloth, 19 gauge, having a  $\frac{5}{8}$  inch mesh; or solid boards which slope gently to the front of the hutch.

A nest box that has proven satisfactory is a rectangular wooden box about 16 inches long, 12 inches high and with a movable lid. The entrance which is usually 6 inches square is located at an upper corner on one of the long sides and is about 6 inches from the bottom of the box. This depth below the entrance prevents the young from crawling out into the hutch before they are able to care for themselves.

Other equipment consists of feeding troughs or pans and a crock for water. Fresh clean water should be available at all times for the rabbits.

#### BREEDING

The medium sized breeds of rabbits first mate at about 7 months of age and the giant breeds at about 9 to 12 months. Since some individuals will mature more rapidly than others, it is a good policy to observe the actions of the does as indications of the initial breeding period. Indications of sexual maturity in the doe are marked restlessness, efforts to join other nearby rabbits, and the rubbing of the chin against various structures in the hutch. Matings should be made at this time. The accepted practice is to take the doe to the buck's hutch for service. Matings usually take place at once.

When the doe does not accept service readily she may be restrained by holding. This is usually accomplished by the operator using the right hand to hold the ears and a fold of skin over the doe's shoulders, with the left hand under the body and between the hind legs. The thumb is placed to the right of the vulva and the index finger on the left side, with sufficient pressure to press the skin gently backward. The tail of the doe is then forced upward over the back. The left hand is also used to support the hind quarters of the doe at the proper height for mating.

One buck can service about ten does. Only one service per doe is necessary. The female rabbit, unlike many other domestic animals, has no regular heat period. In the doe, the sex cells are continually being developed in the ovaries but are not released until mating occurs or the doe has become sexually stimulated in some other manner.

The normal gestation period is 31 to 32 days. False pregnancies sometimes occur caused by infertile matings or by sexual stimulation resulting from does riding other does. Usually a false pregnancy continues for 17 days after which the doe will pull hair and attempt to make a nest.

Besides false-pregnancies, other failures to reproduce young may result from the females being too young at the time of first mating, too old to be fertile, in poor physical condition, being abnormally fat, having sore hocks or other body injuries, in the molting period, or being sterile.

## KINDLING

On the twenty-seventh day following mating, straw should be placed in the nest box. Care should be taken at this time to avoid disturbing the doe as much as possible. The doe will line the nest with fur from her body. A day or two before the birth of the young, known as kindling, the female will usually eat less food than normally. Many rabbit growers give the female at this time a small amount of appetizing green food.

The litter may be inspected when two days old. The usual number is about 6 or 8 young and seven is considered an ideal number to leave with the doe. The excess numbers in a litter may be transferred at about two days old to other does who kindled about the same time and have small sized litters.

Frequently inquiries are received concerning does that eat their young. It is thought that this situation may result from inadequate rations or excessive nervousness of particular females. A doe that destroys her litters more than once, when fed proper foods, should be butchered for meat.

Does should nurse their young for 6 to 8 weeks. At 8 weeks the young should be completely weaned. Some growers separate the offspring from the mother at this time.

By proper management three or four litters can be produced in a year. This requires that the doe be mated at the time each litter is weaned.

## FEEDING

The success of rabbit production depends to a large extent upon the feeding of rations containing a balanced diet of digestible proteins, carbohydrates, fats, vitamins, and minerals. This can be accomplished by feeding various grains, protein supplements, legume hays, green feeds, and root crops. The choice of grains and hay depends mainly upon the costs and availability and many rabbit growers are able to grow some of the foods upon their premises.

Many feeding formulas have been devised and found to be satisfactory. The following were recommended by the United States Department of Agriculture in Farmers' Bulletin 1730, Rabbit Production:

A. Concentrate mixtures (by weight) for dry does, herd bucks, and developing does and bucks.

### Mixture no. 1

- 2 parts whole oats.
- 1 part whole wheat.
- 1 part whole-grain sorghum or barley.
- 1 part pea-size soybean or linseed cake, or pelleted soybean, peanut, sesame, or linseed meal.

### Mixture no. 2

- 2 parts whole oats.
- 2 parts whole wheat.
- 1 part pea-size soybean or linseed cake, or pelleted soybean, peanut, sesame, or linseed meal.

## Mixture no. 3

- 2 parts whole grain-sorghum seed.
- 2 parts whole barley.
- 1 part pea-size soybean or linseed cake, or pelleted soybean, peanut, sesame, or linseed meal.

Mixture no. 4 (This mixture should be dampened slightly just before it is fed, to prevent the meal from settling out and being wasted.)

- 1½ parts rolled oats.
- 1½ parts rolled wheat or barley.
- 1 part corn meal.
- 1 part soybean, peanut, sesame, or linseed meal.

B. Concentrate grain mixtures (by weight) for does and litters.

## Mixture no. 5

- 2 parts whole oats.
- 1 part whole wheat.
- 1 part whole-grain sorghum or barley.
- 2 parts pea-size soybean or linseed cake, or pelleted soybean, peanut, sesame, or linseed meal.

## Mixture no. 6

- 1 part whole oats.
- 1 part whole wheat.
- 1 part pea-size soybean or linseed cake, or pelleted soybean, peanut, sesame, or linseed meal.

## Mixture no. 7

- 1 part whole grain-sorghum seed.
- 1 part whole barley.
- 1 part pea-size soybean or linseed cake, or pelleted soybean, peanut, sesame, or linseed meal.

Mixture no. 8 (This mixture should be dampened slightly just before it is fed, to prevent the meal from settling out and being wasted.)

- 1 part rolled oats.
- 1 part rolled wheat or barley.
- 1 part corn meal.
- 1½ parts soybean, peanut, sesame, or linseed meal.

The legume hays usually fed to rabbits in Oregon include alfalfa, sweet clover, and vetch. This hay should be green in color, leafy, well cured and free from dust or other foreign materials. Green feed commonly includes lawn-clippings, cabbage, kale, rape, and waste from vegetables. Root crops frequently used are carrots, mangels, turnips, and beets.

Miscellaneous foods such as dry bread and milk are sometimes fed and some growers believe that this is an especially satisfactory food for does with litters. Salt should be available in small blocks at all times or it can be included in the mixed feed.

There is considerable variation in the number of times a day rabbits are fed by various persons. Some feed once a day and others twice or three times a day. Unusually, dry does and herd bucks are fed a grain mixture once a day. The amount being that which will be consumed readily in 20 or 30 minutes. Individual rabbits vary in the amounts of food required. Does with nursing litters should be given sufficient grain mixtures for a 24-hour period. Growing rabbits should be fed all the grain mixture they will consume.

Legume hay should be available at times. Green foods and root crops should be fed sparingly as a supplement to legume hay, especially to rabbits not used to such kinds of feed.

### DISEASES OF RABBITS

Diseases of rabbits, as in many of our other domestic animals, must be studied from a viewpoint of prevention rather than treatment. The very nature of properly-constructed hutches makes many of the disease problems easy to control. By the observance of a few of the simple rules of sanitation and good husbandry, most parasites and many of the bacterial diseases are self-eliminating.

It is our purpose to set forth some of the rules that must be observed and an explanation of these rules will then be given in more detail.

1. Do not use old hutches until they have been thoroughly cleaned and disinfected.
2. All breeding stock must be free of disease.
3. All new additions of breeding stock must be held in quarantine for at least two weeks.
4. Whenever a rabbit dies, its pen should be cleaned and disinfected before any new animals are added to the pen.
5. Whenever a rabbit becomes sick, it should be removed to an isolation pen until it is disposed of or recovers.
6. All dead animals must be properly disposed of.

Some suggestions will be made as to the best methods of carrying out the above rules.

The best way to clean a rabbit hutch is to scrape free from the boards or wire all dirt and fecal material, using a putty knife and a wire brush. The hutch should then be scrubbed with a stiff brush and scalding lye water. The lye water is made by adding one pound of commercial lye to ten gallons of boiling water. It is advisable to wear rubber gloves and glasses in this operation to protect the hands and face. After the pen has been washed down, the excess lye water should be rinsed off with clear water. Following this, the wire and metal parts should be gone over with a blow torch. Good cleaning equipment is the most economical investment in the rabbitry.

It is difficult for the layman to select breeding stock that is free from disease. The best assurance one can have is to buy stock from a reliable dealer who is known to be a successful rabbit raiser. Coccidia and other intestinal parasites can be determined by microscopic examination of the fecal material, which must be done by a person trained in this type of work.

By having a quarantine pen that is set aside from the main hutches, it is often possible to prevent the introduction of disease. If the new stock is isolated in this pen for two weeks, most of the diseases to which it may have been exposed will have developed by the end of this time.

Rule number four could read "Never take chances." It is just good common sense to clean house before the new tenant arrives, so whenever a rabbit dies, thoroughly clean the hutch and equipment before new stock is added.

The isolation pen for sick rabbits should be one that is warm, well ventilated, easy to clean, and away from the colony hutches. It should be provided with plenty of fresh, clean water and dry, clean bedding. The sick rabbit should be tended after the others and not before. It is often best to have a member of the family who does not tend the breeding stock look after the isolation pens. This will prevent the possibility of disease being carried from pen to pen. It is well to wear rubber gloves while tending the isolated rabbits, as they can be easily cleaned and disinfected.

Proper disposition of diseased stock is always important and there are only two methods that are satisfactory. The best method is to burn the carcass, and many rabbitries have a burner for this purpose. The next best method is to bury the carcass, but it must be buried deeply enough so that it will not be dug up by dogs. It is always best to cover the carcass with lime when it is buried. Burning is by far the easiest and best method of disposing of dead stock.

In the disoussion of rabbit diseases, it is not our plan to cover all the diseases and parasites, but to limit our scope to those that are more or less common to Oregon. We are guided in our topics by the diseases that have been reported by or diagnosed by the Veterinary Department of Oregon State College.

Diseases and parasites will be discussed under the following headings:

- External parasites
- Internal parasites
- Bacterial and virus diseases
- Injuries and accidents

#### External Parasites

Of the external parasites, the most important are the mange mites. A mite is a very small animal organism that for the most part is just in the range of normal vision. They are free-living and those found on rabbits burrow into the skin.

#### Ear Mange

The most common are the ear mange mites that cause the disease known as ear canker. There are two species of mites that can cause this disease, but since the treatment and control are the same they can be considered together. The mite burrows just under the skin and sets up an inflammation that causes a flaky crust to be formed. This usually starts deep in the ear and extends outward until the crust is clearly visible. On some occasions the inflammation will extend into the middle ear and even to the coverings of the brain itself.

The symptoms of this disease are nervousness, shaking of the head, scratching of the ears, or in some cases the twisting of the neck until the head is held in an oblique position (Wry Neck).

Diagnosis is made by looking in the ear and finding the canker. In early cases it is deep in the ear canal and may be difficult to see. Microscopic examination of ear scrapings will reveal the mites.

This is one of the rabbit diseases that can be treated successfully. The ear is first cleaned by moistening the scab with some cottonseed oil and picking it loose with a pair of tweezers. The ear is then cleaned as much as possible with cotton swabs. After the ear is cleaned it is swabbed with one of the following preparations:

Tetrachlorethylene 2 cc.  
Cottonseed oil 1 oz.

or

An oily solution containing 2% pyrethrum extract

This operation must be repeated every six to eight days until the ear appears normal. Remove the animal to an isolation pen while treating and thoroughly clean its pen before returning. While treating and removing the scabs, the rabbit should be placed on a piece of paper, then the paper with all the crust should be burned.

### Skin Mange

Skin mange is rare, but is occasionally seen in domestic rabbits. This disease is also caused by mites, but a species different from those causing ear mange. There are two species of skin mites, but they can be considered as one as far as control and treatment are concerned. These mites burrow deeper than the ear mites and because of this are much more difficult to treat.

The symptoms are scratching and rubbing of the affected parts. The condition usually first appears around the nose and side of the face and spreads from there to the ears and under the chin. In extreme cases the lesions may even spread to the legs and body. The severe itching causes an inflammation that leads to the formation of a serous exudate that dries into a hard scab. There may be secondary bacterial infections that cause open sores about the affected parts.

Unless the rabbit has unusual value as a breeder or show animal, it is far more economical to destroy the animal than to attempt treatment. This form of mange spreads very rapidly and will cause heavy loss unless it is brought under control very early. The hair around the scab should first be clipped, then the scab softened with cottonseed oil. If the scab is heavy it should be worked loose, and a sulphur ointment applied, which is made up as follows:

Sulphur 1 part  
Lard 3 parts

This must be rubbed well into the mangy areas every fourth day. Some have suggested the use of lime sulphur dip, but the disadvantages of this are that it is quite irritating to the eyes and hard to apply without getting some in the eye. Derris or pyrethrum extracts that are made up for the treatment of mange in dogs have been suggested as being of value.

Another preparation can be made by mixing 1 part finely-powdered pyrethrum flowers and 9 parts of vaseline. Rub well into the affected parts. Treat one week following apparent recovery.



Following an outbreak of skin mange, every sanitary precaution mentioned earlier must be followed out to prevent its spread and reoccurrence.

### Lice and Fleas

Lice and fleas have been occasionally reported but are not common. If they are found, the animal should be placed on a paper and sprinkled with a pyrethrum powder for lice or derris powder for fleas. After the powder has been on the rabbit for about a half hour, it should be brushed off and the brushings burned. The operation must be repeated in about ten days. In the case of lice, the eggs are on the body of the rabbit, being attached to the hair, but in the case of the fleas the eggs hatch and develop off the body, usually in corners or cracks of the floor of the hutch, thus unless the hutch is cleaned the rabbit will soon be reinfested.

### Internal Parasites

The intestinal parasites are classified as protozoa, roundworms, tapeworms and flukes. In wild rabbits or in rabbits that are raised under insanitary conditions, any of the above groups of parasites may become a serious problem, but with the advent of the modern hutch and daily cleaning practices these parasites can largely be avoided.

### Coccidiosis

The most widespread and important disease of domestic rabbits is coccidiosis. This disease is not only important because of the total number of deaths that it causes, but also because of the retarded growth of the rabbits that survive the acute form of the disease.

Coccidiosis is primarily a disease of young rabbits but may also cause considerable loss in adults, particularly those that have not previously had the disease.

This is not a new disease. It was first reported in 1838, when Carswell noticed the lesions of the liver form of coccidiosis. He made drawings of the lesions and thought they were tubercles. The following year, 1839, Hake found the oocysts in the liver and small intestines. It is even possible that Leeuwenhoek was describing oocysts as bile bodies as early as 1674.

It was not until domestic rabbits became a commercial enterprise that coccidiosis passed from the realms of parasitic curiosities and became regarded as an important disease.

The coccidia are small single-cell animals that cannot be seen without the aid of a microscope. There are many different kinds of coccidia but fortunately the vast majority of them are host-specific. That is, the coccidia of rabbits will not infest chickens or other animals and those of chickens and other animals will not infest rabbits. Coccidia of rabbits have not been proven able to infest any other animal.

The life cycle of the coccidia must be understood if the disease and its control are to be understood. Since the life cycle of both the liver and intestinal coccidia is the same, we will give only one, the liver coccidia, in detail.

We will begin with the form called the oocyst as it appears in fresh fecal material. This is a small egg-shaped body that is flattened on one end and contains a large central body closely resembling in size and shape the yolk of an egg. This form is not infective and if fed to a susceptible animal will not produce the disease. If this oocyst is kept moist and warm it will sporulate in 24 to 72 hours, depending largely upon the temperature. By sporulation we mean that the central body has divided into four smaller bodies that are called sporocysts. Each of these sporocysts then divides into two smaller bodies. Thus the original oocyst now contains eight bodies called sporozoites. This is the infective stage and when taken into the body with contaminated food or water the shell of the oocyst and sporocyst is digested and the eight infective forms are freed. These then migrate up the common bile duct until they reach the liver, where they enter the epithelial cells of the small bile ducts.

After entering the cell, they reach maturity by undergoing a number of changes during which further multiplication takes place. Finally, the form referred to as the oocyst is again reached and passes to the intestinal tract through the common bile duct. From there, it reaches the exterior with the fecal material.

There are two forms of coccidiosis in rabbits, as already stated, and we will take them up individually, first calling your attention to the fact that both forms may be and often are seen at the same time in a single rabbit.

#### Liver Coccidiosis, or Spotted Liver Disease

This form of coccidiosis is caused by a coccidium called Eimeria stiedae, the life cycle of which was just given.

This disease is most often seen in young rabbits about three or four weeks of age, and they frequently die in large numbers. If these rabbits survive this acute form, as they often do, then we see what we call the chronic form of the disease. These rabbits seldom do well and the owner notices that they do not eat as well as the others nor gain weight. They are listless, have poor hair coats, and usually become pot-bellied. Some of them will survive and reach maturity, while others slowly waste away and die. It is also well to state at this time that on some occasions the infestation will be light and the owner may not notice any of the symptoms described above and will not be aware of the disease until the rabbits are dressed, at which time he notices the white spots of the liver.

The lesions of this disease are characteristic and do not closely resemble any of the other diseases of rabbits. There are white spots on the liver that, when cut, will liberate a white creamy material. These spots are usually irregular in outline and will vary from the size of a pea to that of a lima bean. There may be only a few spots or the liver may be almost entirely destroyed by these areas. Another lesion that is often seen is edema or fluid in the body cavity. This fluid is usually thin and slightly blood-tinged.

#### Intestinal Coccidiosis

This disease is caused by a different coccidium, the Eimeria perforans. The life cycle of this organism is the same as the Eimeria stiedae except that instead of the sporozoites entering the bile duct, they migrate along the intestinal tract and enter the cells of the lining of the small intestine.

The symptoms of this disease are much the same as for the liver form, except that during the acute stages there is more apt to be a severe dysentery. This form of the disease is usually referred to as rabbit dysentery; however, there are many things other than coccidiosis that will cause dysentery in rabbits. Following the acute stages, the rabbit may make a slow recovery or may linger for some time before death. Externally, it is difficult at times to tell which form is causing the trouble. This can be determined by microscopic examination of the feces or by post mortem examination of one of the sick animals.

The lesions of the intestinal form of the disease are not so pronounced as those of the liver form. By careful examination of the small intestine, small white spots may be noticed through the intestinal wall. These spots are much smaller than those seen in the liver. Upon opening the small intestine it may be noticed that the lining of the intestine is inflamed and there may even be some blood free in the intestinal canal.

Many animals recover from both forms of coccidiosis or may have the disease and show no symptoms, but the cure cannot be regarded as complete. These recovered rabbits usually become chronic carriers and will continue to shed coccidia for the balance of their lives. This is the reason that so many litters of rabbits develop the disease even though the doe appears to be in the best of health and may have kindled in a new hutch.

The most effective way to control coccidiosis is by using the modern type of self-cleaning hutch. Hutches of this nature have a tendency to reduce the extent of the initial infestation even though not preventing the disease entirely. It must be kept in mind that good hutches will require constant attention, as there are always platforms, corners, feeding and watering equipment that must be regularly cleaned. The coccidium is a very resistant organism and most disinfectants used to destroy it are worthless. Mechanical cleaning with a good wire brush and putty knife is quite effective. Following good mechanical cleaning, the pen may be washed with scalding lye water. The temperature of the water is important. It should be boiling hot and freely applied. Wire parts can be flamed with a blow torch. All feeding and watering equipment should be removable and cleaned at regular intervals. Placing this equipment in boiling water for several minutes will kill the coccidia. Regular cleaning is practiced by all successful rabbit raisers and by such regular practices the incidence of coccidiosis is kept at a minimum. If there is an outbreak of the disease, then a complete cleanup should be made every day during warm weather and at least every other day during cool weather.

The most common question asked is regarding treatment. Up to the present time, no treatment has been reported to be of any value under controlled experiments. Many treatments have been tried and under controlled conditions have been no more effective than the sanitary recommendations that are advised with the treatments. It is a common practice to sell a patent remedy and with it insist on a good sanitary program to be carried out in conjunction with the treatment. It has been learned that these treatments are no more effective than the sanitary program that is followed.

#### Other Internal Parasites

As has been stated before, roundworms, tapeworms and flukes are occasionally found in domestic rabbits, but seldom do they ever become a serious problem except where rabbits are raised on the ground or on solid floors. Seldom have any of these parasites or their eggs been seen during examinations in this laboratory.

Heavy infestations of any of these parasites may become serious, especially in young rabbits, but in clean hutches the possibilities of attaining such an infestation is remote. The symptoms of such infestations would closely resemble those of coccidiosis. Diagnosis would depend on finding the worms, flukes or their eggs. Treatment would depend on the class of the parasite found and no general statement for all parasites can be made.

Tapeworm cysts, also called bladderworms, are occasionally seen in rabbits. These are large, watery cysts that are found under the skin or elsewhere in the body. These are an intermediate stage of the tapeworm of some other animal, usually the dog. The tapeworm needs a secondary host to complete its life cycle. Briefly, the rabbit eats the egg of the dog tapeworm and develops a cyst. This cyst must be eaten by the dog before it can develop into a tapeworm. This cycle is often more complicated, for many of the tapeworms and some of the dog tapeworms require a host other than the rabbit for the intermediate stage of its development.

### Bacterial and Virus Diseases

There is possibly more confusion in bacterial diseases of rabbits than in any of the other domestic animal diseases. Many of the diseases are well known by their symptoms and lesions, yet there is considerable disagreement as to their actual cause. Much progress is being made by the Division of Wildlife Research, U. S. Department of Agriculture, and it may be hoped that in the near future much of the confusion regarding the causes of specific diseases will be cleared up. Since there is general agreement as to the prevention and control of these diseases, it will not be our purpose in this circular to review the literature as to the cause of the diseases or enter into any controversy with those investigating them. Most of the serious bacterial and virus diseases of rabbits are rare in Oregon and need not become generally established if the fundamental rules of care and sanitation are followed.

### Pasteurellosis

Possibly the most important of the bacterial diseases is the several forms of a disease caused by a microorganism of the Pasteurella group. This disease, pasteurellosis, is reported to occur in several forms that will be discussed briefly. The forms reported are (1) acute septicemic pasteurellosis, (2) contagious nasal catarrh, or sniffles, and (3) boils.

The acute septicemic form of pasteurellosis is usually seen in adult breeding females. The onset is sudden and they may be found dead before any symptoms are noticed. The disease is largely one of the respiratory tract and the symptoms are rapid breathing, dullness, lack of appetite and marked weakness. The lesions are congestion of the lungs and trachea and an enlarged spleen. Small hemorrhages may be seen along the intestinal tract and on some of the other organs. The symptoms and lesions are not diagnostic as other diseases may resemble pasteurellosis. Positive diagnosis can only be made by a laboratory.

Contagious nasal catarrh, or sniffles, is a form of pasteurellosis that may be seen in rabbits of any age, but is usually thought of as a disease of young rabbits. This form is a disease of the upper respiratory tract or nasal passages.

The first symptom of the disease is sneezing. There will be a thick discharge from the nose and usually a watery discharge from the eyes. The hair and skin around the nose will often become matted and crusty. This disease is usually chronic and tends to clear up, only to be followed by a reoccurrence. The rabbits will grow progressively weaker and thinner and pneumonia will develop that will result in death of the animals.

Boils of rabbits are more or less common and may be caused by any of a number of organisms. There is one form of boils, however, that often becomes a serious problem in a rabbitry. The *Pasteurella* organism referred to is the common cause of these large outbreaks of boils. The boils may appear any place over the body but are most often seen about the lower chin and neck. These often follow one of the other forms of pasteurellosis. The boils, when cut, discharge a thick, creamy pus that is usually without odor.

The *Pasteurella* organism seems to be universal in its distribution and it is reasonable to believe that it is prevalent in most of the rabbitries. It seems to become a disease factor only by the lowered resistance of healthy rabbits. Factors that lead to the development of the disease are insanitary conditions, improper and irregular feeding, poor hutch construction and equipment, drafts and exposure.

There are a number of remedies and vaccines for the treatment and immunization of rabbits for pasteurellosis, but none of them can be recommended. If the animals have been vaccinated well in advance of the outbreak of the disease, there is likely some protection afforded, but once the disease is established only control measures will check the loss and spread. The control measures are the same as for any of the other diseases,

#### Other Bacterial Diseases that May Be Confused with Pasteurellosis

There is another type of nasal catarrh that is usually of shorter duration and less fatal than pasteurellosis. It is said to be caused by a number of organisms, but most workers agree that it is *Alkaligenes bronchisepticus*. This form tends to clear up in a week or two and seldom results in a chronic form.

Boils may follow breeding accidents or fights where the skin has been broken. Any of the pus-forming organisms introduced in this manner will cause infection that may result in either open sores or boils. Boils of this nature do not have a tendency to spread from one pen to another. Another cause of boils or abscesses is becoming more common due to the increased use of bacterins for the treatment or prevention of various diseases. Most of these have no value and when not used under proper supervision will only result in the introduction of infection.

#### Vent Disease

Another disease that may be seen from time to time is vent disease. This is a disease of the genital organs and is seen in the breeding animals. The disease is caused by a microorganism that belongs to a group known as a spirochete.

The disease is seen in both males and females and spreads during mating. It usually requires two or three weeks to develop and many animals may have been exposed before it is noticed. This disease is usually introduced by new breeding stock.

The early lesions are small denuded areas about the prepuse of the male or the vent of the female. These enlarge and will become covered with scabs the size of which vary with the individual animal. In some cases the parts may only be swollen and reddened. The external genitalia is usually the only site of the infection; however, it may spread to the lips and eyelids.

Any animal that shows any enlargement or ulceration about the genitalia should be isolated at once and withheld from mating until the cause of the trouble is determined. This usually requires considerable laboratory work. The hair about the affected parts should be clipped away and the denuded areas painted with a solution made up of half tincture of iodine and half glycerin. This should be repeated every other day. In the male, if the lesions are on the inside of the sheath, a less irritating treatment must be used. One percent solution of potassium permanganate should be used. The rabbit will usually recover in ten days or so, but since the disease may reoccur the animals must be examined carefully before mating. It is authoritatively stated that the disease can be cured by a single dose of Neosalversan, using 0.01 gram per 2.2 pounds of body weight. A veterinarian must be consulted on the use of this drug, as it requires intravenous administration.

The pens must be kept clean and dry as floors that are wet and dirty from urine and feces will aggravate the condition.

#### Urine Burns

It is well to mention at this time that there is a condition that is sometimes confused with vent disease. This is urine burns, a condition that is the direct result of dirty hutches or bedding. The lesions may resemble those of vent disease, but usually there will be other marks of soiled hair on the underneath side of the rabbit. Sore hocks also are usually the result of urine burn or insanitary conditions, but may also be due to improper flooring of the hutches.

#### Tularemia

The subject of tularemia is often discussed whenever the subject of rabbit diseases becomes a topic. The reason for this is that tularemia is thought of as a rabbit disease and it does frequently occur in wild rabbits. It also occurs in many other wild animals, mainly the rodents. This is not due to the fact that domestic rabbits are not susceptible, but because rabbits raised under modern conditions are not exposed. There has been no authentic case of tularemia reported in domestic rabbits.

#### Myxomatosis

Myxomatosis, or big head disease of rabbits, has been reported in this state only once. This is a virus disease. The term virus is used to classify a disease organism that is so small it cannot be seen with the ordinary oil immersion microscope. There are many virus diseases, but the only one in rabbits that occurs locally is myxomatosis. This is a very contagious, rapidly fatal disease. The onset may resemble any of several other diseases in that the animal will lose its appetite, have a purulent discharge from the eyes, and the coat will become rough. Soon there will be edema about the lips, face, ears and vent. This swelling increases until the animal becomes very distressed and shows painful, rapid, shallow breathing. The rabbit usually dies in a coma.

There are no characteristic post mortem lesions by which myxomatosis may be definitely diagnosed. Animal inoculation by trained technicians is the only method that is positive. There are a few lesions, however, that are very suggestive of myxomatosis. When the swollen parts are cut, the surface is white and glistening, and when pressed will exude a clear, serous fluid. The lungs may be quite congested and the spleen will often be enlarged and pulpy.

#### Use of Laboratory

The proper use of the laboratory of the Department of Veterinary Medicine at Oregon State College can be of invaluable aid to the rabbit raiser and his veterinarian. Whenever there is a disease problem, it is always best to consult a veterinarian at once. Most of the diseases can be diagnosed immediately and valuable time can be saved.

If it is decided to seek further information or confirmation of a diagnosis, it is best to send a specimen to the laboratory. It is always best to send a sick animal that is showing typical symptoms or lesions. If this cannot be done, the next choice is to kill or take a rabbit that has just died, have it frozen solid or packed in dry ice, and expressed to the laboratory. The entire carcass is of considerable value to the laboratory.

It is becoming common practice for rabbit owners to send in fecal material for examination. This is easy and incurs little expense, but it also is apt to result in very little information to the owner. The only thing that can be learned from fecal material is whether or not the animal has coccidiosis or intestinal parasites. If the parasite load is low or the coccidiosis chronic, it is possible that the fecal sample collected may be free of the eggs or oocysts at the time the sample was taken. Also, if an animal had diarrhea, the parasite load may be so diluted that the sample may not contain any at certain times. It is impossible for the laboratory to be able to give information on commercial feeds, because we do not know the contents.