Summary of reports...

1962 Sheep and Wool Day

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CONTENTS

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Digestibility of Ryegrass Screenings for Lambs

D. C. CHURCH

Past, present, and probably future feed-lamb price relationships tend to encourage the use of the most reasonably priced feed combinations that will result in satisfactory lamb production. Due to less favorable profits in recent years, more and more by-product and crop-residue feeds are being utilized every year. Screenings from the grass-seed industry are a good example of materials that are being utilized to a greater extent by feeders.

Before considering the feeding value of such materials, there are a number of problems associated with their use that should be considered.

Spreading of undesirable grass and/or weed seeds. This may be quite a problem for the seed industry, although the magnitude of the problem has not been determined. Nearly all undesirable seeds can be destroyed by grinding finely (3/64" hammer mill screen) or by heating in the presence of moisture at about 205° for 1½ minutes. Grinding and pelleting would probably be a good combination of treatments to eliminate this problem.

Variability of the material. Products such as seed screenings are rather variable in terms of chemical analysis, weight per unit volume, and other quality measures. In addition, supplies available to feeders may vary markedly from year to year.

Analysis of screenings available indicate that dry matter content will be about 90%; protein 8-12%; fat 2-4%; fiber 8-24%; and ash 4-10%. Probably there is considerable variation from year to year and from field to field.

Toxicity. Screenings from a number of grass seeds—perennial ryegrass, alta and chewing's and creeping red fescues—sometimes contain substances toxic to cattle and sheep. The toxins have not been identified, but nematodes and ergot are believed to be strong possibilities. No information is now available as to appropriate methods to make such products safe for feeding. Dilution with other feedstuffs might dilute the toxic material to a point where it would not be a problem. Another possibility is that the moist heat involved in pelleting might inactivate the toxins, and make otherwise unusable screenings safe for consumption.

Since common (annual) ryegrass screenings (RGS) have not been implicated to any extent with toxicity problems, a series of digestion trials with lambs was conducted in 1961 in order to make a modest start in the evaluation of screenings from this seed crop. Since feeds of this nature are not normally fed alone, the experiment was designed to determine the value of RGS when fed in different proportions with either alfalfa or with two mixed fattening rations. Screenings used represent both the light and heavy end from the cleaning machine. They were mixed and coarsely ground (¼" screen).

Data obtained from the digestion trial are shown in Table 1.

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Table 1. Digestion coefficients obtained with experimental rations

Ration	Percent digestion*			
	Organic matter	Crude protein	Cellulose	Energy
Alfalfa	57	67	51	56
+ 1/4 RGS	63 (83)	70 (80)	51 (52)	61 (78)
+ 1/2 RGS	65 (74)	72 (76)	46 (34)	64 (72)
Ration No. 2	75	76	36	73
+ 1/4 RGS	75 (73)	79 (85)	29 (15)	72 (70)
+ 1/2 RGS	72 (68)	72 (68)	27 (21)	68 (63)
Ration No. 3	75	74	43	72
+ 1/4 RGS	74 (70)	72 (66)	38 (26)	70 (66)
+ 1/2 RGS	68 (63)	67 (63)	23 (9)	64 (58)

* Data in parentheses are coefficients for RGS calculated by difference.

Data presented in the table show that digestibility of the batch of screenings used was relatively high. Whether this is typical of all screenings is not known. The data also indicate that a screenings-alfalfa combination is a good one.

The coefficients shown in parentheses are calculated coefficients for the screenings. To obtain these, coefficients for the alfalfa were used and applied to the alfalfa-screenings mixtures, with the assumption that the same amount of digestion occurred. This assumption is probably not true, but the only way to determine the true digestibility of the screenings in such a mixture would require the use of isotope techniques.

As indicated in the table, calculated coefficients for RGS are lower when fed with ration No. 3 than with No. 2. One of the primary differences between these rations was that No. 2 contained 20% alfalfa meal, whereas No. 3 contained only 5% alfalfa.

Data are preliminary

It must be borne in mind that data presented here are preliminary. Currently, digestion trials are under way using light and heavy RGS fed alone and in combination with alfalfa, corn silage, and a mixed fattening ration. When this research is completed, and the data summarized, we will have a much better idea of the feeding value of these screenings.

Feeding Linear-Programmed Rations to Lambs

B. R. ELLER and J. A. B. MCARTHUR

Linear programming procedures (based on nutritive composition and cost of feeds) were used to formulate rations for lambs. The experimental plan was designed to compare rations containing two levels of energy (estimated net energy) in combination with two levels of crude protein. Low-energy rations contained approximately 544 calories per pound. High-energy rations contained approximately 600 calories per pound. Low-protein rations contained approximately 10% crude protein. High-protein rations were formulated to have 14% crude protein. The rations were pelleted in cubes one-fourth inch in diameter. The ingredients of each ration are given in Table 1.

Table 1. Composition of rations fed

Treatment	Low protein		High protein	
	Low energy	High energy	Low energy	High energy
Grass-alfalfa hay, lb.	316	429.5	278	361
Barley straw, lb.	432	232	412	219
Beet pulp, lb.	.....	17	.....	.....
Cull peas, lb.	220.5	.....	936	765.5
Milo, lb.	792	1,182	135.5	458
Molasses, lb.	200	102	200	160
Dicalcium phosphate, lb.	18	16	17	15
Salt, trace-mineralized, lb.	20	20	20	20
Antibiotic premix, lb. (Aurofac 15 g./ton)	1.5	1.5	1.5	1.5
Total pounds	2,000	2,000	2,000	2,000
Calculated cost per ton, dollars	40.32	43.46	40.71	43.78
Actual cost per ton (pelleting not included), dollars	40.75	43.03	41.40	43.60
Crude protein by analyses, percent	9.64	11.35	18.87	14.01
Estimated net energy, cal./lb.	544	600	544	600

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Differences between calculated and actual costs of rations were due to changes in the prices used by the computer and final prices paid for the in-

gredients. Rations also varied somewhat in crude protein content. This is because crude protein content of the feedstuffs used was not identical with the information used in formulation.

Local feed used

Ration ingredients were selected from feedstuffs available locally and were priced per cwt. as follows: hammered grass-alfalfa hay $1.50, hammered barley straw $1.00, dried beet pulp $2.60, beet molasses $2.00, millfeed $2.70, ground milo $2.50, ground barley $2.40, ground cull peas $2.50, alfalfa meal $2.50, soybean meal $5.80, linseed oil meal $5.25, cottonseed meal $4.70, steamed bonemeal $5.70, iodized salt $2, dicalcium phosphate $6 and antibiotic premix $60.

The trial was conducted at the Eastern Oregon Experiment Station, using wether lambs of the Columbia and Targhee breeds and crossbreds by Hampshire rams on ewes of the other two breeds. Each lot contained five whiteface lambs and five crossbred lambs. The lambs were fed for 39 days from self-feeders, and at the conclusion of the trial they were trucked to Portland for slaughter.

Results

The level of crude protein in the ration significantly affected average daily gain ($P< 0.01$). In each instance where the crude protein level of the ration was raised, average daily gains increased. Changes in estimated net energy did not significantly affect rate of gain, but they had a significant effect ($P< 0.05$) on carcass grade. Improved carcass grades were associated with the higher levels of net energy. The level of protein had no effect on carcass grade. Dressing percent was not affected by the crude protein content or estimated net energy content of the ration (Table 2).

The data show that daily feed intake increased as crude protein content increased, except for the lot receiving the ration containing over 18% crude protein. Feed efficiency varied from 6.69 pounds of feed per pound of gain (high protein, low energy lot) to 14.23 pounds of feed per pound of gain (low protein, low energy lot).

The high protein, low energy lot had the least expensive gains at 15.21 cents per pound of gain, and the low protein, low energy lot had the most expensive gains at 32.57 cents per pound of gain.

No breed differences in rate of gain were apparent in any of the rations fed. Crossbred lambs had significantly higher carcass grades ($P< 0.01$) than whiteface lambs with all rations fed. Crossbred lambs had slight, nonsignificant increases in carcass yield over whiteface lambs in the high gaining (high protein) lots.

Table 2. Production and carcass data on lambs fed different levels of protein and energy

Lot no.	I	II	III	IV
	Low protein		High protein	
Treatment	Low energy	High energy	Low energy	High energy
Number of lambs				
Crossbred	5	5	5	5
Whitefaced	5	5	5	5
All	10	10	10	10
Days on feed	39	39	39	39
Av. initial weight, lbs.	90.2	91.1	90.2	89.4
Av. final weight, lbs.	101.0	114.3	117.8	114.5
Av. daily gain, lbs.	0.28	0.59	0.71	0.64
Av. daily feed intake, lbs.	3.94	4.53	4.74	4.80
Av. daily C.P.[1] intake, lbs.	0.38	0.51	0.80	0.67
Av. daily ENE[2] intake, cal.	2,130	2,720	2,560	2,875
Av. lbs. feed per lb. gain	14.23	7.62	6.69	7.46
Av. daily feed cost, cents	8.00	9.80	9.80	10.45
Av. feed cost per lb. gain, cents	29.00	16.40	13.80	16.22
Yardage per lb. gain[3], cents	3.57	1.69	1.41	1.56
Total costs per lb. gain, cents	32.57	18.09	15.21	17.78
Av. dressing percent				
Crossbred	52.4	49.2	51.4	52.4
Whitefaced	52.5	50.0	48.1	49.5
All	52.4	49.6	49.8	50.9
Av. USDA carcass grade[4]				
Crossbred	17.0	18.2	18.2	18.8
Whitefaced	16.4	17.6	17.0	17.0
All	16.7	17.9	17.6	17.9

[1] Crude protein in ration: Lot I, 9.64%; lot II, 11.35%; lot III, 18.87%; lot IV, 14.01%.
[2] Estimated net energy: Lots I and III, 544 cal./lb. (low level; II and IV, 600 cal./lb. (high level).
[3] Yardage fee: 1¢ per head per day.
[4] Prime = 20; Choice = 17; Good = 14.

Synchronization of Estrus in Ewes

RALPH BOGART, DUANE ADDLEMAN, and LLOYD WESTCOTT

Open ewes normally come into heat every 16 to 17 days during the breeding season. The estrous cycle is under hormone control. At the beginning of the breeding season, follicle stimulating hormone from the pituitary gland stimulates the development of the follicle in which the egg is developing. The follicle cells secrete estrogens which bring the ewe into heat and also act on the pituitary to cause it to produce luteinizing hormone and reduce its production of the follicle stimulating hormone. When the follicle stimulating hormone and the luteinizing hormone reach a certain balance, the follicle ruptures and the egg is released. This is called ovulation.

The tissue that was formerly the follicle tissue now develops into a corpus luteum (yellow body). The corpus luteum secretes a hormone—progesterone—which helps to prepare the uterus for nourishing the egg, and it also prevents the release of eggs. Thus, the animal goes out of heat and is prepared for pregnancy. If the animal does not become pregnant, the corpus luteum does not normally persist for more than 10 days to 2 weeks. When it regresses, the process described above repeats itself. One might normally expect that ewes would all be bred in 16 to 17 days under natural conditions. We know that this does not happen, because there are variations in cycle length and some ewes do not become pregnant.

Generally, the lambing season, where the breeding season is limited, extends over a 40 to 50 day period with certain peaks of heavy lambing. Research relating to the control of estrus has been based on the fact that progesterone prevents animals from coming into heat. Progesterone injected daily into females has been effective in preventing them from coming into heat. When injections cease, the animals come into heat and ovulate 2 to 4 days following the cessation of progesterone treatment.

Implants used

Research has also shown that a progesterone implant will prevent ewes from coming into heat. When the implant is removed surgically, the ewes will come into heat in 2 to 4 days.

Neither of these two methods was practical, because daily injections require considerable handling of the sheep, and surgically removing implants requires specialized skills. Recently, progesterone materials have been developed that are effective orally. These can be included in the feed for 14 to 16 days and will hold the animals out of heat while they are being fed. When feed containing orally administered progesterone material is discontinued, ewes come into heat within a few days.

It is the purpose of this paper to give results that have been secured with orally administered progesterone materials for the synchronization of estrus in ewes. We are interested in

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information concerning the following:

- What percentage of ewes come into heat following cessation of orally administered progesterone?
- What percentage of ewes become pregnant when this material is used?
- Are there peculiarities associated with the use of orally administered progesterone, and are there hazards from its use?

It may be of interest to speculate upon the advantages and uses that could be made of synchronized estrus. There might be advantages in getting lambs born at about the same time, so that their performance could be more accurately determined for selection purposes. In research work it may be important to synchronize estrus. One very promising area of research where this is needed is in transplanting ova from one ewe to another. We can, by hormone treatment, cause ewes to produce a large number of normal eggs. These can be placed into other ewes for their development if the other ewes are in the right stage of the estrous cycle. This would make it possible to obtain a large number of lambs from a genetically valuable ewe.

In the present study Provera (Repromix) was fed at the rate of 50 to 60 mg. per ewe per day for 14 to 16 days, after which hormone feeding was discontinued. The study covers two years —1961-62 and 1962-63. Lambing records are available for the ewes in the 1961-62 study but only nonreturn to estrus is available for the ewes treated in 1962. Inbred Suffolks, Willamettes (a new sheep being developed at Oregon State), Cheviots, Dorset Horns, and Columbias were used in the study. A total of 270 ewes were used in 1961, and 237 ewes were used in 1962. The records on 210 ewes in 1960 are used for comparison, since these ewes are the same ones used in 1961 and 1962, and they were handled in the same way with the exception of the hormone treatment.

The normal breeding pattern of ewes with no treatment for 1960 is shown in Table 1. There was a uniform distribution of ewes bred during the first 16 days in both the Suffolks

Table 1. The normal breeding pattern of ewes in 1960 with no treatment

Days from turning in ram (Sept. 10)	Suffolk		Willamette		All ewes	
	No.	%	*No.*	%	*No.*	%
1-4	14	12.2	20	21.1	34	16.2
5-8	28	24.3	21	22.1	49	23.3
9-12	18	15.7	21	22.1	39	18.6
13-16	22	19.1	20	21.1	42	20.0
17-20	8	7.0	10	10.5	18	8.6
21-24	19	16.5	3	3.2	22	10.5
25-28	1	0.9	0	0.0	0	0.0
29-32	0	0.0	0	0.0	0	0.0
33-36	1	0.9	0	0.0	1	0.5
37-40	4	3.5	0	0.0	4	1.9
Totals	115	100.0	95	100.0	210	100.0

and the Willamettes. This is what would be expected with no attempt to alter the estrous cycle. Several ewes did not become pregnant during the first 16 days. This is much more noticeable in the inbred Suffolks than in the Willamettes.

Forty of the Suffolks and 14 of the Willamettes were bred at the second estrous cycle. The interval between the first and second heats ranged from 7 to 31 days, but 43 of the 54 ewes that did not settle on the first breeding returned in the 14- to 17-day period following the first breeding. Nine Suffolks and one Willamette returned for the third breeding. All of these were in the 14- to 17-day period following the second breeding. Two Suffolk ewes came in heat the second time, but they lambed from the mating in the first heat. Twenty Suffolks and 4 Willamettes did not lamb.

Gestation length for the Suffolks was 145.0 days and for the Willamettes 146.6 days. Gestation lengths varied from 138 to 160 days, but most of the ewes lambed 143 to 150 days after breeding.

In 1961 270 ewes were fed, with the following numbers by breeds: Suffolk 118, Willamette 125, Cheviot 8, Dorset Horn 9, and Columbia 10. The ewes were fed a ground concentrate ration into which Provera was incorporated at a level to provide 50 mg. per ewe per day. Suffolks and Willamettes were fed as a large group; whereas the Cheviots, Dorsets, Columbias, and nine each of Suffolks and Willamettes were fed as a smaller group. It was noticed that variations existed in the large group; some ewes consumed little of the grain in which the Provera was incorporated, while others ate larger amounts.

Breeding pattern

The breeding pattern of the ewes in the fall of 1961 is shown in Table 2. It can be seen that approximately 65% of all ewes were bred in the first four

Table 2. Breeding pattern of ewes in 1961-62 following treatment with Provera

Days from cessation of Provera	Suffolk		Willamette		Cheviot		Dorset		Columbia		All ewes	
	No.	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*
1-4	77	65.3	73	58.4	8	100.0	9	100.0	8	80.0	175	64.8
5-8	22	18.6	20	16.0	0	0.0	0	0.0	2	20.0	44	16.3
9-12	5	4.2	14	11.2	0	0.0	0	0.0	0	0.0	19	7.0
13-16	6	5.1	7	5.6	0	0.0	0	0.0	0	0.0	13	4.8
17-20	7	5.9	8	6.4	0	0.0	0	0.0	0	0.0	15	5.6
21-24	1	0.8	2	1.6	0	0.0	0	0.0	0	0.0	3	1.1
25-28	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
29-32	0	0.0	1	0.8	0	0.0	0	0.0	0	0.0	1	0.4
33-36	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
37-40	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Totals	118	100.0	125	100.0	8	100.0	9	100.0	10	100.0	270	100.0

days following cessation of Provera feeding. The percentage of ewes bred in this period was greater in ewes fed in the smaller group than it was in ewes fed in the larger group. Practically all of the ewes were bred within 20 days following cessation of Provera feeding.

Sixty-two of the 118 Suffolks showed a second heat; 41 within the 14- to 17-day period following the first heat. Fifty-nine of the 125 Willamette ewes showed a second heat; 24 within the 14- to 17-day period following the first heat. All of the Cheviots showed a second heat within the 8- to 12-day period following the first heat. There was a marked variation of 5 to 38 days in the interval between the first and second heats among the ewes showing a second heat. Very few ewes came into heat the third time.

It is of interest to note that 12 of the Suffolks, 21 of the Willamettes, 4 of the Cheviots, and 1 Dorset Horn that came into heat the second time lambed from the first breeding. Also 4 Suffolks, 6 Willamettes, 1 Cheviot, and 1 Columbia came into heat the third time, but they lambed from the breeding in the second heat.

Of the 270 ewes bred, 252 lambed. Eleven of the 18 ewes not lambing were inbred Suffolks. Some of the other ewes not lambing were accounted for by death of ewes prior to lambing.

Lengths of gestation were 147.5 days for Suffolks, 148.0 days for Willamettes, 148.5 days for Cheviots, 147.0 days for Dorset Horns, and 150.4 days for Columbias.

During the 1962 season, 106 Suffolks and 133 Willamettes were fed a concentrate ration in which Repromix was incorporated to provide 60 mg. of Provera per ewe per day for 14 days. The ewes were observed for 23 days following cessation of feeding the hormone. Ninety-six of the 106 Suffolks (91%) and 127 of the 133 Willamettes (95%) came into heat during the 2- to 5-day period following cessation of the hormone. Thirty percent of all ewes bred during the first estrus came into heat the second time. Among the ewes coming into heat the second time, 70% of the Suffolks and 89% of the Willamettes showed the second heat 14 to 17 days following the first heat.

It should be pointed out that in 1962 the ewes were divided into small groups for feeding the ration containing the hormone. Placing the ewes in smaller groups made it possible to assure more uniform consumption of the hormone.

If it is assumed that several of the ewes showing the second estrus will lamb from the mating during the first estrus, it would appear that reasonably satisfactory results will be obtained from the 1962 studies. It might be predicted that about 70% of the ewes will lamb within a 4-day period.

Synchronization of estrus

It appears from the results in this study that orally administered progesterone shows promise as a material for synchronizing estrus in ewes. There seems to be a slight upset in the hormone balance from orally administered progesterone as shown by two results; the greater variation in estrous cycle intervals and the greater number of pregnant ewes showing estrus. However, the percentage lamb crop of ewes lambing and the percentage of ewes bred that lambed were about the same for ewes fed progesterone and for those not receiving the hormone. Lambing percentage of ewes lambing was 131, 135 for Suffolk ewes nontreated and treated, and 135 and 133 for Willamette nontreated and treated

ewes, respectively. The percentage of ewes lambing of those bred was 88 for the nontreated and 93 for the treated.

The material presented here brings out the fact that more information is needed before synchronization of estrus can be recommended for practical use on the farm. These data appear promising for developing methods to achieve synchronization of estrus, whereby a short lambing period can be realized. Whether sheep breeders and producers will want to have most of their lambs arrive within a 4-day period will depend upon their management situation. This development will be of immense value to research workers, and it may be of value to breeders who want more uniformity in order to make selection more effective.

Blood Components and Their Relationship to Growth and Meat Quality of Sheep

A. F. ANGLEMIER

The importance of finding a solution to the problem of meat quality evaluation and prediction is widely recognized throughout the entire meat industry. Any objective method that could reliably predict the muscle characteristics of the live animal or determine the meat quality of the subsequent carcass would greatly facilitate all phases of meat production, processing, and marketing.

Since blood is a circulating tissue which participates in every functional activity of the body and provides an optimal nutrient environment for all body cells, the analysis of blood from live animals appears to be a means of gaining information that might be applicable to the development of objective meat-quality criteria.

As early as 1902, Garrod (1) suggested that "just as no two individuals of a species are absolutely identical in bodily structure, neither are their chemical processes carried out on exactly the same lines." Biochemical individuality as defined by Williams (2, 3) indicates that differences in the levels of blood components might provide a basis for insight into individual characteristics. Williams has noted that the blood enzymes which have been adequately evaluated in humans show substantial inter-individual differences, and that a difference in the normal range of three- to five-fold is not uncommon. In humans, it has been observed that an individual tends to maintain a relatively constant and distinctive body enzyme pattern throughout the life cycle, except in times of disease or injury.

Enzymes are present in every cell, and they are responsible for chemical transformations that are necessary and essential for all life processes. They are able to create new matter as well as to break down substances. They are responsible for the formation of all compounds found in plants or animals. In the living body, amino acids origin-

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ating from the dietary intake of either plant or animal proteins are taken from the blood stream and used to form tissue or muscle that is quite different from that originally ingested.

On the basis of the foregoing discussion, studies on the blood components of meat animals were initiated at Oregon State. More specifically, we have directed our attention mainly to the serum-enzyme activity levels in both sheep and beef animals in order to determine whether some relationship might be found between certain of these measurable blood-borne factors and the characteristics of body tissue or muscle.

EXPERIMENTS

Data on the blood studies of sheep presented here were obtained from two different experiments. Hence, the results of these two studies must be discussed more or less independently, since there was a great deal of difference between the animals of the two experiments in regard to age and weight and also in over-all experimental objectives.

Experiment 1

The main objective of this study was to determine normal enzyme-activity patterns of lambs during their normal growth and fattening stages. Thus, 33 male lambs of the same breed were bled systematically (at 10-day intervals) from 48 hours of age to a slaughter age of 110 days. Blood samples were analyzed for the following serum enzymes; acid and alkaline phosphatase, amylase, glutamic-oxalacetic, and glutamic-pyruvic transaminases. These values were then plotted against age for each individual animal and also on a group basis—a fast gaining group versus a slow gaining group.

Although these enzyme levels were semi-quantitated in terms of relative activities rather than in absolute amounts, the data do indicate some interesting trends. The better-gaining animals maintained a relatively higher level of alkaline phosphatase activity and higher alkaline/acid phosphatase ratio than did the poorer-gaining animals. Curves showing plottings of growth in relation to alkaline phosphatase activity levels and alkaline/acid phosphatase ratios readily reveal that the better gainers had a much smoother pattern of values, as contrasted with the erratic pattern of the poor-gaining group. The better gainers generally presented a picture of fairly high alkaline phosphatase levels, decreasing rather slowly over a period of time; whereas the poor gainers had somewhat lower initial values accompanied by a rather rapid reduction in activity levels in a short period of time. Alkaline phosphatase activity of both groups reached peak levels at about 50 days of age, after which a decline was noted. There did not appear to be any relationship between the other enzymes and growth.

Loin roasts were obtained from these animals after slaughter. The roasts were cooked and evaluated by a trained taste panel for tenderness, juiciness, and texture. Taste panel data were compared with results of the blood enzyme analysis in order to determine whether any relationship existed. It was noted that lambs producing the most tender meat had both significantly higher levels of alkaline phosphatase and higher alkaline/acid phosphatase ratios from 50 days of age to slaughter time (110 days of age) than those producing less tender meat. This same trend was also noted between the groups for juiciness and texture, al-

though the differences were not as large.

In looking at the data as a whole, it was concluded that no prediction could be derived from the blood analysis during the first 50 days of age in lambs, due to excessive fluctuations during the interval. These fluctuations might possibly be attributed to the ruminant animal gradually shifting its metabolism from that of a simple stomach to one of complete ruminant functioning.

Experiment 2

The second study was conducted on wether lambs during their growing-fattening period in the feedlot. At the start of this study, the weight of the lambs ranged between 70 and 90 pounds. These animals were fed diets containing varying levels of coumestrol (a plant estrogen) in conjunction with implantation of diethylstilbestrol (DES). Blood analyses were completed on these lambs prior to the feeding period to establish normal values for estimating the effect of coumestrol and DES upon some of the blood components during the test period. After establishing normal serum enzyme activity levels, the animals were placed on test, and blood samples were taken at 2-week intervals during the subsequent 8-week testing period. The serum was analyzed for amylase, acid, and alkaline phosphatase activity levels and also for total cholesterol.

Briefly, the results of this test were: animals implanted with DES and fed the high coumestrol diet showed the highest rate of gain of any of the groups on test; and, animals implanted with DES exhibited more rapid rate of gain than those that were not implanted with DES. The effects of coumestrol and DES upon the growth patterns of the lambs were somewhat reflected by changes in the serum enzyme activity levels. Lambs implanted with DES and receiving dietary coumestrol showed an increase in the alkaline phosphatase activity, as contrasted with a gradual decrease noted for the control lambs.

Generally, the alkaline phosphatase activity levels of the lambs on the control ration showed a gradual decline as they approached maturity. The reduction of alkaline phosphatase with an increase in age was also noted in the first experiment. Amylase activity and total cholesterol levels decreased in the implanted and coumestrol-fed animals during this test, as contrasted with an increase in these two components in the control lambs. Normally, these two constituents tend to increase gradually with age and weight.

Data on the serum enzyme activity in this study indicate that maturation was retarded in the lambs receiving coumestrol and DES. These compounds had a tendency to delay normal aging; i.e., they kept the animals physiologically younger for a greater period of time than those in the control group. The loin roasts of these lambs have not yet been evaluated by the taste panel. Thus we have no knowledge regarding the relationship between blood analyses and taste panel results.

Results

Results obtained from the above studies offer encouragement for the continuation of this research, and also indicate that it might be wise to expand the research to include enzymatic studies on the muscle tissue itself.

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Recent Advances in the Control of Parasites in Sheep

S. E. KNAPP

At least 22 different types of internal parasites have been identified from Oregon sheep. Six of these types are considered responsible for most livestock losses attributed to parasitism. Included in this group are the liver fluke, thread lung worm, eastern stomach worm, brown (medium) stomach worm, small stomach worm, and the bankrupt worm. This report deals with methods of controlling these species of internal parasites which occur in the gastro-intestinal tract of sheep.

Understanding the life cycle

The control of parasitism requires an understanding of the life cycle of the parasite. This knowledge will permit the livestock producer to develop and enforce important management practices, such as sanitation and the application of drugs. The life cycle for this group of parasites is relatively simple. Eggs deposited by the adult female, residing in the stomach or small intestine, are passed with the droppings. The eggs may hatch in a few days or remain dormant, depending on weather conditions. When there is abundant moisture and average daily temperature of 55° F. or higher, eggs will hatch two or three days after they are passed. Such conditions could occur at any time in western Oregon and would be most common from March until November. Larvae, from the eggs, develop into infective forms within a week. These move up the forage and are then available to grazing livestock.

Since many thousands of eggs may be passed by a single animal at one time, it is possible that another animal could acquire a severe parasitic infection after grazing a single tuft of forage. Therefore, it should be recognized that animals confined to limited pastures with high carrying capacities would be more likely to acquire heavier parasite burdens than range sheep or sheep that are frequently moved from one pasture to another. Consequently, management practices should be particularly directed toward animals on lush irrigated pastures and in areas where the climate is mild and moist.

Methods of control

There are several important management factors which should be considered with regard to controlling parasitism in sheep.

Purchase of new animals such as replacement ewes and rams. Keep these animals separate from other livestock until they can be treated with an anthelmintic. Do not allow them to graze a pasture until they have been treated. This also applies to feeder lambs which are placed on winter ryegrass pastures.

Treatment time. Administer an anthelmintic to adult sheep after they have lambed and preferably before the flock is turned to pasture. Spring lambs should be treated about two months before they go to market.

During the summer, drench all lambs and ewes if the animals are

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grazing irrigated pastures. Drench all animals in the late fall or early winter. In most cases anthelmintics are safe to administer to pregnant ewes if given a month before lambing. Post-treatment abortions probably result from careless handling during drenching.

Change to a different pasture. This may be an excellent time for treatment with an anthelmintic, since the existing worm burden can be reduced at the time the sheep are moved to a clean pasture.

Selection of anthelmintics. Phenothiazine has been the drug of choice for a number of years. Recent studies have shown that a purified micro-fine form of this drug is more effective in removing gastro-intestinal parasites than other forms of phenothiazine. An experiment involving the use of purified fine-particle phenothiazine in Oregon lambs is summarized in Table 1.

Within the past six months a new anthelmintic (Thibenzole) has been licensed by the Food and Drug Administration for use in sheep. Results of an experiment where this material was used are shown in Table 2. One of the outstanding characteristics of this drug is an apparent low toxicity to sheep.

Tactical drenching. In some cases

Table 1. Average percentage reduction of nematodes at neucropsy for lambs treated with organic phosphate and purified fine-particle phenothiazine

Treatment*	Abomasum	Small intestine	Total
	%	%	%
Bayer L 13/59[1] 75 mg./kg.	50.19	26.47	34.08
Bayer L 13/59—21/199[1] 50 mg./kg.	83.39	79.70	80.05
Purified fine-particle phenothiazine 25 gr./lamb	86.95	58.73	66.91

* Twenty lambs in each group.
[1] Organic phosphate drugs (systemics).

Table 2. Comparison of thibenzole and phenothiazine in removing gastro-intestinal nematodes from lambs[1]

Parasite species	Thibenzole	Purified fine-particle phenothiazine
	% reduction	*% reduction*
Eastern stomach worm	100.00	99.20
Medium stomach worm	80.70	93.20
Stomach hair worm[2] and bankrupt worm	77.20	43.70

[1] Adapted from data published by A. C. Todd, Vet. Med. *57(4):322-325.* 1962.
[2] Other studies have indicated a higher efficiency for Thibenzole against the stomach hair worm.

tactical drenching is a good practice. This involves the use of one type of anthelmintic, such as phenothiazine, in the spring, followed by a different anthelmintic in the summer. The reason for this is that phenothiazine is reported to be quite effective against the species of stomach worm most common during that season. A different material, such as copper sulfate-nicotine sulfate or Thibenzole, could then be used during the summer when a second species of stomach worm, reportedly not highly susceptible to phenothiazine, is the principal problem.

Directions on the labels of anthelmintic products give specific recommendations for their use.

Other developments

It has been emphasized that a knowledge of the life cycle of the parasite is the basis for proper management practices. Current research concerning development of more effective methods of control is also based on this idea. We have learned that as more animals are raised in less space parasitism increases. We have also found that dependence on internal drenches will not permit adequate control of parasitism, regardless of the excellence of the drugs involved. The research program at Oregon State University has been focused on the combination approach. Studies completed within the past three years have indicated that: selection of forage types may aid in the reduction of parasite burdens in sheep by providing a sub-optimal environment for infective larvae which survive over winter (Table 3); and that the use of chemical sprays (hematocides) may become an effective procedure for eliminating infective larvae from pastures (Table 4).

This information and other research data yet to be discovered will, when combined with our knowledge of anthelmintics, provide a complex, integrated system for prevention of severe parasitism and elimination of economic losses associated with low-level parasitic infections.

Table 3. Number of adult stomach worms recovered from worm-free lambs grazed on different species of forage five months after larvae were placed on plots[1]

Forage type	Number of lambs and plots[2]	Average no. adult stomach worms from lambs/forage type
Ryegrass	5	820
Velvetgrass	5	1,014
Red clover	5	1,328
Alsike clover	5	1,762
Subterranean clover	5	2,005
New Zealand white clover	5	3,114

[1] Larvae placed on plots January 2, 1962.
[2] One worm-free lamb was allowed to graze each plot (64 sq. ft.) for 18 days.

Table 4. Number of infective-stage stomach worm larvae recovered from individual plants after application of nematocide (Fumazone 70-E)

Forage type	Number of plants tested	Average number of larvae recovered[1]	From controls
			%
Perennial ryegrass			
Sprayed	50	27.52	58.80
Not sprayed (controls)	50	66.80	.....
Subterranean clover			
Sprayed	50	33.20	55.79
Not sprayed (controls)	50	75.10	.....

[1] One thousand larvae were placed at the base of each plant. Five days later Fumazone was applied using an atomizer. Five days after spraying, the plants were cut at ground level and placed individually into shell vials filled with water. Numbers of nematode larvae present were determined by counting all those present in the individual vials.

Reproductive Performance of Crossbred and Purebred Ewes

C. W. Fox and J. A. B. McArthur

The concept of crossbreeding has been generally accepted for the purpose of producing market lambs. In many geographic sections of the United States a crossbred market lamb is produced by crossing a blackface ram with whiteface ewes. Besides showing increased milk production, crossbred ewes generally excel purebred ewes in fertility. Whitehurst et al., (1947) reported that Cheviot-Romney ewes produced 31% more lambs than Romney ewes. Similar studies in New Zealand by Phillips (1951) and Hewitt (1951) indicated the superiority of lambing percentage for Cheviot-Romney ewes over Romney ewes. More studies are needed to compare lamb production from crossbred and purebred ewes when both kinds have been selected for similar traits as weanling lambs. Also, data are needed on the level of fertility from crossbred and purebred females when bred as lambs.

The present study pertains to a comparison of reproductive performance from each of 16 crossbred and purebred ewes.

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Selection of ewe lambs

In the fall of 1959, eight ewes were allotted at random to each of four Hampshire ram lambs. Selection of

these ram lambs was based on heavy weaning weight and total gain made during a performance-test period following weaning. The ewes were either of the Columbia or Targhee breed. The crossbred lambs from these matings were born in January or February of 1960 and weaned the following June. At weaning, four crossbred ewe lambs were selected from each of the four sires. These 16 crossbred ewe lambs were selected on the basis of heavy weaning weight.

Sixteen purebred Hampshire ewe lambs that were born in January or February of 1960 and weaned the following June were used to compare with the crossbreds. Heavy weaning weight was the basis for selecting these ewe lambs; they were from various sire groups.

Flushing and breeding of ewe lambs

Following weaning, the two groups of ewe lambs were kept together on a similar plane of nutrition. During the flushing and breeding period, the lambs were on an increasing plane of nutrition. The breeding period was started September 14, 1960. Two breeding groups of an equal number of crossbred and purebred ewe lambs were joined with each of two rams. A semen sample was obtained from both rams used in the study, prior to turning them in with the ewes. The percent of live sperm and motility score indicated that each ram possessed semen of good quality. The length of the breeding period was the same for both groups of ewe lambs. From the end of the breeding period until lambing, both groups were together. Any ewe which did not lamb was placed with the "dry" flock. Ewes with lambs were pastured together until their lambs were weaned.

Lambing results when bred as lambs

The weights of these young ewes at flushing and breeding and the lambing results are presented in Table 1. The purebred ewe lambs were born 12 days later than the crossbreds. Any influence that these 12 days may have had on body weight was not apparent on August 31, which was the initiation of the flushing period. Both groups of ewe lambs increased in body weight from the start of the flushing to the end of the breeding period. This increase in body weight was approximately the same for the two groups.

Table 1. Mean value of performance traits from ewes, 1961[1]

	Purebred	Crossbred
Number	16	16
Average date born	2–5–60	1–24–60
Body weight, lbs. 8–31–60	132	130
Body weight, lbs. 10–21–60	139	140
Average lambing date	3–1–61	2–13–61
Ewes lambing[2] (%)	44	94
Lambing percentage[3]	100	153

[1] Bred as lambs.
[2] Based on ewes exposed to ram.
[3] Based on ewes lambing.

The crossbred ewes excelled the purebred ewes in percent of multiple births, percent of ewes lambing, and they also lambed earlier in the season. Based on ewes exposed, 50% of the crossbreds produced multiple births compared with none for the purebreds. Only one crossbred ewe did not lamb compared with nine of the purebred ewes. The large difference between the two groups in percentage of ewes lambing could be explained in several ways. With the restricted breeding period, the purebred ewe lambs were not yet exhibiting estrus. The 17-day difference between the purebred and crossbred ewes for date of lambing would tend to support this hypothesis.

Since the crossbred ewe lambs were bred earlier, there is a remote possibility that a reduction in fertility of the ram could have accounted for some infertile services among the purebred ewe lambs. The semen from each ram was not evaluated after the breeding period. The percentage of twin births from the crossbred ewes seems to indicate a real difference in the level of fertility. This difference in reproductive efficiency could be due to nonadditive gene action.

Flushing and breeding of yearling ewes

The following year these two groups of ewes were again compared for reproductive performance. The crossbred yearling ewes were mated to the same rams as in the previous year. The purebred yearling Hampshire ewes were allotted among four Hampshire rams. Both groups were together during the flushing period. The ewes were divided into their breeding groups August 22, 1961. One ram was placed with each group of ewes. All rams were again evaluated for semen quality, and considered to possess semen of good quality. The breeding period was the same length of time for each group of ewes. Following the breeding period, both groups of ewes were kept together until lambing.

Compared to the lambing results of the first year, the average date of lambing was almost the same for the two groups. The results seem to indicate that at yearling ages there was no noticeable genetic difference between the two ewe groups for date of conception. No comparable data were available on the other parental breeds for dates of conception or for percent of multiple

Table 2. Mean value of performance traits from ewes, 1962[1]

	Purebred	Crossbred
Number	16	16
Body weight[2], 8–9–61	157	159
Body weight[3], 10–30–61	168	179
Average lambing date	1–21–62	1–23–62
Ewes lambing[4] (%)	100	94
Lambing percentage[4]	125	169

[1] Second year of lambing.
[2] Start of flushing period, 8-9-61.
[3] End of breeding period, 10-30-61.
[4] Based on ewes exposed.

births. If an assumption is made that these two white-face breeds do slightly excel the Hampshire breed for multiple births, the mid-point for the parental breeds would certainly not compare to the number of multiple births exhibited by the crossbred ewes. It can be assumed that this is another example of heterosis in ovulation rate that is often obtained from selected crossbred dams.

Summary

Comparisons were made between 16 purebred and 16 crossbred ewe lambs for percent lambing, percent of multiple births, and average date of lambing. Both groups of ewe lambs were selected on the basis of heavy weaning weight. The genetic background of the crossbred ewes was Hampshire rams crossed with Columbia or Targhee ewes. The four Hampshire rams used to sire the crossbred ewes had been selected for heavy weaning weight. The same comparisons were made between both groups when bred as yearlings. Lambing percentages are expressed as number of lambs born from ewes exposed to the ram.

When bred as ewe lambs, 94% of the selected crossbred ewes lambed, and produced a 143% lamb crop. Only 43% of the selected purebred ewes lambed, they produced no multiple births; and they lambed 17 days later than the crossbreds.

When bred as yearlings, 94% of the selected crossbred ewes lambed, and produced a 169% lamb crop. All 16 of the purebred ewes lambed; they produced a 125% lamb crop, and they lambed two days earlier than the crossbreds.

The higher percentage of lambing by the crossbred ewes when bred as lambs would indicate that these ewe lambs were in estrus at an earlier age than the purebred ewe lambs. When based on ewes lambing, the higher percent of multiple births from the crossbred ewes for both years would indicate that this increase was due to nonadditive gene action.

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Sire Evaluation Determined by Carcass Value of Offspring

C. W. Fox and J. A. B. McArthur

Today the livestock industry is being asked to produce a product having more lean meat and less fat. Most sheepmen are looking for a ram which will produce the "ideal" lamb. "Ideal" in that the producer, to stay in business, must make an adequate profit from the sale of this lamb. For the packer the "ideal" lamb should grade Choice, and yield sufficiently high that more than 50% of the purchased live weight can be sold to a retailer. The retailer can merchandise only the carcass purchased from the packer. Finally, the consuming public will consistently buy that meat which it can afford. It should be quite evident that there is no universal agreement on what constitutes this "ideal" lamb. However, we must not lose sight of the fact that the consuming public will determine the fate of the "ideal" lamb.

In a comparable span of five years, a ram, by natural service, will produce 30 or 40 times more offspring than a ewe. Therefore, research workers have been attempting to determine the genetic ability of rams to transmit to their offspring those hereditary units which will permit development of desirable lambs, including carcasses of high merit.

Material and methods

During the 1960 breeding season, four registered Hampshire rams were loaned by Hampshire breeders to the Department of Animal Science. Two ram lambs from each of these four sires were chosen for progeny testing from the upper half of the lamb crop, based on adjusting weaning weight. One ram lamb was selected on the basis of heavy weaning weight and one was chosen at random.

That fall, 16 whiteface ewes were allotted at random to each of the 8 ram lambs. The whiteface ewes were either of the Columbia or Targhee breed and were maintained at the Eastern Oregon Branch Experiment Station at Union. The crossbred progeny from this cross were weaned early in June 1962. From each of the eight sires, the three heaviest wether lambs were slaughtered. For these 24 crossbred lambs, the average age at slaughter was 140 $\pm$ 2 days, and the average shorn weight was 91.8 $\pm$ 6 pounds. From these 24 carcasses, various subjective and objective measurements were made on amounts of lean meat and fat. These carcasses had an average cold weight of 45.1 $\pm$ 4.8 pounds.

To establish a basis for evaluating any lamb carcass, a shoulder, rack, loin, and leg were selected by a retail merchant from each of the best four carcasses. These selected cuts had a maximum amount of lean meat and no more than one-fourth inch of external fat covering over the rack and loin. The shoulder and legs possessed only sufficient finish to prevent their dehydration during a transit shipment, or during the time they were displayed for sale as retail cuts. These primal cuts that were selected as "very desirable" from a retail evaluation were given a subjective score of 5.

It was determined from boning and trimming the primal cuts from all 24 carcasses that for each numerical score above 5 the excess fat trim was one-fourth pound. Therefore, a loin having a subjective score of 9 would have 1 pound of excess fat. Using this scoring system, it was possible to obtain an estimated value for each carcass that would approach the monetary value a retail merchant could anticipate receiving for each carcass. Also, a carcass having a subjective score of 5 for its primal cuts would have 82-85% of the carcass weight as salable retail cuts. The nonsalable parts making up the other 15-18% would consist of bones, kidneys, kidney fat, fat trim, and scraps. A standard retail mark-up of 25% was made for a carcass price of $43/cwt. for USDA Prime and Choice and $41/cwt. for USDA Good. The retail price per pound for the shank, shoulder, rack, loin, and leg was 29, 49, 89, 98, and 79 cents, respectively. The retail return per carcass was adjusted to 140 days of age and to a single birth. At 140 days of age, a carcass from a twin was 1.2 pounds lighter in weight than from a single birth.

Results and discussion

Data in Table 1 relate to the average of three carcasses per sire.

It is evident from the data in Table 1 that there was little difference in retail value between the sires. However, the three wether lambs from each sire had been selected because they were the heaviest in weight at weaning, and only a small number of lambs was used in the evaluation. For the adjusted rib-eye area, there was no significant difference between the eight sire groups. The rib-eye area (*longissimus dorsi* measured at the 11th rib) for twins born and raised as twins was 0.2 square inches smaller than that for singles.

By USDA grade, the retail carcass value per 100 pounds was $53.45 for Prime and $57.34 for Choice and Good —a difference of 7% in favor of the lower grades.

Correlations of retail carcass value with rib-eye area and retail value of trimmed legs were 0.39 and 0.78, respectively. This would indicate that the rib-eye area is not as important in carcass value as are the legs. These correlations were from data adjusted to 140 days of age and to a single birth.

A 6-rib roast from each carcass was cooked and scored for tenderness, juiciness, flavor of lean and fat, and overall desirability. Between these eight sire groups there were no significant differ-

Table 1. Carcass data from three wether lambs of eight sires

	Selected				Random within selected group			
Sire number	1–67	1–51	1–19	1–41	1–9	1–37	1–13	1–7
Weaning wt., lbs.[1]..	90	100	99	92	90	93	98	83
Actual age, days	141	137	147	143	143	144	138	134
Retail value, dollars[2]	56.72	56.56	57.81	56.42	56.63	57.93	56.14	57.72
Rib-eye area[3]	1.91	1.84	1.93	1.64	1.82	1.94	2.01	1.73
Tenderness score[4] ..	6.2	5.9	6.1	6.0	6.4	6.1	6.4	6.6

[1] Adjusted to 140 days and single birth for the 3 wethers.
[2] 25% markup and based on 100 pounds.
[3] Measured at 11th rib (*longissimus dorsi*) and adjusted to 140 days and a single birth.
[4] The higher the value, the more tender the meat.

ences for any of the flavor scores. At these young ages tenderness score was not significantly correlated with rib-eye area, carcass grade, or age of lamb at slaughter. There was a correlation of 0.50 between tenderness and juiciness.

Summary

From these limited data, it would appear that more than three offspring per sire should be used to determine the genetic potential of a sire. Also, it might be more meaningful to use randomly selected offspring from a sire rather than selecting only the heavier lambs. Adjusting the carcass data for age of lamb and type of rearing will help reduce the variation between sires. At these young ages there were no differences in flavor scores from lambs of different sires. USDA Choice and Good lambs yielded 7% more retail return than Prime lambs. In evaluating carcasses on a retail basis the area of the rib-eye is not as valuable as the legs.

The European Common Market and Its Possible Impact on the Sheep Industry

G. Alvin Carpenter

In recent months, much has been said and written about the development of the Common Market in Western Europe and the possible impact of this development on international trade and on various industries in the United States. The drive for European unification, which began some 10 years ago under the Schumann Plan, the ultimate objective of which is a more united and powerful Europe, is reaching a decisive stage.

In the six countries comprising the Common Market, a customs union is rapidly taking shape. Many common policies are being hammered out, sometimes painfully but nonetheless surely. The fact that Great Britain and other countries have applied for membership has created new interest on the part of U. S. citizens as to what the long-run implications are for the American economy. Individual industries and commodity groups are getting more apprehensive as to the type of competition they will face as they see these new policies develop.

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Basic aims and objectives of the Common Market

The basic aim of the Common Market is to pool the economic resources of the member countries in a customs union within which goods, labor, services, and capital will move freely. The common economic community will apply common policies for foreign trade and tariffs, agriculture, transportation, and coordinated policies in a large number of other economic fields. Whereas the old idea in Western Europe was one of balance of power between countries, this idea is now giving way to a fusion of common interests. Many people refer to the Treaty of Rome, which set up the Common Market in late 1957, as the most important

development in Western Europe in the past century. It may well be just that.

Some of the long-time objectives of the Common Market are:

- To end forever the conflicts that have so long divided Western Europe.
- To restore the weight and importance of Europe in world trade and economic affairs.
- To abolish outdated trade barriers which split Western Europe into small protected markets.
- In short, to set up institutions which will form the basis of a future United States of Europe.

Obviously these goals will not be easy to accomplish, but the six countries in the Common Market are showing a new spirit with great determination. In the four years in which the Common Market has existed, these six countries have achieved considerable progress. They have cut internal tariff rates by 50%, and approved a further acceleration of the program. They have made the first moves toward common external tariff development, and have set external rates on many commodities. They have made decisions on the first measures for a common agricultural policy, which is to be implemented in full by 1970. The Common Market has begun negotiations with the United Kingdom, Denmark, and Ireland, countries that have applied for full membership. When these three countries come into the Common Market, the population of common market countries will exceed 250 million, and will comprise one of the most productive and efficient economic areas of the world.

This in brief gives a bird's-eye-view of what is developing in Western Europe. These countries have launched a massive program, which is to be accomplished over a transition period by 1970. It will not be easy, but they have set their course. We, in this country, must try to evaluate the impacts of this development on our own economy and on certain industries and key commodities.

The Common Market has three major trade objectives:

1. To build markets for industrial commodities within the common market area and throughout the world.

2. To establish and implement policies which will expand trade among its members and to the world at large, and at the same time protect its growing markets from the imports of nonmember countries.

3. To get a larger share of world markets and more economic power so as to wield more political power.

The development of the Common Market is a combination of opportunities and dangers for us. The possible membership of other countries culminating in growing economic power creates a danger of widening the division between Europe and America. It increases the difficulties of American producers selling some of their commodities to Western Europe. We must realize that the six countries of the Common Market now take one-third of all U. S. exports and approximately one-fourth of our agricultural exports —the major part being paid for by dollars. Its rapid economic growth makes it potentially even a larger market in the future.

Agricultural policy

On January 14, 1962, the Council of Ministers agreed on essential objectives for the agricultural policy of the Common Market. The basic aim is to create a single market similar to our own national domestic market. To

reach this aim, the Common Market Commission proposed an agricultural marketing policy and a policy for structural improvement of agriculture. Basic objectives include:

- A more productive agriculture for Europe.
- A better balance between supplies and needs.
- Higher incomes for farmers.
- Stable markets for farm products.
- Reasonable prices to consumers.

Methods used to attain objectives

Members of the European Common Market are embarking on an agricultural program of more self-sufficiency and protectionism. Their aim is to develop a common price policy for all basic commodities and to establish quality standards so that trade between member countries can be facilitated. The program will be implemented by the following measures:

1. Establishment of support prices to safeguard agriculture and stimulate production in all countries of the community.
2. Establishment of common external tariff rates for imports from outside countries to protect the growing domestic production.
3. Gradual removal of all tariffs between member countries within the community so that trade will flow freely between them.
4. Protection of prices of domestic products within the community by a system of variable import levies and import certificates designed to give preference to member producers. How this variable-levy system will affect access of our own products to Western Europe depends on how it is applied. If applied in a restrictive manner, it will be more difficult to get our products into the market. If applied in a liberal manner, there will be more reasonable access to the market.

Internal support price levels for various commodities are also important. If these are set too high, domestic production will be stimulated, and our imports will be subjected to more restrictive levies. Consequently, if such a policy is followed, U. S. exports will be adversely affected.

These objectives of the agricultural policy of the Common Market will not be reached all at once. Many conferences and negotiations between member countries have already been held, and further conferences will be needed before final agreements are reached and objectives achieved. Nevertheless, this is the course on which they are embarking; and it is important for us to understand their objectives and their impact on our industries.

The common market policy for meat

The aim of the agricultural policy for meat within the Common Market is to stimulate more domestic production and to remove tariff barriers and discrimination between producers and consumers inside the common market area. The aim is further to increase external tariff rates which will favor producers within the Common Market and make it more difficult for imports from outside countries to enter. They have already announced that the external tariff on fresh or frozen beef, veal, and variety meats will be increased to 20% ad valorem, to be fully effective by April 1, 1966. This, of course, will make it more difficult for our exports of variety meats to get into that area.

Just how important has the common market area been for U. S. livestock and meat products?

In 1960-61, the U. S. exported a total to all countries of $350 million worth of meat and meat products. Of this total, $90 million represents exports to countries that are now members of the Common Market. The major products sold there were lard, grease, fatback, tallow, hides and skins, casings, and variety meats. Now with the development of the Common Market and the initiation of their agricultural policy, it may be more difficult to expand outlets for variety meats in that area.

U. S. livestock producers, although they export very few products to Western Europe, are interested in expanding foreign outlets for by-products of the industry, because prices for these by-products are reflected in the prices packers can pay producers for live animals. The policy toward self-sufficiency in Western Europe and the increase in external tariff rates will make it more difficult for by-products of the U. S. industry to move into those countries.

Impact on U. S. market

The particular impact that common market policy will have on a commodity in this country depends on whether or not that commodity is on an export basis or an import basis. As you all know, the United States has been on a net import basis for beef and veal and for lamb and mutton for several years. Demand and prices for meats have been higher in this country than in most other areas. Consequently, exporting countries of the world, particularly Australia and New Zealand, have tried to expand their sales here. U. S. sheep producers are more concerned about protecting their industry from increasing imports than in pushing efforts to expand exports, except for some of the by-products. Since 1958, there has been a significant increase in imports of boneless beef and boneless mutton and lamb from Australia and New Zealand. For example, in 1957, lamb and mutton imports represented less than 1% of the U. S. production; but they increased to about 12% of the U. S. production by 1961. Thus far in 1962, mutton exports to the U. S. from Australia have nearly doubled over 1961.

For years Great Britain has been the largest importing nation for meats in the world, and Australia and New Zealand have relied greatly on Great Britain as their market. During the last year or so there has been a tendency for both of these countries to reduce supplies of meat moving to Great Britain, whereas supplies moving to the United States of both beef and boneless mutton and lamb have been increasing. Both cattle and sheep producers of this country are very apprehensive as to how much more these imports will increase, and what the net effect will be on domestic price levels. We cannot halt imports entirely; but certainly if they continue to expand as they have done recently, they will have increasing impacts on our domestic price structure which will be unfavorable to domestic producers.

Developments in the common market area are likely to have more indirect than direct effects on the U. S. sheep industry. Much depends on the final terms under which Great Britain enters the Common Market. We will not know this exactly until her negotiations with the "six" are completed. As mentioned earlier, Britain is the world's largest importer of meats. The Commonwealth countries of Australia and New Zealand have been large suppliers. In fact, New Zealand ships 90% of her lamb exports to Great Britain—

in 1961 these exports amounted to some 19 million lamb carcasses. These British Commonwealth countries have heretofore enjoyed duty-free entrance of their products into Great Britain. This is known as the Commonwealth trade preference. When Britain becomes a member of the Common Market, these Commonwealth countries may not find it possible to enter their meat duty free and may be required to meet the external tariff barriers of the Common Market. This trade preference enjoyed by Commonwealth countries is one of the major issues now in the current negotiations for Britain's entrance.

We must realize that New Zealand and Australia must export to live, and they expect the United Kingdom to continue to buy much of their meat. If higher common market tariffs reduce the possibility of sending large volumes of lamb and mutton to that area, or if they are required to go over a 20% increase in ad valorem external tariffs, it will necessarily increase the pressure on these countries to send more of their meat products to the United States. The last two or three years, both of these countries have been trying to push more of their meat into our country. They have had economic missions here studying our markets to try to determine market specifications and develop possibilities for expanding their trade here.

These two countries in particular see the handwriting on the wall in Europe. They envision increasing difficulties in expanding their export outlets to the common market area, especially if Great Britain goes into the group and cannot safeguard their trade preferences. Consequently, they will do everything possible to increase their share of the U. S. market. This is doubly important to them because this market is the highest-priced market for meat in the world, and we have lower trade barriers than most countries, except Great Britain. Consequently, as we look to the future, we can expect increasing competition from these two countries in particular. The U. S. livestock industry, therefore, has much at stake on the final outcome of negotiations between Great Britain and the Common Market.

The new trade expansion bill

The new Trade Expansion Bill, which passed Congress this year, gives the President much greater authority than any President has had over tariffs in the past. It gives him authority to reduce tariffs 50% below where they are now. The possibility that this new authority might be used to lower tariffs on meat and meat products, and thus allow for increased imports of these items, raises considerable apprehension in the minds of many U. S. livestock producers. At this time, there is nothing to indicate that tariffs on meats will be lowered; but some of the arguments for the passage of the bill were to the effect that new negotiating authority was needed so that the U. S. might more favorably compete with developments in the Common Market. It was argued that if we expected to gain more access to the common market area, we must be willing to give concessions to them on some of our commodities, in return for which we would gain concessions to enter more of our products into their market area.

The big question is which products will be required to bear the burdens and which are going to gain the benefits. Some of these possible developments in relation to the new Trade Act give livestock interests the most concern. Livestock groups must be ready

to demonstrate conclusively, with the proper evidence, that increasing imports of meats would have an adverse effect on their domestic industry. It is conceivable that when the announced agricultural policies for the Common Market are in full effect, and, if the 20% ad valorem external tariff rate is applied for lamb and mutton going into the Common Market, then the trading patterns in the world may be shifted considerably.

Future possibilities

We must not always look at the negative side. There is still a big possibility that the external tariff rate for lamb going into the Common Market will not be as high as 20% ad valorem. Britain is the largest per-capita consumer of lamb in the world. Consumers there eat about 25 pounds per capita as compared with roughly 3 pounds per capita for the average of the six European countries in the Common Market. There is some talk to the effect that some concessions might be accorded New Zealand in the case of her lamb exports. Some of the countries on the continent feel that it may be well to let New Zealand lamb enter Britain under a lower duty than the 20% ad valorem. If this were the outcome of the final negotiations, it would relieve the pressure on New Zealand to push her lamb exports toward the United States. Another point we should consider is that it is a natural tendency for meat consumption per capita to increase as the income of the consumer increases. If present rates of economic activity continue in the common market countries, and, if their per-capita incomes increase faster than these countries can increase their own meat production, the common market area may import more red meats and meat products from the outside. This possibility, of course, will relieve the pressure on Australia and New Zealand and consequently on the U. S.

Our future exports of by-products to that area will depend in the short-run on our ability to obtain concessions in trade negotiations. In the long-run, it will depend on changes in the level of economic activity and increases in effective demand of consumers in that area, as well as on livestock production rates there. Livestock production has been increasing in all of the common market countries. They are now self-sufficient in pork, and are rapidly increasing their production of poultry and eggs. Most of these countries will still need to import feed grains to increase livestock production. Over the longer period, feed grain production will increase, especially in France, and more resources will be diverted to livestock production. All of these trends, if they continue, will have an eventual influence in the U. S.

Wool policy

No definite policy has been developed as yet for wool in the Common Market. The tendency is to look upon wool and cotton as industrial commodities. They import these commodities with few, if any, tariff restrictions. They manufacture finished goods from these commodities and export them to other world markets. To the extent that economic activity in the Common Market continues to increase, and especially if woolen mills can expand their demand for woolens, such activity may have a favorable influence on world prices for wool. Britain and the nations on the continent import wool from Australia and New Zealand. It is not anticipated at this time that the development of the Common Market will have an adverse effect on world wool prices.

New and Superior Wool Products from the USDA's Wool and Mohair Laboratory

HAROLD P. LUNDGREN

I appreciate this opportunity to describe to you some of the work we are doing on wool in the United States Department of Agriculture's Wool and Mohair Laboratory at Albany, California. Our wool research program is directed towards enabling wool to compete more effectively in today's textile markets. Our aim is to find and develop ways to make new and superior wool products and make them attractive to more people.

The consumer wants appearance and performance most of all in apparel fabrics. He wants richness in appearance, good handle and drape, comfort in wear—in cold as well as in warm climates. He wants fabrics that do not shrink when washed, and that remain neat on wearing and after repeated cleanings.

Wool highly prized

As a textile fiber, wool has always been highly prized for its rich appearance, softness, and tailorability. Wool garments are comfortable to wear, and those made from the heavier weight fabrics are relatively wrinkle resistant. Wool fabrics are relatively soil resistant and easy to clean. They are flame resistant. Because of this combination of desired qualities—a combination not found in any other textile fiber—wool maintains a market close to 13% of the billion pounds of all fabrics used annually in apparel goods in the United States.

Wool occupies a prestige position in the apparel field, but this position is being challenged. Man-made fibers are capturing traditional markets from wool. Were it not for our increasing population and standard of living, wool would be losing out fast. The synthetics invaded markets formerly held by wool by promoting ease-of-care, shrinkage resistance, speed and smoothness of drying, wrinkle resistance of lightweight fabrics, and moth resistance.

Fortunately, the particular advantages that synthetics have enjoyed are now being reduced by improvements in wool products. The past year has seen some important new developments. Wool garments are now available with durable pleats and creases. Improved and less expensive treatments for moth resistance have been developed. New types of wool fabrics have appeared. Foam-backed wool fabrics are receiving increased attention. Stretch fabrics made wholly from wool are on the market.

Progress noted

It is pleasing to report that our laboratory is making progress in the development of a new and better fabric treatment to give durable pleats and creases. The U. S. Army Quartermaster Supply Center in Philadelphia recently conducted a trial run of the treatment, preliminary to its large scale use in Army, Navy, and Air Force garments.

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Also, we have made progress in development of our new treatment for control of dimensional stability in wool fabrics. We have named our process the WURLAN treatment; the treated fabrics are referred to as being WURLANized. The treatment is designed primarily to control laundering shrinkage, which it does exceptionally well. In addition, the treated fabrics come out of the tumble dryer looking relatively smooth, so that only light touchup ironing is needed. Moreover, treated fabrics are more resistant to abrasive wear than untreated fabrics. In some cases abrasion resistance is 200% greater than in untreated fabric.

Trials being conducted

Several of this country's largest wool-fabric manufacturers are conducting mill trials on the WURLAN treatment for shrinkproofing woolens, worsted, and knit goods. One wool mill wrote to us recently: "Our laboratory tests indicate that your process achieves far better results in the areas of shrinkage during laundering, retention of color, and the amount of mussiness present after drying than any other process we have tried to obtain washable woolens. We expect to use this process and to promote it." Rapid, continuous processing on standard textile equipment makes the treatment particularly attractive to the manufacturer. There is every indication that treated goods will be on the market within the coming months.

The WURLAN process is based on a principle called "interfacial polymerization." It involves the formation of an ultrathin resin coating on the surface of the fibers. The particular resin we have studied most is a polyamide. We are now investigating other kinds of resins that can be similarly applied. We are exploring also the incorporation of other chemicals with the resins to give multipurpose effects; for example, to add permanent mothproofing, greater soil resistance, and water repellency to the features now obtained by the WURLAN treatment.

Another field of exploration is the application of the WURLAN treatment to wools before the yarn is spun, a procedure particularly useful in the manufacture of knit goods of all kinds. Preliminary results look very promising.

Research continues

Our research team has its sights on other important objectives. We are looking for effective, durable, and practical treatments that inhibit the yellowing of wools, and also for improved bleaching methods that do not damage fiber quality as present methods do. We have recently reported research (done for us under a contract) that revealed a better way to remove trace vegetable matter from wool without seriously damaging fiber quality. We also hope to find practical ways to impart effective wrinkle resistance to light-weight wools, and to reduce pilling and increase wear life.

Initial studies of new treatments are done by our basic research group. This group studies the structure of wool and explores various new chemical modifications of the structure in order to find ways to impart desired permanent properties. Our products-development group examines and develops the more promising findings on commercial-scale machinery in our pilot processing plant. Thus, we can furnish practical information directly to wool mills.

Our pilot plant is presently equipped with machinery for the worsted system of manufacture. The worsted system uses fine, long-staple fiber to make smooth-textured yarns and fabrics such

as gabardines, whipcord, and serge. Addition of woolen-system machinery to our pilot plant would enable us to study the combed-out shorter staple fibers that make woolen yarns and fabrics such as tweeds, woolen flannels, and blankets.

A vigorous research program on wool assures a fair share of the market, and the long range outlook for wool is good. America is now spending 25 billion annually for clothing. Estimates indicate that this will come close to $35 billion by 1965. The population will then be 200 million. Textile markets are growing with the population and with the rising standard of living. Capturing a healthy share of these markets will depend on the combined efforts of wool growers, textile processors, wholesalers, retailers, and research men.