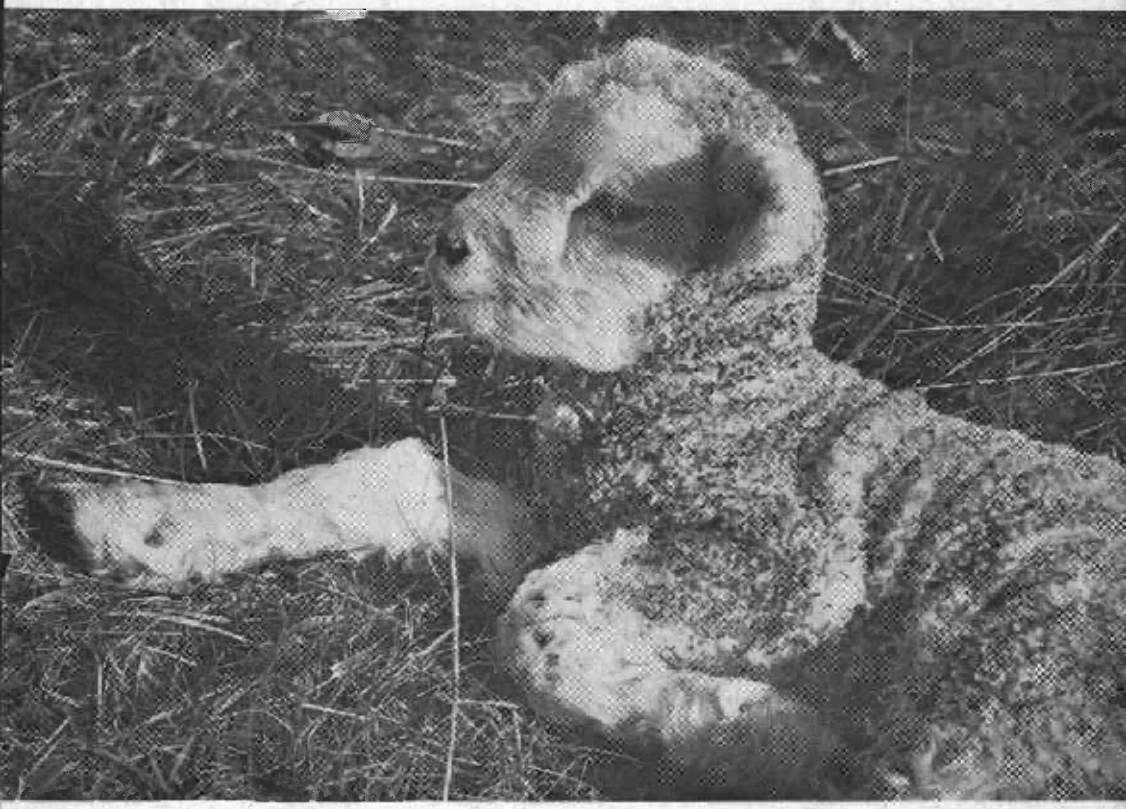
Summary of Reports . . .

1964 Sheep and Wool Day



Special Report 182 **December 1964**

Agricultural Experiment Station • Oregon State University • Corvallis

Contents

Sponsored by the Department of Animal Science, Oregon State University, and the Western Oregon Livestock Association.

Summary of Reports . . .

1964 Sheep and Wool Day

Control of Fascioliasis in Oregon Sheep

S. E. KNAPP

Fascioliasis is a disease caused by infection with the trematodes *Fasciola hepatica, Fasciola gigantica* or *Fascioloides magna.* The definitive hosts for these parasites are cattle, sheep, horses, pigs, goats, deer, elk, and rabbits. Distribution is limited to wet-damp areas which are ideally suited for satisfactory growth and survival of the snail, the intermediate host. Two of these parasites, *F. hepatica* and *F. magna,* are found in continental North America and are responsible for economically significant livestock losses.

The "classic" symptoms for fascioliasis are loss of body weight, poor condition, anemia, and sub-mandibular edema (bottle jaw). *Fasciola hepatica* may be severely pathogenic in sheep. Cases of flock fatalities have been recorded annually from western Oregon, and possibly of greater economic significance is the relationship of morbidity to lamb production.

The life cycle of *Fascioloides magna* is shown in Figure 1. This parasite has only recently been found to be relatively common in Oregon cattle (Knapp and Shaw, 1963; Dutson, 1964). No cases have been reported involving its occurrence in sheep, although it is known to parasitize sheep in other parts of the United States. Its life cycle is particularly interesting, since it is a natural parasite of deer and elk and only accidentally transmitted to domestic animals. The life cycle of *Fasciola hepatica* is similar to that of *F. magna,* except it is a natural parasite of both domestic and wild animals. Both parasites occur in areas of Oregon where there are abundant sources of moisture. However, the greatest number of reports of *F. magna* have been from the Columbia River area between Astoria and Portland.

Control of these parasites is difficult, especially where pastures or grazing areas cannot be drained or tiled. Present control recommendations include: (1) drench animals in the late fall and early winter with either carbon tetrachloride or hexachlorethane; (2) drench newly purchased animals if they are known to have been on wet or swampy pastures; (3) tile-drain swampy pastures or do not allow stock to graze these areas when they are wet; (4) fence stock ponds so that animals cannot get into them; (5) clean irrigation ditches of overhanging vegetation; (6) fence seepage areas such as springs; and (7) treat wet areas with copper sulfate according to specifications in USDA leaflet No. 492, "Control of Liver Fluke in Sheep."

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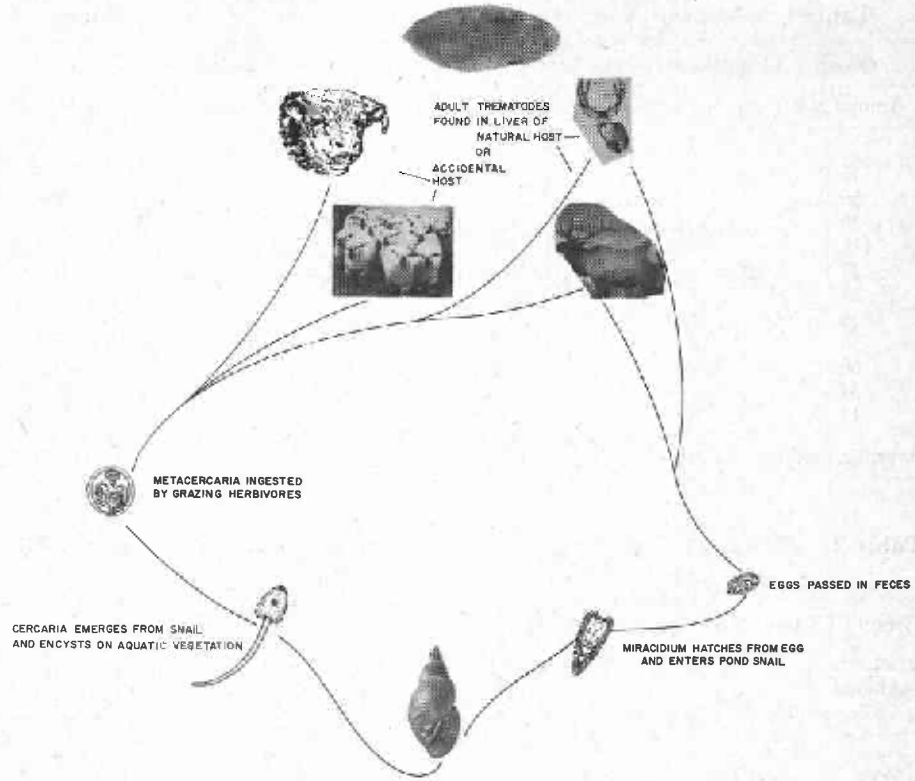

LIFE CYCLE OF FASCIOLOIDES MAGNA (BASSI, 1875)

FIGURE 1

Description of 1963-1964 research at OSU Experiment Station

Two new drugs have been evaluated to determine their efficacies for controlling *Fasciola hepatica* in sheep. One of these, "Freon 112a,"[1] was examined in trials involving 75 naturally infected sheep (Knapp, *et al.*, 1963). At dosage rates of 100 mg/kg or 150 mg/kg, the drug was found to be more than 95% effective in removing flukes. Neither dosage induced any significant weight loss. Further studies of this compound are anticipated during 1965 to determine its efficacy against immature stages of the fluke.

Another compound, Bayer 9015,[2] was evaluated at what dosage level it would be effective in removing *Fasciola hepatica* and to compare its anthelmintic action with carbon tetrachloride and hexachlorethane (Knapp, *et al.*, 1964). Results of these studies are shown in Tables 1 and 2. This compound was found to be highly effective in controlling *Fasciola hepatica* in sheep, and its use did not induce any

[1] Product of E. I. DuPont deNemours and Company.

[2] Product of Chemagro Corporation.

Table 1. Efficacy of Bayer 9015 against *Fasciola hepatica* in sheep

Group 1 (3 mg/kg)		Group 2 (6 mg/kg)		Group 3 (controls)	
Animal No.	Adult *Fasciola*	Animal No.	Adult *Fasciola*	Animal No.	Adult *Fasciola*
	No.		*No.*		*No.*
15	40	59	0	65	510
56	0	50	0	1	147
30	1	31	0	38	96
18	46	11	0	43	6
37	14	48	0	39	74
23	0	16	0	5	243
36	17	61	0	67	369
54	0	66	0	27	11
60	2	62	0	2	2
34	2	53	0	20	9
13	1	32	0	7	207
Average/animal	11.18		0		152.18

Table 2. Efficacy of Bayer 9015, CCl_4, and hexachlorethane against adult *Fasciola hepatica* in sheep

Group 1 (Bayer 9015, 6 mg/kg)		Group 2 (CCl_4 1 cc)		Group 3 (Hexachlorethane 1½ oz.)		Group 4 (No treatment controls)	
Animal No.	Adult *Fasciola*	Animal No.	Adult *Fasciola*	Animal No.	Adult *Fasciola*	Animal No.	Adult *Fasciola*
	No.		*No.*		*No.*		*No.*
180	0	139	0	170	0	151	5
142	0	164	0	141	0	176	35
160	0	154	0	173	1	187	5
148	0	165	0	143	0	146	24
167	0	161	0	192	5	138	21
178	0	158	0	184	0	159	59
168	0	155	0	198	0	150	26
193	0	156	0	197	2	177	4
171	5	191	0	194	2	163	40
186	0	199	0	196	4	179	7
Total	5		0		14		226
Average	0.5		0		1.4		22.6

measurable drug toxicosis which has occasionally been noted following treatment of sheep with carbon tetrachloride. Neither product is currently available, since further studies must be done to determine their value as commercial anthelmintics.

Other studies have involved the determination of snail species in Oregon which may serve as intermediate hosts for liver flukes. So far, four species have been found. The biology of these snails is being studied, and all species have recently been cultivated in artificial habitats. Principal emphasis concerns determination of the type of conditions necessary for the larval fluke to infect the snail.

Future research objectives

Future research objectives will emphasize studies on the mode of action of drugs on the parasite, an evaluation of molluscacides, and improvement of management procedures. A study supported by United States Public Health Service concerning the mode of action of anthelmintics against *F. hepatica* was initiated during the summer of 1964. The principal objective of this research is to determine factors influencing the mode of action of certain compounds on the parasite. Information of this type may not show directly that a particular chemical is effective against a parasite, but it may show how a chemical interacts with the parasite's system. Such information may subsequently be of value in the selection of effective anthelmintics or in the determination of other types of control procedures.

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Control of Breeding in Ewes by Hormonal Means

E. F. ELLINGTON, C. W. FOX, and MILLARD SHELTON

To be able to successfully control breeding dates of sheep and other farm animals would have obvious managerial advantages. Of all hormonal materials that have been used in this regard, the use of hormones classified as progestogens offers the greatest promise. For the past few years much attention has been given to the use of orally effective compounds belonging to the progestogen classification.

Although progress has been made, certain problems still remain. A significant one is the tendency for lowered fertility at the induced or controlled heat period which occurs within a few days subsequent to hormone withdrawal. The studies in the past have usually involved a time from the initiation of hormonal treatment to breeding, approximately equivalent to the length of one estrous cycle. In view of the complexity of physiological events involved, perhaps attempting to effectively control breeding by a more gradual process would have some merit. This was the purpose of the present study.

Procedure

Thirty-two crossbred (Lincoln-Rambouillet) ewes were randomly allotted to four groups of equal size during their breeding season, as follows: Group I, control; Group II, each animal was fed 60 mg. of Provera (Upjohn Company) in a grain mix once daily for 15 days and allowed to breed at the first post-treatment estrus; Group III, each animal received the Provera treatment described for Group II, but

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breeding was not allowed until the second post-treatment estrus; Group IV, each animal was fed Provera for 15 days as above, taken off Provera for the next 8 consecutive days, again placed on Provera for 10 days, and then allowed to breed as soon as estrus was apparent. Arrangements were made for allowing each of the four rams used to breed an equal number of ewes in each group, and for breeding of all groups to start at the same time of the breeding season. At breeding time, ewes in all groups had been on grain for the same length of time. Ewes returning to estrus after one breeding were rebred to rams genetically different from those of previous service.

Results and discussion

The breeding and lambing performance of ewes subsequent to Provera treatment is given in Table 1. Within a 10-day period, all of the 32 ewes were served. Statistical tests showed that all treated groups required significantly less days than did the controls, but revealed no differences among treated groups.

The first post-treatment estrus occurred at an average of 2 days after the single treatment (Group II) and at an average of 3 days after the double treatment (Group IV), whereas the second post-treatment estrus (Group III) occurred at an average of 20 days after treatment. Even though only one ewe returned to estrus in Group IV, whereas a larger number returned in the other groups, the difference among groups was not statistically significant. None of the ewes returned to estrus more than one time.

All 32 ewes included in this study lambed. It is seen that the length of gestation is essentially the same for all groups. That some synchronization of reproductive activity may be carried to lambing time may be seen in Group

Table 1. Breeding and lambing performance of ewes bred subsequent to Provera treatment

	Group I (Control)	Group II (Breeding at 1st post-treat. estrus)	Group III (Breeding at 2nd post-treat. estrus)	Group IV (Breeding after double treatment)
No. ewes	8	8	8	8
No. ewes breeding	8	8	8	8
Days required for breeding	10	2	3	3
Days from end of treatment to breeding		2	20	3
No. ewes rebreeding	3	3	2	1
No. ewes lambing	8	8	8	8
Length of gestation (days)	147	147	146	146
No. ewes lambing within a 5-day period	3	5	3	7
No. rebred ewes lambing to 2nd service	3/3	3/3	1/2	1/1
Percent lamb crop[1]				
First service	100	88	125	175
Both services	163	163	138	200

[1] Percent lamb crop $= \frac{\text{no. lambs born}}{\text{no. ewes bred}} \times 100.$

IV. Seven of the eight ewes lambed in a five-day period. This value was found to differ significantly from those of Groups I and III. It is interesting to note that one ewe (Group III) lambed to the first service even though it had rebred. Similar observations have been reported previously.

The values for percent lamb crop depend upon the number of services considered. The percent lamb crop, as based on the first service, was the lowest for Group II and the highest for Group IV, and the difference between these two values is statistically significant. Percent lamb crop based on the two breedings, instead of one as would be expected, is higher for all four groups. Again, the value is the highest for the fourth group. In this regard, it differs significantly from Group III.

Summary

The results of this study look encouraging, especially in reference to the control of reproductive events and the resulting fertility for Group IV. The number of animals involved is relatively small, and additional work, including a replication presently in progress, appears in order.

Lamb Production from the Willamette Breed of Sheep

RALPH BOGART

A sheep, the Willamette (Figures 1 to 4), is being developed at Oregon State University for the production of fat lambs under western Oregon conditions. Columbia, Dorset Horn, and Cheviot breeds were used to establish the foundation. Columbia ewes were bred to Cheviot and to Dorset Horn rams to produce crossbred lambs. Reciprocal crosses were made using these crossbred lambs, and the offspring produced were put into a closed breeding population. Selection has been on an index basis in which weight at 120 days of age $\times$ 2, + score for condition + score for conformation are considered. In addition to this, any abnormality is culled. Lambs are selected at weaning time for replacements. The ewes are culled solely on the basis of their performance in lamb production, with the top-indexed lambs used to replace them.

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The purpose of this report is to present information on the performance of the Willamette sheep, in comparison with samples of sheep from the three breeds that were used to establish the Willamettes, and in regard to their performance on farms in western Oregon.

Milk production of ewes and gain of lambs per day were measured on Cheviot, Dorset Horn, and Columbia ewes for seven consecutive two-week periods, starting when the lambs were about 10 days of age. The ewes were obtained from the same general breeding flocks as the original sheep used to establish the foundation for the Willamette sheep. The resulting figures were compared with similar figures obtained on the Willamette. Figures on milk production of 10 ewes from each of the four kinds of sheep are shown in Table 1.

It can be seen that Dorset Horn and Willamette ewes were the heaviest

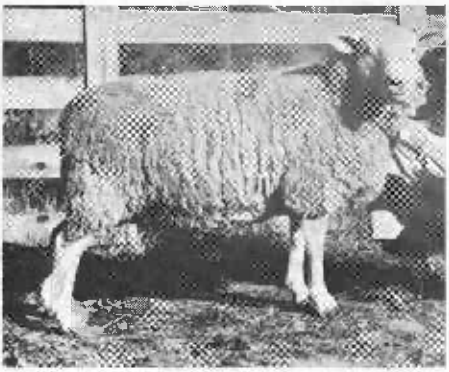

Figure 1. Willamette yearling ewe. Note open white-face and mutton characteristics.

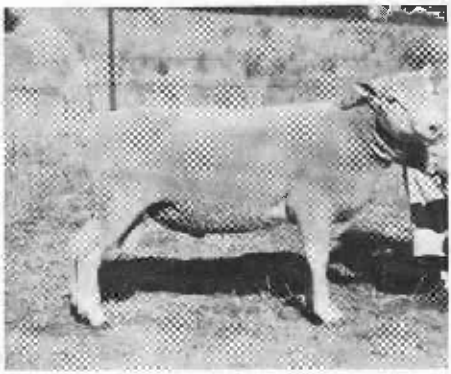

Figure 2. Willamette yearling ram. This ram was shorn in August.

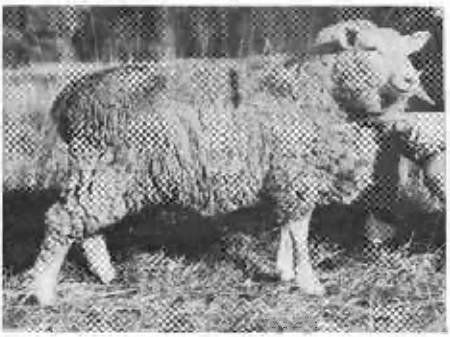

Figure 3. Willamette ewe lamb born in February and photographed in October.

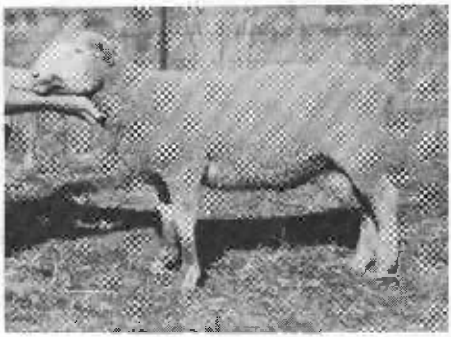

Figure 4. Willamette ram lamb approximately eight months of age.

Table 1. Average milk produced per ewe (in pounds per day) over seven periods

Breed	Periods							Avg.
	1	2	3	4	5	6	7	
For ewes nursing single lambs								
Cheviot	2.68	3.45	2.40	2.10	1.79	1.35	1.25	2.24
Dorset Horn	4.68	4.02	4.24	3.26	3.48	2.31	1.79	3.56
Columbia	3.69	4.25	3.05	2.99	2.44	1.73	1.62	3.01
Willamette	4.21	4.49	3.81	3.34	2.86	2.34	1.78	3.42
For ewes nursing twin lambs								
Cheviot	4.69	4.53	4.27	3.46	3.47	2.30	2.04	3.68
Dorset Horn	5.03	5.50	4.43	4.01	3.02	2.35	1.74	3.92
Columbia	3.57	5.22	4.70	3.45	3.58	1.44	1.61	3.71
Willamette	5.42	6.79	4.43	3.79	3.17	3.00	2.72	4.30

milk producers. It also can be seen (Table 1) that ewes nursing twin lambs produce more milk than ewes nursing single lambs.

There was no difference between breeds or between ewes nursing single lambs versus those nursing twins in milk percentages of protein, fat, total solids, or nonfat solids. The ranges in means for percentages of the components are:

Protein	5.02- 5.75
Fat	7.72- 9.18
Solids	18.34-19.91
Nonfat solids	10.18-11.04

The figures on gain of lambs per day by ewes of the four breeds are shown in Table 2. It can be seen that Willamette ewes produced lambs with more rapid daily gains than did ewes of any of the other three breeds. More gains per ewe were made with twins than with singles, but gain per lamb per day was greater for single lambs (Table 2).

The weight per lamb at 120 days, conformation score, condition score, and composite preference score of the meat of the lambs are presented in Table 3. It can be seen that Willamette lambs weighed more at 120 days than any of the other lambs and scored as well in conformation and condition as the others. It is interesting to note that the meat desirability, as evaluated by a trained panel, is highest for the Columbia lambs even though they were lowest in conformation and condition scores (Table 3).

Table 2. Average gain of lamb (in pounds per ewe) over seven 14-day periods

Breed	Periods							Avg.
	1	2	3	4	5	6	7	
For ewes nursing single lambs								
Cheviot	0.412	0.482	0.542	0.449	0.500	0.700	0.608	0.564
Dorset Horn	0.374	0.537	0.648	0.535	0.643	0.784	0.714	0.652
Columbia	0.396	0.619	0.612	0.683	0.784	0.775	0.722	0.683
Willamette	0.465	0.828	0.828	0.756	0.848	0.786	0.903	0.815
For ewes nursing twin lambs								
Cheviot	0.562	0.661	0.945	0.963	1.14	1.57	1.14	1.06
Dorset Horn	0.811	0.767	1.02	1.00	1.36	1.36	1.20	1.14
Columbia	0.665	0.698	0.958	0.822	1.55	0.927	1.07	1.00
Willamette	0.641	1.00	1.07	1.27	1.68	1.96	1.38	1.38

Table 3. Production and carcass comparison of four groups of sheep

Breed	Conformation score	Condition score	120-day weight	Composite meat score
	Units[1]	*Units*[1]	*Pounds*	*Units*[2]
Cheviot	88	82	72	4.5
Dorset Horn	87	86	78	4.9
Columbia	78	78	87	5.1
Willamette	88	89	100	5.0

[1] 90-100 = prime, 80-90 = choice, 70-80 = good.
[2] Units of 1-7, with 7 very desirable and 1 very undesirable.

The performance of small samples of Willamette sheep has been measured on one farm in Douglas County and one farm in Lincoln County. Nine ewes went to Douglas County but one died in early December. From the eight surviving ewes, the following records for 1964 were obtained:

Percent lambs raised	162
Pounds lamb per ewe	148
Income per ewe from lamb ($)	30.80
Avg. wt. (lb.) per lamb at weaning	91

Fifteen ewes were sent to Lincoln County. One died in the early fall. From the 14 surviving ewes, the following records were obtained in 1964:

Percent lambs raised	130
Pounds lamb per ewe	116
Avg. wt. (lb.) per lamb at weaning	88

Summary

It appears that selection for weight and score of lambs at weaning time and that culling of ewes on lamb-producing ability in Willamette sheep have been effective in improving milk-producing ability of ewes and growing ability of lambs. As a result, Willamette sheep are superior to the representatives from the three breeds that were used to provide foundation material for the Willamette sheep. Limited testing of the Willamette females on farms indicate that they have merit as a sheep for fat lamb production in western Oregon.

Epididymitis in Rams

DEAN H. SMITH

Epididymitis often refers to any inflammation of the epididymis of one or both testicles. However, at times it may refer to a specific infectious disease of sheep.

Cause of the disease

A number of reports on ram epididymitis have appeared the past few years, and some of these seem to be in conflict as to the organism causing the disease and also as to the effects of the disease on the fertility of the ram. Research workers do not all agree on the cause of the specific infectious disease. Some of the causative agents have been listed as *Brucella ovis, Pasteurella pseudotuberculosis, Escherichia coli, Hemophilus* species, *Neissemia* species, *Actinobacillus seminis,* and *Corynebacterium pseudotuberculosis.* Also, tapeworm cysts and tumors are sometimes present. Because of the large number of causative organisms, an immunizing agent prepared for use against any one organism will have little or no effect against the others.

Problems due to epididymitis

An organism causing sterility in rams and abortion in ewes has been described in Australia, New Zealand, and other areas of the world. Research workers have usually classified *Brucella ovis* as the organism causing this infection. It is believed that an infected ram may transmit the organism to other rams and also to females during the breeding period. In California, Mc-

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Gowan and Shultz have described a disease which they believe is the same specific disease which has been reported in New Zealand and Australia. However, these authors do not feel that the organism causing epididymitis is a Brucella. They refer to the organism as r-e-o, meaning ram epididymitis organism. As yet, the organism has not been further classified.

Identification of the disease

Detection of epididymitis infection depends upon specific serological tests or isolation and identification of the agent from semen samples or from infected tissue. However, breeding history, clinical signs, and scrotal palpation may help distinguish infected animals. The treatment of infected animals has not been very satisfactory. Besides the cost of treatment, there is the very good possibility that the impaired fertility is permanent, even though the infection may be eliminated.

Vaccination

Immunizing procedures in the past have included the use of killed cultures of *Brucella melitensis* or *Brucella ovis* and a living avirulent strain of *Brucella abortus* (Strain 19). The obvious problem here is that although Strain 19 is avirulent to cattle, it may not be to other species. At present there is commercially available a bacterin or killed suspension of ram epididymitis organisms. As these organisms have been killed, there is no danger of spreading or perpetuating the disease. Presently, the recommendations are that the rams be vaccinated twice. The second vaccination should be given 30 to 60 days following the first. In some cases, a small nodule will occur at the site of injection. Some veterinarians are recommending that a booster shot be given annually to the rams prior to the breeding season. Complete data are not available on how long the immunity due to these vaccinations will last.

Some breeders in Oregon are vaccinating their ram lambs at six or seven months of age. Most of these rams will eventually be sold as yearlings in out-of-state sales. Vaccination of rams that will be sold in out-of-state sales may help in obtaining a higher sale price for the rams. Some Oregon breeders have felt that there has been a price discrimination against nonvaccinated rams in the sale ring.

Shipping Fever in Lambs

DEAN H. SMITH

The terms shipping fever, hemorrhagic septicemia, and pasteurellosis seem to refer to the same acute or subacute infection in sheep. Hemorrhagic septicemia, as the name implies, describes the acute disease which is marked by widespread hemorrhages. This clinical picture is not seen in a majority of cases, and the name is not used as much as it was formerly. A predisposing stress factor such as inclement weather, irregular feeding schedule, chilling, overheating, or crowding is almost always present. Shipping often provides one or more of these, and the disease follows so often it has been termed "shipping fever." The third term, pasteurellosis,

refers to the identification of microorganisms found associated with a majority of cases.

Symptoms

Affected animals are depressed, have drooped ears, lack appetite, and their fever may reach 108° F. There is often a rather thick mucous discharge from the eyes and nose, and there may be some coughing. Animals will appear gaunt and show accelerated respiration and pulse. Occasionally arthritis occurs, and lameness is noted in these cases.

Causative agents

The cause of this disease is still not clear. *Pasteurella multocida* and *Pasteurella hemolytica* are the two microorganisms most often found in tissues of affected animals. In some respects, this has been incrimination by association. These microorganisms sometimes fail to produce disease when injected into laboratory animals, and they are sometimes found in apparently healthy animals. This group of organisms is capable of producing serious disease in man and animals. Examples of this are bubonic plague in man (caused by *Pasteurella pestis*) and tularemia (caused by *Pasteurella tularensis*).

It is generally felt that the pasteurella organisms are involved in shipping fever, but probably in combination with some other agent. Viruses have been isolated from cattle outbreaks, and this could also be true in sheep. A combination of causative agents would help explain the various types seen clinically.

In early stages of the disease there are subcutaneous, submucous, and subserous hemorrhages. These are especially outstanding around the heart, throat, stomach, and intestines. Lymphoid tissues are sometimes involved. As the disease progresses, it usually localizes in the lungs, producing a rather typical lobar pneumonia with solidification of the lower dependent portions.

If not confined to the respiratory tract, the disease may affect the liver and produce small, white necrotic spots throughout the gland. Inflammation of the abomasum and intestine sometimes occurs. The synovial membranes of bursae and joints may be involved.

Shipping fever must be differentiated from illness caused by poisonous plants (especially wild cherry and those containing prussic acid), by heavy metals, and by infectious diseases such as anthrax and enterotoxemia.

Treatment

Treatment with broad-spectrum antibiotics has been successful in some outbreaks. Sulfonamides, especially sulfamerazine and sulfamethazine, have also been used.

Two biologic products are available for prophylaxis. An antiserum can be used for immediate, short-acting protection and a bacterin for longer immunity. Both are made using the pasteurella organisms often found associated with shipping fever outbreaks. Results are variable, but many livestock men and veterinarians feel they get some protection by using the products. A most important consideration in preventing shipping fever is to remove as many external influences as possible that might add stress to the animals. Shipment to new quarters seems to be a major predisposition to the disease, and special efforts should be made to protect these animals in every way possible.

The Lane-Benton County Lamb Pool

CLEVE E. DUMDI

A lamb marketing pool is a cooperative way of marketing lambs by producers. The Lane-Benton Lamb Pool, as well as other Willamette Valley lamb pools, has proved to be of great service to producers who have participated in the pool, as well as a benefit to those who have not, by creating desirable competition in the areas where it has operated.

Operational procedures

There are three things necessary in the operation of a lamb pool. They are:

1. A committee representing all the sheep producers to govern the operation of the pool;
2. A qualified grader, as well as desirable facilities in order to handle the lambs on shipping day;
3. A qualified and responsible person or firm to do the selling and the making of the payments for each pool.

It is also necessary to set up a marketing cost for the lamb pool. In the case of the Lane-Benton Lamb Pool, a fee of 50 cents per hundredweight was charged for the cost of marketing. This was broken down as follows:

Commission firm	15 cents
Grades and facilities	25 cents
Lamb pool organization	10 cents

After two years of operation, the pool found that it could reduce the fee charged for the lamb pool organization to 5 cents per hundredweight, making a total cost of 45 cents per hundredweight for the cost of marketing through the pool.

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In operating a pool, it is necessary to establish a marketing day. The Lane-Benton Pool, when it first started, selected Saturday as the shipping date.

It is also necessary to set up times at which the lambs have to be delivered to the shipping point. The times that have been scheduled for this pool have been from six to eight a.m. If a producer had to make more than one trip, he had an extended time period.

After two years of operation, the Lane-Benton Pool committee decided there were too many pools shipping at the same time of the week; therefore, in 1964, the pool shifted to a Tuesday shipping date.

Producers who participate in the weekly pool must notify the secretary of the Lamb Pool Association of their intent to ship prior to the shipping date and also give the approximate number of market lambs they have for the pool shipment. This past year the producers notified the secretary by nine a.m. on Monday. After receiving the numbers from all the producers who wish to participate for the weekly pool, the secretary then passes this information on to the commission firm, which sells the lambs on a bid basis. The first two years, the pool committee was able to notify the producers of the price they would receive ahead of delivery date, but due to a Tuesday shipment this was not possible this past year.

Producers have had the option of having their lambs graded either at the receiving point or on the farm. After the first two years of operation, producers have been encouraged more to try and select their market lambs themselves and have them graded at the re-

ceiving point in order to cut down the cost of operation. In the early part of the marketing season most producers can do a reasonably good job of selecting their market lambs, but as the marketing season progresses, they need more assistance by having the grader do the grading on the farm rather than at the central point.

Quality and grade

It is necessary to set standards in marketing the lambs through a pool. In the case of this pool, lambs had to weigh 85 pounds or more, and in most cases the producers were encouraged to market lambs 90 pounds and heavier. The lambs had to meet a live grade of choice or prime in order to sell.

It is necessary to have high standards in the pool in order to get as much buyer participation as possible. It has been the goal of the Lane-Benton Lamb Pool to satisfy the buyers in all ways, thereby receiving a bid from all buyers on each pool. Also included among the standards set up by the pool committee is the stipulation that no undocked or uncastrated lambs would be accepted through the pool.

The participation of producers in the Lane and Benton County areas has certainly grown since the start of the lamb pool, as is shown in the tables.

Weight

The average weight of the lambs is very important, in order to hold the yield as high as possible for the buyer. The pool has increased its average weight each year, which is a direct indication that the pool has educated the producers on the desired market weights.

Yield

During the early pool season there is very little problem in satisfying the buyers in regard to yield, but in the Willamette Valley area we do have a problem, as summer progresses, in holding our yields up where we would want them. The Lane-Benton Lamb Pool committee has followed up by requesting through the commission firm all of the yields possible to get. In 1963 we had a quite complete record. This does help show the producers how their lambs are yielding as an average, and it helps educate them in doing a better job of marketing.

Table 1. Summary for the 1962 Lane-Benton County Lamb Pool

Date	Buyer	Shippers	Lambs	Live average weight	Price[1]
		No.	*No.*	*Lb.*	*Per cwt.*
May 14	Swift & Co.	11	196	94.1	$19.75
May 28	Seattle Packing Co.	15	337	93.4	22.00
June 4	Seattle Packing Co.	19	440	90.9	21.25
June 11	Cohn & Neill	29	502	91.7	20.50
June 18	Armour & Co.	16	368	91.2	21.60
June 25	Seattle Packing Co.	32	560	88.9	20.35
July 2	Swift & Co.	46	533	92.9	18.25
	Average	24	419	91.9	$20.53

[1] Prices paid at receiving point—Monroe, Oregon.

Table 2. Summary for the 1963 Lane-Benton County Lamb Pool

Date	Buyer	Shippers	Lambs	Live average weight	Price
		No.	*No.*	*Lb.*	*Per cwt.*
May 13	Swift & Co.	9	254	96.0	$22.00
May 27	Swift & Co.	22	654	95.3	21.50
June 3	Swift & Co.	14	268	95.3	21.50
June 10	Cohn & Neill	21	329	95.7	21.25
June 17	Armour & Co.	31	508	94.3	21.40
June 27	Cohn & Neill	32	580	94.1	19.30
July 1	Armour & Co.	20	303	94.3	19.50
July 8	Swift & Co.	28	424	92.2	19.75
July 19	Swift & Co.	64	807	92.7	19.75
	Average	27	458	94.4	$20.66

[1] Prices paid at receiving point—Monroe, Oregon.

Table 3. Summary for the 1964 Lane-Benton County Lamb Pool

Date	Buyer	Shippers	Lambs	Live average weight	Price[1]
		No.	*No.*	*Lb.*	*Per cwt.*
May 11	Swift & Co.	10	198	103.2	$24.00
May 25	Taffee	26	619	98.3	21.50
June 2	Taffee	35	733	94.8	22.50
June 10	Wilson	24	664	95.3	22.60
June 17	Wilson	37	672	94.4	22.75
June 24	Wilson	27	501	92.5	22.15
July 1	Taffee	33	457	92.9	20.75
	Swift & Co.	29	345	93.2	20.60
July 8	Willamette Valley				
July 15	Sheep Co.	54	623	91.7	21.80
Aug. 17	Swift & Co.	23	98 unshorn	100.0	20.75
			279 shorn	94.2	20.50
	Average	30	519	95.0	$21.80

[1] Prices paid at receiving point—Monroe, Oregon.

Feeder lambs

The pool committee felt that it also had an obligation to the producers, not only to help them sell their market lambs but also to help them sell their feeder lambs. This also has worked out very successfully for the producer. This year the pool sold 1,720 head of feeder lambs, compared to 488 head for the same period in 1963.

Summary

In summary, I would like to say that the lamb pool has certainly been a valuable tool from the standpoint of doing Extension work. Because of weekly

contact with various producers, it has been possible to suggest ways of improving their methods of sheep management. Improved rations for pregnant ewes, creep feed for lambs, better control of internal parasites, and the use of better quality mutton-type rams are some of the practices used. As a result of incorporating some of these management practices, production has been improved in many of the farm flocks in this area.

In conclusion, I would state that for a successful lamb pool, both the buyer and the producer must be satisfied with the operation of the pool.

Effects of Heterosis on Lamb Production from Crossbred Ewes

C. W. Fox, B. R. Eller, and J. A. B. McArthur

Throughout most areas of Oregon, the concept of crossbreeding has been followed for the purpose of producing a crossbred market lamb. In general, black-face rams are crossed with white-face ewes, and all the resulting crossbred lambs are sold at market age. Presently, an increasing number of these crossbred ewe lambs are not being slaughtered but are being incorporated into farm flocks in Oregon and other sections of the United States where farm flocks are of economic importance. Because of this trend, producers are becoming interested in knowing the amount of lamb production which can be obtained from these F_1 females.

Reports have shown that most F_1 crossbred ewes will excel the parental breeds for milk production and fertility. In many of these studies, the figures for production were not obtained under a common environment for both the parental breeds and their respective F_1 crossbreds. Regardless of the experimental design, most results do indicate an advantage in some production characteristic for the crossbred dam. In an early study from South Africa, Bonsma (1944) reported that for a period of 12 weeks purebred Merino ewes produced fewer pounds of milk than did crossbred ewes which were the result of crossing Merino ewes with rams of different breeds. Studies by Phillips (1951) and Hewitt (1951) indicated a superiority for lambing percentage from half-bred Cheviot-Romney ewes when compared with straight Romney ewes. Fox and McArthur (1962) reported that when bred as lambs and again as yearlings, the Hampshire-Columbia crossbreds exhibited a higher percentage of ewes lambing and a higher percentage of multiple births than was exhibited by the parental purebreds.

This report compares the reproductive performance and the pounds of lamb produced per ewe from F_1 crossbred females with the production from purebred females of the parental breeds. The data over a four-year period are included in this report.

Material and methods

During the past four years, the experiment station at Corvallis has progeny tested eight Hampshire ram lambs annually. These ram lambs have been selected for progeny testing because

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each has exhibited a high individual record of performance based on weaning weight, feed efficiency, and daily gain made during a specified feed test-period. The general procedure for progeny testing has been to mate each ram with 14 purebred white-face ewes. The purebred Columbia and Targhee ewes are maintained at the Eastern Oregon Experiment Station at Union. Annually, data from the progeny tests have been analyzed for two main objectives: (1) To determine the growth rate from birth to weaning for all crossbred progeny and to determine the carcass merit of the crossbred wether progeny for each of the eight Hampshire rams (summarized in the 1962 and 1963 sheep day reports); and (2) to determine the efficiency of lamb production from the crossbred (two-breed) females when mated as lambs and again as yearlings to rams of a third breed.

The lambs involved in the present study were born during either January or February in each of the last four years. The purebred Hampshire lambs were born and reared to a weaning age at the Corvallis station. The purebred Columbia, Targhee, and crossbred lambs were born and reared to a weaning age at the branch station. Each June following weaning of the lambs at the Union station, a group of crossbred and a group of purebred Columbia and Targhee lambs were shipped to Corvallis. Selection of lambs that were shipped to Corvallis was based on obtaining a representative sample of females, with a heavy weaning weight, from each sire line for the two white-face breeds and from each of the eight sires producing the crossbreds. Similar procedures were used in selecting the purebred Hampshire ewe lambs.

Each year following arrival of the ewe lambs from Union, all the lambs were maintained as one group from post-weaning until the start of the breeding period. These ewe lambs were given the best pastures available, plus a daily supplement of concentrates. This supplementation was continued through the breeding period. Each year, the breeding period was initiated during the middle of September. At that time, the ewe lambs were divided into two groups for breeding. A Southdown ram was placed with one group and a Cheviot ram with the other. The flip of a coin decided which ram was placed with which group of ewes. The choice of the two breeds of rams was made to prevent, as much as possible, any difficulty in parturition for the young ewes. A semen sample was obtained from each ram prior to the breeding period to be certain regarding the fertility level of each ram. The percent of live sperm and the motility score indicated that each ram possessed semen of high quality. Each year, the length of the breeding period was the same for both groups of ewe lambs. Following conclusion of the breeding period, the two groups were regrouped and remained together until the time of lambing. Because these ewe lambs were still in an immature stage of body growth, they were maintained on a high level of nutrition during gestation and lactation.

Results and discussion

For each of the four years, all ewe lambs increased in body weight from the start of flushing to the end of the breeding period. Each year this increase in body weight was approximately the same for all breeds of ewe lambs.

When breeding was initiated, the mean body weight for the ewe lambs

Table 1. Lambing results from crossbred and purebred females[1]

Kind of ewe	Hampshire purebreds	White-face purebreds	Combine purebreds	Hampshire-white-face crossbreds	Advantage for crossbreds
Number exposed	62	28	90	64	
Number of ewes lambing	44	20	64	54	
Number of lambs born	60	24	84	76	
Ewes lambing (%)	71	71	71	84	18%
Lambs born of ewes exposed (%)	97	86	93	119	28%
Lambs born of ewes lambing (%)	136	120	131	141	8%
Lambs weaned of lambs born, alive or dead (%)			74	93	26%

[1] When bred as lambs.

was between 115 to 130 pounds. At this time, the lambs were seven to eight months of age.

From the data in Table 1, it can be concluded that the F_1 crossbred females excelled each of the parental purebred females. Thus, the crossbred ewes exhibited some heterosis or hybrid vigor for percent conception, percent multiple births, and percent of lambs weaned. An acceptable way to determine if heterosis exists is to compare the mean of the F_1 progeny with the mean of the parents. The percent superiority of the crossbred females over the mean of the parental purebreds indicates an advantage of from 18 to 28%. The advantage of the crossbred females appears to be real, since the 64 crossbreds represent offspring from 32 different Hampshire rams. The 62 head of Hampshire females are from 16 different Hampshire rams. The 28 head of white-face females are from at least 8 rams of each of the 2 breeds.

Because they have more multiple births and wean a higher percentage of their lambs, it would be expected that the crossbred ewes should produce more pounds of lambs per ewe than the purebred ewes. The data are summarized in Table 2.

Table 2. Results of lamb production from ewes bred as lambs

Year born	Ewes weaning a lamb	Pounds of lamb weaned/ewe	Avg. age of lamb at weaning
	No.	*Lbs.*	*Days*
	Crossbred		
1960	14	80	110
1961	9	112	123
1962	18	77	124
1963	13	95	120
Average		88	119
	All purebreds		
1960	9	57	96
1961	16	79	120
1962	8	82	130
1963	14	77	114
Average		75	115

Except for those born in 1962, the crossbred ewes have excelled in pounds of lamb weaned when compared to the mean of the parental purebreds. Combining results from the four years, each F_1 crossbred female has produced 17% more pounds of lamb at weaning age.

Of further interest is the production from these crossbred females when bred as yearlings to a third breed. For the past three years, they have averaged weaning 121 pounds of lamb per ewe. No comparable figures are available from the purebred breeds because, as yearlings, each female is mated to a ram of her respective breed. The average production expressed as pounds of lamb weaned per crossbred ewe was 41% greater when she lambed as a two-year-old than when she lambed at a yearling age. Thus, it would appear that breeding the F_1 female as a lamb has not reduced the potential for future lamb production.

Summary

Each of the past four years, eight Hampshire ram lambs possessing a record for high individual performance have been progeny tested with purebred white-face ewes. When compared to the mean of the parental breeds, the resulting F_1 crossbred females have exhibited the effect of heterosis for an increase in percent of ewes lambing, percent of offspring born and weaned, and in pounds of lamb weaned per ewe. These comparisons were made over each of four years and relate to data from the females being bred as lambs to Southdown or to Cheviot rams.

Lamb production from the crossbred two-year-old females did not appear to be adversely affected by their producing lambs at a yearling age.

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