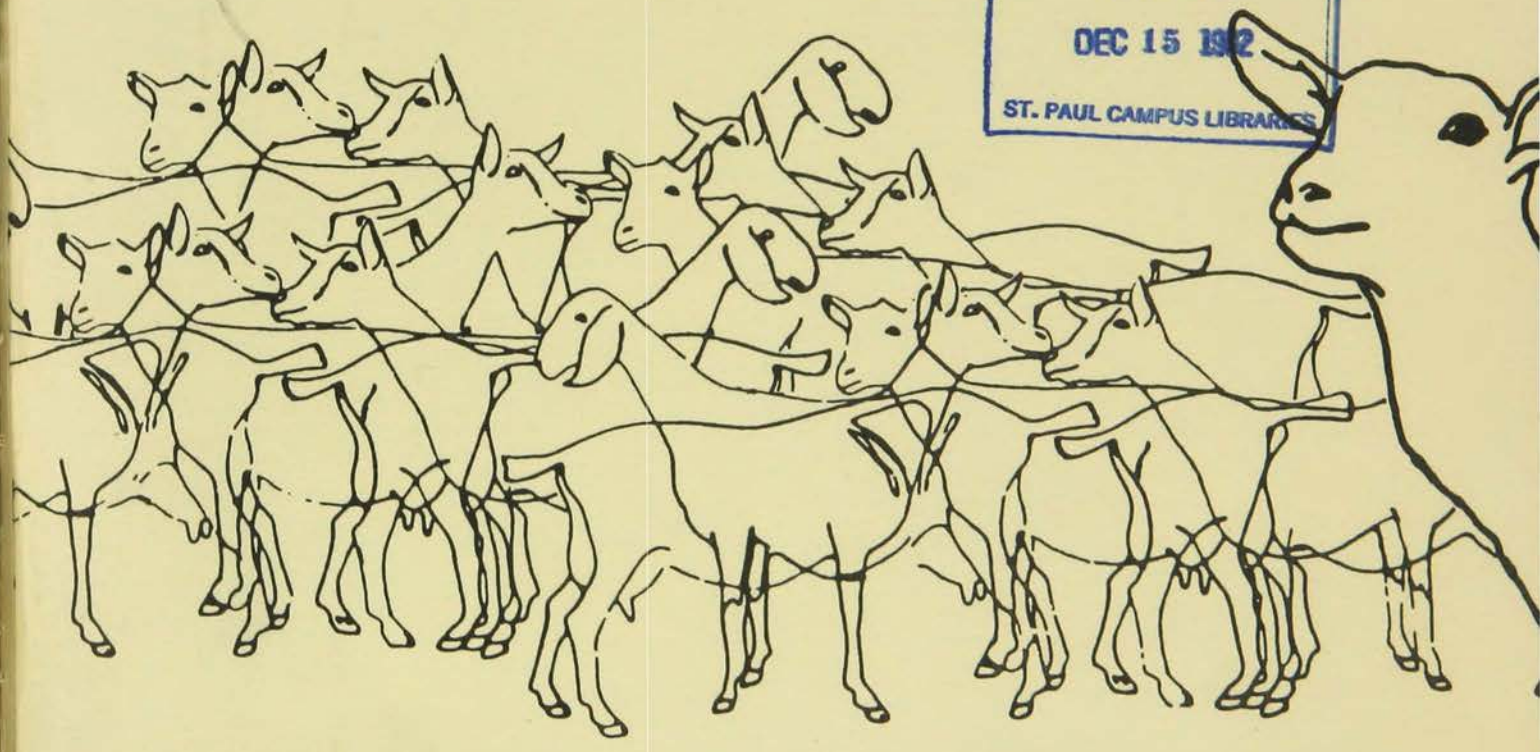
DAIRY



GOATS

5th Annual Conference · St. Paul Student Center ·

Agricultural Extension Service · University of Minnesota

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5TH ANNUAL DAIRY GOAT CONFERENCE PROCEEDINGS COMPILED AND EDITED BY: GERALD WAGNER, EXTENSION SPECIALIST, PROGRAM DEVELOPMENT, OFFICE OF SPECIAL PROGRAMS, UNIVERSITY OF MINNESOTA, ST. PAUL

5TH ANNUAL DAIRY GOAT CONFERENCE

St. Paul Student Center
St. Paul Campus, University of Minnesota
November 20, 1982

Purpose

The Fifth Annual Dairy Goat Conference will provide an in-depth program which will enable dairy goat farmers to:

1. Select the best quality feeds for milk production
2. Develop the best rations with available hay and grains
3. Determine the best cost rations
4. Make herd health management decisions based on current problems
5. Recognize situations that require professional health services
6. Learn to classify goats
7. Use classification information
8. Practice effective goat husbandry
9. Develop a goat management system
10. Share ideas with other goat raisers

Participants

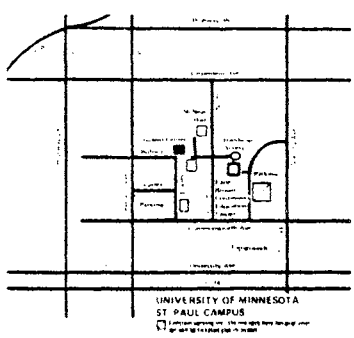
Dairy goat farmers from Minnesota and surrounding states, extension agents, veterinarians, Vo-Ag instructors, and others interested in dairy goat husbandry.

Fee

$13.00* — includes proceedings, programming costs and refreshments
$ 7.00 — for each additional family member
$ 7.00 — for University students

Food Service:

*Lunch is available in the student center or you may bring your own.



Program

a.m.

7:45 Registration
8:00 For early arrivals — three short films will be shown: *("Fitting & Showing", "Breeding & Kidding", "Basic Management")*
8:55 Welcome — *Roald Mason*
9:00 Nutrient and Feed Requirements for the Dairy Goat — *James W. Crowley*
10:20 Break
10:40 CAEV: Caprine Arthritis Encephalitis Virus — A Growing Concern — *Dave Sherman*
11:25 Why Classification? — *Harvey Considine*
12:00 Lunch

p.m.

Concurrent Sessions

Session 1

1:15 Feeding the Goat Herd — *James W. Crowley*
1:50 Classifying Goats — *Harvey Considine*

Session 11

1:15 Homesteaders —
1) Hard Cheese Making — *Robin Raudabaugh*
2) Tanning Goat Hides — *Anna Mosher*
3) Beginners Basic Management — *Maxine Sheldon*
3:30 Break
3:45 Update 1982: Current Health Problems in Minnesota Goats
4:30 Adjourn

Who's Who

Harvey Considine, judge and classifier, American Dairy Goat Association, Portage, Wisconsin
James W. Crowley, extension dairyman, University of Wisconsin, Madison, WI
▽**Marge Kitchen,** MDGA, Grande, MN
▽**Vince Maefsky,** director MDGA, owner — Poplar Hill Goat Dairy, Scandia, MN
Roald Mason, MDGA president, Marine on St. Croix
Anna Mosher, homestead dairy goat owner, Pine City, MN
Robin Raudabaugh, homestead dairy goat owner, Pine City, MN
▽**Maxine Sheldon,** MDGA, dairy goat owner, Marine on St. Croix
▽***Dave Sherman,** DVM, assistant professor, College of Veterinary Medicine
▽***Gerald Wagner,** extension specialist, program development

*University of Minnesota
▽Planning Committee

5th ANNUAL DAIRY GOAT CONFERENCE

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NUTRIENT REQUIREMENTS OF DAIRY GOATS

James W. Crowley, Extension Dairyman
University of Wisconsin

Recently there have been several papers presented at symposia and conferences specifically titled "Dairy Goat Feeding." Most of the material presented has basically been derived from research work and nutritional guidelines for sheep and dairy cattle. Certainly no apology nor criticism of these materials is needed. However, the National Research Council (NRC) has recently published a specific booklet on Nutrient Requirements for Dairy Goats. The title page and selected pages from this bulletin are attached. Like individual authors the committee had to rely on basic research with other species for much of the material. But research from around the world and some recent research with goats has been extensively utilized.

The primary reason for discussing this publication here is to encourage every one interested in Dairy Goat Nutrition to buy and use this publication. The publications for various species have been widely used and does bring uniformity to feeding suggestions by various nutritionists. As noted by the authors in the last sentence of the introduction this is not the final word on goat feeding and further revisions will be needed as new research becomes available.

From a practical or applied standpoint following the new nutrient requirement guidelines will not change the general feeding suggestions of feeding forages free choice and supplementing grain based on milk production. Feeding a pound of grain for each 2.0 to 2.5 pounds of milk with average hay or silages is still a good thumb rule. Likewise free choice trace mineral slat or about 0.5 percent TMS in the grain plus free choice for those not receiving much grain is a practical way to meet salt and trace mineral requirements. Like all ruminants the primary major minerals needed in addition to salt are calcium and phosphorus. Forages are higher in calcium than phosphorus, since ruminants consume large amounts of forage a good phosphorus supplement is usually needed.

N.R.C. publications utilize the metric system. The requirement table included gives animal weights and nutrient requirements in kilograms or grams. Most of us think in terms of pounds or ounces so you will probably want to convert the tables you use. One pound is 454(450) grams, one ounce is 28 grams and one kilogram is 2.2 pounds. For example a 50 kilogram doe weighs 121 pounds (50 x 2.2). Maintenance requirements for this doe with moderate activity is 795 grams or 1.75 pounds of T.D.N. and 110 grams or about .24 pounds of total protein.

Example Requirements for 60 Kg Goat producing 6 kilograms (13.2 lbs) of 3.5% fat milk low level of activity. (Adapted from N.R.C.)

	TDN		Total Protein	
	Grams	lbs.	Grams	lbs.
Maintenance	760	1.7	105	.23
Lactation	2052	4.5	408	.90
TOTAL	2812	6.2	513	1.13

NUTRIENT
REQUIREMENTS
OF
DOMESTIC
ANIMALS

NUMBER 15

Nutrient Requirements of Goats:

Angora, Dairy, and Meat Goats in Temperate and Tropical Countries

Subcommittee on Goat Nutrition
Committee on Animal Nutrition
Board on Agriculture and
Renewable Resources
Commission on Natural Resources
National Research Council

NATIONAL ACADEMY PRESS
Washington, D.C. 1981

1 INTRODUCTION

This report represents a first effort to establish the nutrient requirements of goats from original studies directly concerned with the needs of goats. Current scientific literature on goats is not nearly as extensive and comprehensive as it is for other domestic livestock species, and past efforts to set nutrient requirements have relied heavily on extrapolation of values derived from cattle and sheep studies.

There are approximately 400 million goats in the world, with over 2 million head in the United States alone, producing meat, milk, fiber (mohair) and skins (Haenlein, 1978; FAO, 1979; Shelton, 1980a,b; Terrill, 1980). An increasing number of people in the United States and around the world drink milk from goats, and interest in goats is on the increase (Bhattacharya, 1980; Devendra, 1980a; Haenlein, 1980a; Harris, 1980; Iloeje *et al.*, 1980; Leach, 1980). There is an increasing place for goats in commercial agriculture and with the small, part-time farmer (Lowe, 1943; Woinoff, 1949; Shannon, 1956; Garcia, 1958; Clamohoy *et al.*, 1959; Agricultural Research Institute, Cyprus, 1964; Oppong, 1965; Wahid, 1965; Banco Nacional Agropecuario, 1971; Skinner, 1972; Anonymous, 1973; Choveiri, 1973; Joubert, 1973; Maubecin, 1973; Bula *et al.*, 1977; McDowell and Bove, 1977; Ace, 1978; Fitzhugh *et al.*, 1978; Guss, 1978; Sands and McDowell, 1978).

Several national and international goat symposia have been staged recently: the American Dairy Science Association symposium in 1977 at Iowa State University, and in 1979 at Utah State University; the French National Institute for Sheep and Goat Research (ITOVIC) symposia in 1971 and 1981 at Tours; and the Winrock International Livestock Research and Training Center symposia in 1977 and 1978 at Morrilton, Arkansas. The Third International Conference on Goat Production and Disease will meet in 1982 at Tucson, Arizona. Their proceedings add greatly to the knowledge of the nutrient requirements of goats.

It is also increasingly evident that despite similarities to sheep and cattle, goats exhibit significant differences in grazing habits, physical activities, water requirements, feed selection, milk composition, carcass composition, metabolic disorders, and parasites. The nutrient requirements of goats may therefore justifiably be treated separately from those of other ruminants. As older literature becomes more accessible and new communication among world scientists increases, further documentation and information will be forthcoming (Nottbohm and Phillipi, 1933; Zorn *et al.*, 1938; Meklenburcev, 1949; Benzie and Phillipson, 1957; Saperstein, 1960; Crawford and Grogan, 1961; Eker, 1961; Hanson and Andersen, 1962; Hofmeyr *et al.*, 1965; Schaefer, 1967; Rogers *et al.*, 1969; Brandsch and Kruger, 1970; French, 1970; Morand-Fehr and deSimiane, 1977; Corbett, 1978; Haenlein, 1980a,b; Jenness, 1980). This first NRC report on the nutrient requirements of goats must be considered within the limits of available knowledge, and refinements are reserved for subsequent editions as the literature of goats improves.

3 TABLE OF NUTRIENT REQUIREMENTS

The nutrient requirements presented in Table 1 can be used to formulate diets for the different classes and categories of goats by proper use of available feedstuffs. The table lists nutrient requirements for maintenance at different levels of muscular activity and additional requirements for growth, pregnancy, lactation, and mohair production. The daily energy requirements for maintenance are 101.38 kcal ME/$W_{kg}^{0.75}$ [1 kg TDN = 4.409 Mcal DE (Garrett *et al.*, 1959) or 76 DE = 62 ME = 35 NE; protein requirements are related to energy needs as follows: 22 g DP or 32 g TP per Mcal DE]. The energy requirement for growth is 7.25 kcal ME/g of gain. Goat kids at very young ages may not be able to consume the suggested required quantities of DM. Similar situations can exist with high-producing dairy goats, but intakes of more than 5 percent of body weight have been reported (Haenlein, 1978). The energy requirements per kg FCM at 4 percent are 1246.12 kcal ME; and a 0.5 percent fat change in 4 percent FCM is 16.28 kcal ME. Additional requirements for mohair production are also presented. Details on Table 1 are discussed in Chapter 2.

TABLE 1 Daily Nutrient Requirements of Goats[a]

Body	Feed Energy				Crude Protein				Vita-		Dry Matter per Animal			
											1 kg = 2.0 Mcal ME		1 kg = 2.4 Mcal ME	
Weight (kg)	TDN (g)	DE (Mcal)	ME (Mcal)	NE (Mcal)	TP (g)	DP (g)	Ca (g)	P (g)	min A (1000 IU)	Vita-min D IU	Total (kg)	% of kg BW	Total (kg)	% of kg BW
Maintenance only (includes stable feeding conditions, minimal activity, and early pregnancy)														
10	159	0.70	0.57	0.32	22	15	1	0.7	0.4	84	0.28	2.8	0.24	2.4
20	267	1.18	0.96	0.54	38	26	1	0.7	0.7	144	0.48	2.4	0.40	2.0
30	362	1.59	1.30	0.73	51	35	2	1.4	0.9	195	0.65	2.2	0.54	1.8
40	448	1.98	1.61	0.91	63	43	2	1.4	1.2	243	0.81	2.0	0.67	1.7
50	530	2.34	1.91	1.08	75	51	3	2.1	1.4	285	0.95	1.9	0.79	1.6
60	608	2.68	2.19	1.23	86	59	3	2.1	1.6	327	1.09	1.8	0.91	1.5
70	682	3.01	2.45	1.38	96	66	4	2.8	1.8	369	1.23	1.8	1.02	1.5
80	754	3.32	2.71	1.53	106	73	4	2.8	2.0	408	1.36	1.7	1.13	1.4
90	824	3.63	2.96	1.67	116	80	4	2.8	2.2	444	1.48	1.6	1.23	1.4
100	891	3.93	3.21	1.81	126	86	5	3.5	2.4	480	1.60	1.6	1.34	1.3
Maintenance plus low activity (=25% increment, intensive management, tropical range and early pregnancy)														
10	199	0.87	0.71	0.40	27	19	1	0.7	0.5	108	0.36	3.6	0.30	3.0
20	334	1.47	1.20	0.68	46	32	2	1.4	0.9	180	0.60	3.0	0.50	2.5
30	452	1.99	1.62	0.92	62	43	2	1.4	1.2	243	0.81	2.7	0.67	2.2
40	560	2.47	2.02	1.14	77	54	3	2.1	1.5	303	1.01	2.5	0.84	2.1

TABLE 1 (*continued*)

Body Weight (kg)	Feed Energy				Crude Protein				Vitamin A (1000 IU)	Vitamin D IU	Dry Matter per Animal			
											1 kg = 2.0 Mcal ME		1 kg = 2.4 Mcal ME	
	TDN (g)	DE (Mcal)	ME (Mcal)	NE (Mcal)	TP (g)	DP (g)	Ca (g)	P (g)			Total (kg)	% of kg BW	Total (kg)	% of kg BW
50	662	2.92	2.38	1.34	91	63	4	2.8	1.8	357	1.19	2.4	0.99	2.0
60	760	3.35	2.73	1.54	105	73	4	2.8	2.0	408	1.36	2.3	1.14	1.9
70	852	3.76	3.07	1.73	118	82	5	3.5	2.3	462	1.54	2.2	1.28	1.8
80	942	4.16	3.39	1.91	130	90	5	3.5	2.6	510	1.70	2.1	1.41	1.8
90	1030	4.54	3.70	2.09	142	99	6	4.2	2.8	555	1.85	2.1	1.54	1.7
100	1114	4.91	4.01	2.26	153	107	6	4.2	3.0	600	2.00	2.0	1.67	1.7
Maintenance plus medium activity (=50% increment, semiarid rangeland, slightly hilly pastures, and early pregnancy)														
10	239	1.05	0.86	0.48	33	23	1	0.7	0.6	129	0.43	4.3	0.36	3.6
20	400	1.77	1.44	0.81	55	38	2	1.4	1.1	216	0.72	3.6	0.60	3.0
30	543	2.38	1.95	1.10	74	52	3	2.1	1.5	294	0.98	3.3	0.81	2.7
40	672	2.97	2.42	1.36	93	64	4	2.8	1.8	363	1.21	3.0	1.01	2.5
50	795	3.51	2.86	1.62	110	76	4	2.8	2.1	429	1.43	2.9	1.19	2.4
60	912	4.02	3.28	1.84	126	87	5	3.5	2.5	492	1.64	2.7	1.37	2.3
70	1023	4.52	3.68	2.07	141	98	6	4.2	2.8	552	1.84	2.6	1.53	2.2
80	1131	4.98	4.06	2.30	156	108	6	4.2	3.0	609	2.03	2.5	1.69	2.1
90	1236	5.44	4.44	2.50	170	118	7	4.9	3.3	666	2.22	2.5	1.85	2.0
100	1336	5.90	4.82	2.72	184	128	7	4.9	3.6	723	2.41	2.4	2.01	2.0
Maintenance plus high activity (=75% increment, arid rangeland, sparse vegetation, mountainous pastures, and early pregnancy)														
10	278	1.22	1.00	0.56	38	26	2	1.4	0.8	150	0.50	5.0	0.42	4.2
20	467	2.06	1.68	0.94	64	45	2	1.4	1.3	252	0.84	4.2	0.70	3.5
30	634	2.78	2.28	1.28	87	60	3	2.1	1.7	342	1.14	3.8	0.95	3.2
40	784	3.46	2.82	1.59	108	75	4	2.8	2.1	423	1.41	3.5	1.18	3.0
50	928	4.10	3.34	1.89	128	89	5	3.5	2.5	501	1.67	3.3	1.39	2.7
60	1064	4.69	3.83	2.15	146	102	6	4.2	2.9	576	1.92	3.2	1.60	2.7
70	1194	5.27	4.29	2.42	165	114	6	4.2	3.2	642	2.14	3.0	1.79	2.6
80	1320	5.81	4.74	2.68	182	126	7	4.9	3.6	711	2.37	3.0	1.98	2.5
90	1442	6.35	5.18	2.92	198	138	8	5.6	3.9	777	2.59	2.9	2.16	2.4
100	1559	6.88	5.62	3.17	215	150	8	5.6	4.2	843	2.81	2.8	2.34	2.3
Additional requirements for late pregnancy (for all goat sizes)														
	397	1.74	1.42	0.80	82	57	2	1.4	1.1	213	0.71		0.59	
Additional requirements for growth—weight gain at 50 g per day (for all goat sizes)														
	100	0.44	0.36	0.20	14	10	1	0.7	0.3	54	0.18		0.15	
Additional requirements for growth—weight gain at 100 g per day (for all goat sizes)														
	200	0.88	0.72	0.40	28	20	1	0.7	0.5	108	0.36		0.30	
Additional requirements for growth—weight gain at 150 g per day (for all goat sizes)														
	300	1.32	1.08	0.60	42	30	2	1.4	0.8	162	0.54		0.45	
Additional requirements for milk production per kg at different fat percentages (including requirements for nursing single, twin or triplet kids at the respective milk production level)														
(% Fat)														
2.5	333	1.47	1.20	0.68	59	42	2	1.4	3.8	760				
3.0	337	1.49	1.21	0.68	64	45	2	1.4	3.8	760				
3.5	342	1.51	1.23	0.69	68	48	2	1.4	3.8	760				
4.0	346	1.53	1.25	0.70	72	51	3	2.1	3.8	760				
4.5	351	1.55	1.26	0.71	77	54	3	2.1	3.8	760				
5.0	356	1.57	1.28	0.72	82	57	3	2.1	3.8	760				

C. *For a 40 kg pregnant doe having low body activity and producing mohair at a rate of 6 kg per year.*

Total Requirements (from Table 1)

Maintenance	2.47 Mcal DE/day	77 g TP/day
Pregnancy	1.74	56
Mohair	0.22	26
Total	4.43	159

Ration

	DM basis			As-fed basis		
Feeds	Amount (g)	DE (Mcal)	TP (g)	DM (%)	Amount (g)	% of ration
Alfalfa hay, mature	700	1.66	93	91	769	48
Corn grain	630	2.51	67	87	724	46
Molasses, cane	75	0.26	4	74	101	6
Total	1,405	4.43	164	—	1,594	100

Composition of ration: DE = 3.15 Mcal/kg DM
TP = 11.7% of DM
Level of intake (DM): 3.5% of body weight

D. *For a 30 kg doe having high body activity, nursing at the rate of 1 kg of milk production of 4% fat per day, and producing mohair at a rate of 4 kg per year.*

Total Requirements (from Table 1)

Maintenance	2.78 Mcal DE/day	74 g TP/day
Lactation	1.53	72
Mohair	0.07	9
Total	4.38	155

Ration

	DM basis			As-fed basis		
Feeds	Amount (g)	DE (Mcal)	TP (g)	DM (%)	Amount (g)	% of ration
Johnsongrass hay	400	0.98	30	91	440	28
Alfalfa hay, mature	400	0.95	53	91	440	28
Corn grain	600	2.39	64	87	690	42
Cottonseed oilmeal	20	0.08	9	91	22	2
Total	1,420	4.40	156	—	1,592	100

Composition of ration: DE = 3.1 Mcal/kg DM
TP = 11.0% of DM
Level of intake (DM): 4.7% of body weight

6. OTHER EXAMPLE RATIONS FOR GOATS IN TEMPERATE AND TROPICAL REGIONS AND FOR ANGORA GOATS

A. *Temperate regions*

Does: pregnant or dry
Example 1:
pasture plus good mixed hay and
0.5 kg of a 16% protein supplement
Example 2:
0.5 kg silage
0.5 kg mixed hay
0.3 kg beet pulp
0.5 kg 16% protein supplement
Example 3:
1.0 kg beets
0.5 kg alfalfa hay
0.5 kg beet pulp
0.5 kg 16% protein supplement

Does: lactating
Example 1:
1.5 kg clover hay
2.0 kg 14% protein supplement
Example 2:
1.5 kg grass legume hay
2.5 kg 16% protein supplement
Example 3:
0.5 kg mixed hay
2.5 kg corn silage
2.0 kg 18% protein supplement
Example 4:
3.0 kg roots, beets, carrots, steamed potatoes
1.5 kg mixed hay
0.25 kg beet pulp
0.5 kg oats straw
1.0 kg 14% protein supplement
Example 5:
2.0-4.0 kg green chop, pasture
1.5 kg sugar beet leaf silage
0.5 kg alfalfa hay
0.7 kg beet pulp
0.45 kg 14% protein supplement

Kids: nursing
Colostrum on the 1st day, 0.25 to 1.0 kg milk 2 to 3 times a day according to size for six to nine weeks, plus 16% protein supplement consisting of coarse grain, steamed rolled corn, oats, barley, pelleted alfalfa leaf meal, molasses (not more than 10%), and grass hays *ad libitum*

Kids: weaned and yearlings
Good mixed hay *ad libitum*, plus 0.25 to 0.75 kg of 16% protein supplement consisting of coarse grain mixtures and pasture

Bucks: breeding
(out of season)
Good hays *ad libitum* and pasture
(in season)
0.5 to 1.0 kg of a 14% protein supplement, plus mineral supplementation and salt, plus good hays and pasture

B. *Tropical regions*

Postweaning growth and meat production:
Example 1 (India):
50% cereal straw
30% corn grain
20% Alexandrian clover (Berseem), green

CAE: CAPRINE ARTHRITIS ENCEPHALITIS - A GROWING CONCERN

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University of Minnesota
College of Veterinary Medicine
St. Paul, Minnesota 55108

INTRODUCTION

In 1974 a scientific report appeared describing a previously unreported nervous disease of goats which was believed to be caused by a virus.[1] This was followed by a report of an arthritic disease in goats presumably caused by the same agent.[2] Shortly afterward the viral cause of these conditions was confirmed and the virus characterized.[3] The development of a diagnostic serologic test was soon reported along with the observation that a high percentage of goats in the United States appeared to have experienced the virus.[4] Investigation into the transmission of the disease suggested that virus was spread through colostrum and milk of infected dams and that virus free herds might be maintained by raising kids in isolation.[5]

It is truly remarkable how much has been learned about this previously unrecognized caprine disease in just eight short years. As is often the case however, it seems that for each question answered two new ones are raised. The purpose of this presentation is to summarize existing knowledge of the Caprine Arthritis Encephalitis (CAE) Syndrome, to clarify some possible misconceptions about the disease and its control, and to identify some industry concerns generated by the appearance of this disease problem in this country.

NOMENCLATURE

The nervous disease first reported in 1974 was named Viral Leukoencephalomyelitis of Goats (VLG). When it became apparent that arthritis could also result from the same virus infection, the name of the disease was changed to Caprine Arthritis Encephalitis Syndrome (CAE). It is now apparent that the virus also produces changes in the lung and udder. The name CAE however still remains in place.[6]

THE CAUSATIVE VIRUS

The virus which causes CAE is very closely related in structure to the virus which causes Ovine Progressive Pneumonia, a common respiratory ailment of sheep in the western U.S., and to the virus which causes Visna, a nervous disease of sheep first reported from Iceland. These agents, called retroviruses, are classified as slow viruses which means that they usually produce disease only after a very long incubation period and that once an animal is infected, the infection persists throughout the animal's life. This fact is important in regard to interpretation of diagnostic tests which will be discussed later. CAE virus has not been shown to cause any disease problems in man.

TRANSMISSION OF CAE VIRUS

Knowledge of how a disease is transmitted is often the key to developing a successful program for preventing the spread of infection. To date, all published reports suggest that goats become infected with CAE virus as newborn kids. Experimental evidence for this is persuasive. Kids delivered either naturally or taken by C-section but deprived of colostrum and fed cows milk remain free of virus despite the fact that their does are infected. If taken by C-section or delivered naturally, but allowed to nurse colostrum or milk from an infected doe, kids will show evidence of virus infection. These findings indicate that kids are not infected in utero or during passage through the birth canal, but do pick up infection when nursing either colostrum or milk from infected dams. This suggests that control of the spread of new infections might be achieved by separation and artifical rearing of kids at birth.

PREVALENCE OF CAE

One aspect of the CAE syndrome which has proven most troubling to the U.S. goat industry was a published report that a high percentage of goats tested from all over the United States showed serological evidence of infection with CAE virus.[4] Of 1160 goats tested from 24 states, 81% showed antibody to CAE virus using the agar gel immunodiffusion (AGID) test. It can be assumed that animals with antibody to CAE virus have been exposed to and infected by the virus.[7] The only exception to this could be young kids with detectable antibody picked up from the dam's colostrum. Unlike most bacterial diseases, where a strong antibody response means that the animal has cleared itself of the invading organism, infections with CAE and other retroviruses are likely to persist in the animal despite a high antibody titer. Therefore it is probably true that a large percentage of antibody positive goats carry persistent infections. However it does not necessarily follow that the majority of these goats are likely to show clinical signs of the CAE syndrome. The factors which contribute to the onset of clinical signs in animals infected with the virus are unknown.

The major problem associated with this high prevalence of infected U.S. goats is not the actual incidence of clinical disease so much as the negative perception of prospective goat buyers and regulatory officials confronted with a positive AGID test. Already some countries importing U.S. goats, like Kenya, have refused or destroyed shipments of goats which turned out to be antibody positive. Economic restraints such as this increase pressure on the goat industry to aggressively tackle the CAE problem.

THE CLINICAL SIGNS OF CAE

Two separate distinct syndromes are caused by the CAE virus, a neurological disease in the spinal cord and brain of young kids and a joint infection of older goats resulting in arthritis. How individual animals infected with CAE virus escape one or the other or both syndromes remains a mystery. The clinical signs of the two syndromes are as follows.

The Nervous Form of CAE

The nervous form of CAE was the first to be described. All breeds of goats can be affected as can both sexes, and most individuals first show signs between one and four months of age.[8] The problem is one of progressive weakness (paresis) of the hind limbs leading to eventual paralysis. The early paresis may be perceived as lameness, incoordination or weakness in one or both rear legs. Knuckling over of the feet and difficulty in rising may follow until such time that the animal is unable to rise at all. The course of the disease is from several days to several weeks. Despite the progressive paralysis, the kid will usually remain bright and alert and continue to eat and drink. Mild pneumonia may be present. If the correct diagnosis is made, the animal is often euthanized since there is no known treatment for the condition.

The development of these signs results from inflammation in the spinal cord induced by the virus. Nerves which control motor function of the hind limbs are progressively destroyed. In spite of the ongoing inflammation, there is little or no change observed in the cerebrospinal fluid on CSF tap nor in the complete blood count (CBC). Diagnosis is based on recognition of the clinical signs and confirmation depends on observation of the characteristic changes seen microscopically in the spinal cord at the time of post-mortem examination.

Recently veterinarians have been observing in older goats a clinical variation of the nervous form of CAE which is clinically indistinguishable from Listeriosis. Signs include circling, head tilt and facial nerve paralysis. On post-mortem exam, the characteristic lesions of CAE virus are found in the brain stem rather than the cervical spinal cord.

The Arthritic Form of CAE

The joint form of CAE most often appears clinically between one and two years of age. There can be great varability in the progression and severity of signs. Some goats can be severely crippled within a few months while others may show only intermittent lameness or stiffness for years without ever becoming completely debilitated. A "typical" case would fall somewhere in-between. The disease is usually first recognized as a gradually developing lameness accompanied or followed by swelling of the joints. Swelling is most often noted in the front knees (carpi) and can also be seen in the hock and stifle joints. As the condition progresses, joint pain and stiffness become more apparent. The animal may spend a good deal of time lying down, will begin to lose weight and develop a rough hair coat. In severly affected joints, the range of motion may become limited and goats are forced to walk around on their carpi. No specific cure is known for CAE arthritis. The well-being of affected goats may be improved by proper foot trimming, extra bedding and administration of anti-inflammatory drugs such as aspirin or phenylbutazone.

As in the nervous form, the complete blood count in goats with CAE arthritis will most likely be normal. Fluid taken from affected joints however may show changes suggestive of CAE. These include a reddish brown discoloration, increased volume, low viscosity and an increase in mononuclear cells. All joint fluid aspirates should be cultured for bacteria, chlamydia and myco-

plasma since these organisms can also cause arthritis in goats. In addition to these infectious causes, traumatic injury and poor conformation can also lead to joint problems. Keep in mind that not all swollen joints or stiff limbs are CAE arthritis and work closely with a knowledgeable veterinarian to establish a definitive diagnosis.

Other Clinical Syndromes of CAE

Young kids with the nervous form of CAE may show a concurrent pneumonia. On post-mortem examination goats with either the nervous form or the arthritic form may show characteristic changes in the lungs attributable to CAE virus infection. These changes are described as interstitial infiltration of mononuclear cells. Pneumonia due to CAE virus however is rarely seen as the only clinical sign in infected goats.

Another interesting microscopic finding from post-mortem examination is a similar mononuclear infiltration of the mammary gland of infected does. There is some speculation, but no certain confirmation, that the well known condition of hard udder seen in some does at freshening may be due to CAE virus. This mysterious condition is often misdiagnosed as udder edema or mycoplasma mastitis. Additional research needs to be done in this area.

PREVENTION AND CONTROL

Suggestions for the control of CAE infection and plans for the establishment of CAE free herds have been published in recent years. These plans are based on current knowledge concerning the transmission of the virus and some controversy has arisen regarding the practicability and effectiveness of these programs.[9] Perceptions of how reasonable these suggestions are may depend largely on the motivation to establish a CAE virus free herd. A hobbyist with two grade does in the backyard for home milk consumption may not be motivated sufficiently to change his or her management scheme in order to raise CAE free kids. On the other hand, a reputable breeder with international sales of registered stock may live in fear of a positive AGID test and would be strongly motivated to establish and maintain a CAE free herd. For the latter individual, a control plan would include the following:

1. A serologic survey of all animals presently in the herd.

2. Culling of all AGID positive animals if economically feasible.

3. Repeated AGID testing at 6 month intervals to insure that all positive individuals were identified.

4. If some or all AGID positive animals are maintained for the time being, the strategy then shifts to the creation of a new CAE free herd founded with the next kid crop.

5. At the next kidding season all births are observed and the kids are removed from their does immediately. These kids are either deprived of colostrum, fed only frozen colostrum from does previously identified as AGID negative, or fed pasteurized colostrum. Only experienced herdsmen with a strong background in kid rearing should attempt to raise colostrum deprived kids since these animals are susceptible to a variety of

dangerous infections. Pasteurization of colostrum is considered a poor alternative because heating to 161°F causes the liquid to congeal. Slow pasteurization at 131°F for 1 hour may minimize this problem but this is time consuming. Feeding colostrum from AGID test negative does may be the best compromise although it must be pointed out that an occasional seronegative doe may actually be shedding the virus and a small number of new kids may be infected.[9]

6. Kids should be reared in separate quarters from does and fed cows milk or milk replacer until weaning.

7. All kids should be tested at 6 months of age and periodically thereafter to insure their seronegative status. Seropositive animals should be culled immediately.

8. As the new replacement herd matures, older previously seropositive animals still in the herd should be systematically culled. Any animal showing clinical signs of CAE should be culled immediately.

9. In this manner the incidence of CAE in a herd can be dramatically reduced in one generation and possibly eliminated in several generations. For this to occur conscientious adherence to the program is necessary.[10]

Hopefully research into the workings of CAE virus will continue at the same dynamic pace observed over the last eight years. Clarification of the mechanisms of transmission and the animal's response to infection could lead to better recommendations for control of the disease and possibly a vaccine for prevention.

REFERENCES

1. Cork, L.C., Hadlow, W.J., Crawford, T.B., Gorham, J.R., Piper, R.C.: Infectious Leukoencephalomyelitis of Young Goats, J. Infectious. Dis., 129:134-141, 1974.

2. Crawford, T.B., Adams, D.S., Cheevers, W.P., Cork, L.C.: Chronic Arthritis in Goats Caused by a Retrovirus, Science, 207:997-999, 1980.

3. Cheevers, W.P., Roberson, S., Klevjer-Anderson, P., Crawford, T.B.: Characterization of Caprine Arthritis Encephalitis Virus: A Retrovirus of Goats, Arch. Virology, 67:111-117, 1981.

4. Crawford, T.B., Adams, D.S., Caprine Arthritis Encephalitis: Clinical Features and Presence of Antibody in Selected Goat Populations, J.A.V.M.A., 178:713-719, 1981.

5. Adams, D.S., Crawford, T.B.: CAE: A Viral Arthritis Encephalitis Syndrome in Goats, Int. Goat and Sheep Res., 1:168-172, 1980.

6. Knight, A.P., Jokinen, M.P.: Caprine Arthritis Encephalitis, Comp. on Cont. Ed., 4:S263-S269, 1982.

7. Adams, D.S., The Meaning of the Agar Gel Immunodiffusion Test (AGID) for Antibody Against Caprine Arthritis Encephalitis Virus (CAEV), Dairy Goat Journal, 60:633-635, 1982.

8. Cork, L.C.: Differential Diagnosis of Viral Leukoencephalomyelitis of Goats, J.A.V.M.A., 169:1303-1306, 1976.

9. Guss, S.B.: Veterinary Column: Pasteurizing Colostrum, Dairy Goat Journal, 60:629, 1982.

10. Kapture, J.: Attempt Made to Raise Kids Free of CAE: Positive Results Are Experienced, United Caprine News, 6:5, June 1982.

TYPE EVALUATION OF DAIRY GOATS

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The identification of a correct physical trait, or its lack, is known as type-trait evaluation or more commonly "classification". It is the comparison of an individual animal and its parts with the ideal for that breed, sex and age. Recognizing that physical appearance of an animal has a relationship to its usefulness and concerning ourselves with those traits that help an animal function more successfully, is the basis of classifcations.

Type evaluation is nothing new, for all livestock breeds and species have been developed through the centuries of breeders selecting their stock by looking at them. Fundamentally, type evaluation, is the art of trained people, examining animals by eye to determine physical strengths and weaknesses.

The idea of description type identification and its aid in developing superior dairy cattle was developed by Dr. George Trimberger of Cornell University. Holstein cattle breeders adopted the system followed by other cattle breeds, and the American Dairy Goat Association. The dairy goat industry is now collecting into its computer data banks, information on sires that can be of great importance to world goatkeeping. Bucks will be located who not only have the ability to sire high producing daughters, but also who have physical characteristics that make them more valuable overall.

Breeders are recognizing that the true worth of a good dairy goat is not only based on milk production in a particular location, but on lifetime production, at a relatively low feed cost, with few health problems, and

while also producing a large number of desirable offspring. These characteristics can be determined. Does have yielded 20,000 to 30,000 lbs of milk while living fourteen years and delivering thirty offspring. Invariably, such animals have physical properties that a trained classifier will observe and point out in a program designed to develop durable, useful, long-lived goats.

It is recognized that the ideal program for dairy goat improvement employs production testing and type evaluation. A random sampling of 10,000 scores of dairy goats of the five major breeds in the United States indicates a positive correlation between front end scores (width of chest and smooth shoulders) and length of life. Of the animals five years old or more, 86% had front end scores of 1 (Excellent) and the rest were 2 (Acceptable). Those aged one through four years, had 59% with scores of 1 (Excellent) in front end. This would indicate that the higher front end scores are associated with longer life.

It is essential that a classifier is well-trained so that accurate coding and scoring is done. As a milking doe is brought to the classifier, his trained eye will note length of bone, overall width, strength and power as well as the correlation of parts, e.g. how well the animal "fits together". The ease of motion and leg action will be observed from front, side and rear. Udder and teat size, shape and placement will be considered. While individual techniques vary as to the order of examination, the usual method is to handle the udder and make a final appraisal of the tightness and area of attachments, ease of milking and softness of udder tissue. Usually a squirt of milk is drawn from each teat. Then a code number is assigned in each of five areas. These descriptive codes range from one to five and each has a specific meaning. "ONE" is the excellent code and means 90% or

more perfection. "TWO" is the acceptable code and covers the range from 70% to 89% of perfection and includes those who are nearly undesirable to those nearly excellent. Numbers THREE, FOUR and FIVE are used to describe different characteristics that are undesirable and will probably affect the usefulness of an animal. Each number is used for a different fault in a specific area.

Fore Udder

The Fore Udder is scored as follows:

(1) Means a strong, wide, tightly attached fore udder, extending well forward and blending smoothly into the abdomen.

(2) A moderately firm attachment of fore udder but with a noticeable degree of either looseness, bulginess, pocketing, or failure to be far enough forward.

(3) Short; a term used to indicate a fore udder that inhibits usefulness by failing to provide capacity in a safe place, that is close to the body. It does not extend well forward and often does not extend ahead of the stifle joint.

(4) Loose, pocketed or bulgy fore attachment. A loose attachment would allow the udder to swing from side to side as well as possibly being carried too low so the chance of injury, especially while the doe is running, would be greatly increased. A pocketed fore udder means that there is an open space of considerable size in between the side attachments at the front of the udder. Such a characteristic forces a doe to have more of her milk secreting tissue, the delicate alveoli, carried at a low level, down between the hocks perhaps, where the chance of injury is greater. A bulgy fore udder consists of non-milk secreting tissue, often fat or connective tissue, extending forward and usurping the place of milk-secreting tissue.

(5) A broken attachment, a fore udder held only by a couple of folds of skin and so disastrously low that udder injury is imminent with its consequent likelihood of disease.

Rear Udder

After ascertaining which of the above codes applies to the fore udder attachment, that number is recorded and the Rear Udder attachment is likewise evaluated:

(1) Great width, tightness and height, often just an inch or so below the vulva and blending smoothly into the escutcheon. The higher the attachment, the safer the udder from scratches or injury.

(2) Adequacy, but some degree of lowness, narrowness or looseness has been observed.

(3) An udder attached very LOW between the hind legs.

(4) The rear udder is narrow and pinched. This is frequently found in udders with unsatisfactory production.

(5) The attachments are broken, the udder is pendulous and the doe frequently has great difficulty walking with the rear legs because the udder swings with each step.

Udder Support and Floor

This area is closely allied with the structure and strength of the medial suspensory ligament.

(1) Applies to the area where the medial suspensory ligament neatly divides the udder halves with a small inverted "V" and proceeds horizontally right and left towards the teats for a distance of 2 to 3 inches. Normally a Code 1 in this area is used only if the codes on fore udder and rear udder are both "1" or "1" and a "2". The length must be strong enough to keep the teats in proper placement and the udder tight against the body.

The contribution of the udder support and floor to overall mammary excellence cannot be over-emphasized.

(2) Some degree of:

a. shortness

b. over-length

c. failure to carry well forward on the doe

d. failure to carry high enough into the escutcheon

e. too much cleavage

f. not quite enough cleavage

(3) A lack of defined halving - the udder floor flat or even curving downward. Often teats point outward because of this trait.

(4) An udder floor that is too low making the udder subject to injury with each step the animal takes.

(5) A broken suspensory ligament and/or weak floor. In either case the udder hangs so low as to be a burden to the goat and is subject to injury and sanitation problems.

Udder Quality

(1) Reserved for those few does (currently about 1 in 20) who have extremely soft tissue in the udder. The udder usually requires observation both while extended with milk and then immediately after milking out before a Code 1 is given. Very little connective tissue can be palpated and the skin is soft and smooth.

(2) Most animals have a Code 2, acceptable, but not outstanding, with a bit more connective tissue in proportion to the extremely soft alveoli - the milk secreting cells.

(3) If, for various reasons, such as closeness to parturition, the udder texture can not be determined a

Code 3 is applied.

(4) In those extreme cases when an udder has so much connective tissue usurping the place of milk secreting tissue that it is limiting production.

Teat Size and Placement

(1) Teats that are about 2½ to 3 inches long, 3/4" to 1 inch in diameter, placed evenly and squarely on the udder, nearly plumb but pointing slightly forward. (This latter reason because all dairy goat milking in the United States is done from the side of the doe and teats pointing slightly forward are easier to grasp and milk.)

(2) Some deviation from ideal in length, shape or placement but still functionally useful.

(3) A size or shape that is either hard to milk or subject to injury. An overly large teat is both difficult to grasp by hand or milk with a machine, and it also has the disadvantage of being more easily stepped on or torn by sharp objects the doe is climbing over. On the other hand, teats that are too small may make hand milking so difficult and time consuming as to render the doe almost useless.

(4) Teats that point outward to such a degree that both hand and machine milking are made difficult.

(5) Occasionally, does are found with abnormal teat structure, such as a double orifice (two openings for the milk to emerge in the same teat) or extra teats, some of which may actually give milk resulting in an extra chore at milking time. When abnormalities are discovered a Code 5 is used.

Mammary System

Five areas of the mammary system are now coded and along with a general observation of the shape and capacity of the udder, a final score is given. Three general guides are:

If all 5 areas are coded "1", the score must be above 90.

If all 5 areas are coded "2", the score must be between 70 and 89.

If all 5 areas are coded in combinations of "3", "4", or "5", the score must be 69 or lower.

Most udder codes are combinations of acceptable "2" with an occasional excellent "1" and some unacceptable "3", "4", or "5". The classifier must use his skill and expertise to arrive at the overall score.

Body Capacity

The classifier will observe the comparative length, width and depth of the animal, noting especially the length, depth, and spring of rib and width of chest floor. A comparison will be made mentally between the animal being classified and the ideal of that breed, sex and age. As the animal approaches the ideal, the score may go into the high 90's, or may be as low as 50 for an extremely small, frail animal. Younger animals, yearlings, 2 year-olds and 3 year-olds, are not expected to be as large as a mature 4 year old; nor are does as large as bucks. Toggenburgs are not required to be as large as the other breeds. A guide of acceptable breed standards in minimum weight for mature does is:

Toggenburgs	120 lbs.
LaManchas	130 lbs.
Nubians	135 lbs.
Saanens	135 lbs.
Alpines	135 lbs.

Dairy Character

In arriving at this score, careful observation is made since this is to indicate the animal's "will to milk and the strength to sustain it".

Many factors are considered in arriving at the final score. These include:

A long, lean neck.

Proper degree of fleshing throughout.

Smooth shoulders.

Sharp withers.

Prominent vertebrae.

Incurving thigh.

A chiseled head.

Cleanly molded hocks.

Tortuous mammary veins as related to age and stage of lactation.

Production evident in the udder as related to age and stage of lactation.

This score should be closely related to an animal's ability to produce milk, but is also influenced by the soundness of the udder. In general, a dairy character score is lowered by 10 points if the score previously given to the mammary system is below 70.

General Appearance

To aid breeders in their program, this area is descriptively coded in 8 subareas much as the mammary system.

Stature

This term loosely defines overall size and length of bone.

(1) This animal should be tall at the withers, at least 2 inches over breed minimums which are:

26 inches for Toggenburgs

28 inches for LaManchas

30 inches for Alpines, Saanens, Nubians

These standards are for mature does, but the Code "1" doe must also have a correct length of cannon bone (from knee to pastern) and be above average in overall length of body and general size.

Height at withers must be slightly more than at hips, and bone must be of good size. These characteristics make an animal "upstanding".

(2) Animals meeting breed minimum standards but not up to the code "1" level are coded "2" - "intermediate".

(3) These animals are too short and small for breed and age or have extremely short legs. Code "3" describes low set - short legs.

Head

It should be noted that on the head there may be observations that can be termed aesthetic besides being functional. Conformity to breed ideals in structure of nose, shape and size of ears are considered. This is balanced by the practical considerations of length, width, strength, set of jaw and overall symmetry.

(1) This head is beautiful when judged by a breed fancier or the practical eye of the commercial dairyman. With beauty of eye, nose, ear, and overall form it must also be a combination of strength and refinement. It should have a balance of length, width and substance that insures an ability to consume large amounts of forage with ease.

(2) Acceptable, lacking some in either strength or breed character.

(3) Sometimes the head is coded "3" because it is too short - a trait often associated with lack of will to eat plenty of feed.

(4) Frequently crossbred animals are such a hodge-podge of breed characteristics as to be unflatteringly plain - just not pretty - and they are coded "4". A head is also coded "4" in the case of a large coarse animal with little

indication of refinement. Often associated with poor productivity, the "4" in this case means coarse.

(5) This last code, applicable to some heads, is for those whose strength is lacking everywhere and is shown in the head by frailty with a narrow muzzle, weak jaw, pinched nostril, narrow forehead and sunken eye. It says simply "weak".

Front End

This is a combination of chest and shoulder features.

(1) A wide chest floor and prominent brisket with smooth blending of shoulder blades and sharp withers. Such a front end ensures plenty of room for the heart and lungs to do their life-giving work with ease and also is evidence of proper muscle and ligament strength in tight shoulders. As pointed out earlier, preliminary research indicates a strongly positive correlation of high front end scores with longevity.

(2) Code "2" is frequently used where there is some degree of deficiency in:

Width of chest floor;

Tightness of shoulder blades;

Proper fleshing of shoulders (the animal is a little over-fleshed).

Code "2" may mean just acceptable in all three subareas.

(3) If the animal is much too overfleshed or the point of shoulder is obnoxiously prominent a code "3" is given - coarse shoulder and neck.

(4) A narrow, weak condition - with almost no chest floor or brisket; the heart and lungs are extremely crowded; body

capacity is adversely affected and longevity greatly reduced.

(5) An open shoulder, a condition resulting from loose ligaments holding the shoulder blade to the chest wall and often making it difficult and painful for the animal to move.

Front Legs

(1) Those legs which are straight, perpendicular to the ground, sound in the knees, full at point of elbow and move with the front feet pointing correctly straight ahead.

(2) Sound legs but not quite straight or moving quite correctly.

(3) The front legs bow forward at the knees when viewed from the side. For a simulation of the undue strain put on muscles and tendons when this occurs, one is advised to try standing upright for some minutes with the knees curved forward. It is no wonder, the animal quits feeding before she should, and lies down; consequently producing less when this condition is present.

(4) Swollen knee joints - normally this is associated with an arthritic condition and interferes with mobility. It is frequently associated with a short canon bone in the forelegs.

(5) Front legs which point outward as the animal walks; a peculiar "paddling" action is observed and the points of elbow continually dig into the sides of the chest wall.

Back

(1) A straight, strong, wide, long, level back; denotes strong physiology, indicative of strength to carry copious quantities of feed, milk and offspring for many gestations and lactations.

(2) Means acceptable and is numerically from 70 to 89% on the ideal score card.

(3) A severe dip in either the chine and/or loin.

(4) An animal is lower at the withers than at the hips and is appropriately called "low in front". This condition can be a serious detriment to the health and well-being of an otherwise sound animal, for as parturition approaches, the digestive and reproductive organs tend to follow the pull of gravity and fall forward onto the diaphragm. This compresses heart and lungs, making it hard for the animal to breath and have proper circulation. A survey of classification scores shows it is rare for an animal with this trait to survive past 5 years of age.

(5) A severely roached back - very arched and high through the loin. While not especially dangerous in itself, it is frequently associated with a weak chine, steep rump and makes the topline indicative of lack of overall strength and symmetry.

Rump

Affects leg set, kidding ease, and potential udder attachment, this area is of great importance.

(1) Long, wide, level from thurl to thurl, cleanly fleshed, and having a correct slope from hips to pins.

(2) Some degree of impropiety in the above descriptions.

(3) A narrow rump - this condition often leads to a rise in the vertebrae processes making the rump resemble a gable roof. Naturally, kidding ease is lessened by the narrow rump and pelvis.

(4) A very steep slope from hips to pins. Actually this

condition, when combined with great width, frequently makes for easy kidding. But since it also lessens the area for a large udder attachment and makes for an awkward rear leg set, it must be tempered toward what is termed the "proper slope". A perfectly level rump is not desired either.

(5) This last deficient condition is short. It is not often found.

Hind Legs

(1) Rear legs that are very wide apart and straight when viewed from the rear, with clean hocks and just the right combination of bone refinement and strength. Observed from the side, a plumb line originating at the pin bone would fall parallel to the leg bone from hock to pastern and touch the ground at the heel of the foot. The resulting angles produced at the hock and stifle joint will be the most ideal for an easy walk and a minimum of joint problems. These angles are seldom, if ever, found in a leg beneath a code "4" rump (severely sloping).

(2) Acceptable rear legs will have a noticeable deviation in angle, straightness or strength, but are not yet affecting the animal's walking ability.

(3) The rear legs turn inward when observed from the rear. In such a condition, a couple of things happen. First, the udder, if of any size, is battered first one way, then the other by the doe as she walks; Secondly, the animal usually has a tendency to point the feet outward and "paddle" as he/she walks. It is not comfortable for the goat and results in less movement for feeding and especially when heavy with kid.

(4) This animal has hind legs that are too close together. When associated with a large udder, the mammary system is frequently twisted by lack of space and is hard to milk.

(5) A leg that is too straight or posty. Most noticeable is the lack of angle at hock and stifle joint, and it seems to get worse with age. Probably causing more trouble than any other single leg ailment, it is of particular concern when the animal walks without flexing the hock joint.

Feet

(1) A strong, well-formed foot with tight toes, deep heel and level sole. Such a foot is highly resistant to injury or infection and is easy to keep trimmed.

(2) Slight deviations are acceptable. It might be noted here for some familiar with cattle that the dairy goat is much smaller and is not affected as much by less than ideal feet than the vastly heavier cow. Also the horny outside of the hoof grows quite rapidly under ordinary commercial dairy conditions and is more frequently trimmed and shaped by the herdsman. Therefore, a degree of imperfection that would cause serious problems in a cow is less likely to occur in a dairy goat.

(3) This is a common undesirable affliction - a spreading toe. Often this is a result of weak ligaments in the pastern area. It produces ill-shaped toes that are hard to trim and also provides a place for manure and debris to build up and cause infection.

(4) This code refers to a defective condition known as "shallow heel". In a normal foot, the hoof hairline

should be parallel with the sole of the foot. In the shallow heel there is less depth at the rear of the toe than the forward part, and the animal is forced into rocking back on the pasterns putting undue strain on them.

(5) Feet that turn over. Such feet are miserable to trim and hard to walk on. They put a considerable and unusual strain on the pasterns.

Miscellaneous Conditions

Occasionally some conditions are found that need to be noted to properly describe an animal.

(1) Overshot jaw - when the lower jaw is shorter than the upper jaw - also known as parrot-mouth - it often affects feeding ability.

(2) Undershot jaw - the lower jaw is longer than the upper jaw and can also affect feeding ability.

(3) Winged shoulder - a condition manifest in looseness of the attachment of the shoulder blades to the chest wall and especially at the point of elbow. A winged shoulder makes movement more difficult.

(4) Small for age.

(5) Weak chine - it is used in conjunction with a code "3" in the Back to point out that the chine is weak but not the loin.

(6) Sickle leg - in this case the hind leg has too much "set" or angle, and puts more strain on the leg structure. It is the opposite of a "posty" leg.

(7) Overly refined bone - an indication of frailty, bones too weak to carry the body weight.

(8) Weak or broken pasterns.

(9) Severely cleft udder - the medial suspensory ligament divides too soon resulting in a non-existent udder floor and wasted space between the udder halves.

(10) Tilted or twisted udder - with a tilted udder, the teats will point nearly forward. A twisted udder has one half ahead of the other half to some degree.

(11) Disqualifiable defect in breed character - each breed has its own standards for ear size, set and structure, nose structure and some have color norms. The classifier must be aware of these so he can point out animals ineligible for registry in a certain breed, but this has small importance in this discussion which stresses function.

(12) Swollen or blemished hock.

(13) Dry - indicates the doe was observed while dry, that is, not lactating. More possibility of error exists at such a time especially in udder evaluation. So classifiers tend to be conservative and the possibility of a higher score when in milk should be kept in mind.

(14) Off-color. For example, a Toggenburg doe with a large white spot on her side.

(15) High dorsal process in the rump. Often associated with a narrow rump and kidding problems.

(16) Teats too large. Used in conjunction with a code "3" teat, it indicates exactly why they are of undesirable size.

(17) Teats too small. Again used with a code "3" for teats.

When the descriptive coding is finished the classifier will now assign a numerical score to the General Appearance of the animal. Lastly, using 30% for General Appearance, 20% for Dairy Character, 20% for Body Capacity, and 30% for Mammary System, a final overall score for a doe will

be calculated. (When a buck is classified, the formula is 45% for General Appearance, 30% for Dairy Character, and 25% for Body Capacity.) A score of 90 or above will place the animal in the Excellent group, 80 to 89 is Very Good, 70 to 79 is Good Plus, 60 to 69 is Good, 50 to 59 is Fair, and below 50 is Poor. A majority of animals fall in the upper 70's to low 80's.

A useful part of this program is using it as a guide for corrective matings. For example, a herd may have plenty of production and generally satisfactory body type but has uniformly large, hard-to-milk teats. By locating and using a buck whose daughters have above average type and production and also have a high proportion of Code 1 (near ideal) teats, a good improvement can be made in just the next generation. This is known as Corrective Mating and can be applied to any part of the conformation of a herd or animal to produce superior offspring.

Classification of a herd is done by application to ADGA (the American Dairy Goat Association). There is a fee of about $4.00 per head which covers bookkeeping and travel reimbursement to the classifier, if at least 150 goats are classified in a certain area. Special classifications can also be arranged but may be more costly. Study of a judging book, like the one by Considine and Trimberger and/or the officeial score cards obtainable from the breed clubs is highly recommended in preparation for type classifications.

FEED DAIRY GOATS

James W. Crowley, Extension Dairyman
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Primary objective in feeding of domestic animals should be for optimum performance. For dairy goats good growth, good reproduction, good health and good milk production should be objectives. This is very different than a feeding program that is based on utilizing poor quality of feeds and the primary objective of survival. Likewise it is quite different than the objective of using goats to control brush growth. The idea that goats can exist on tin cans, garbage, paper and brush is not a sound nutritional program. Like all ruminants the goat can very efficiently utilize high fiber feeds (forages). But like all ruminants the quality of the forages greatly influence performance and the amount and kind of supplements needed. The dairy goat has the ability to utilize many kinds of forages more efficiently than dairy cows. In a short chapter in the new National Research Council book utilization of browse and lower quality forages is discussed in detail. However for optimum or profitable performance a well balanced ration is required.

Dairy goats eat more per unit of body weight than dairy cows. Usually dairy cows consume dry matter at 3 to 4% of their body weight. High producing dairy goats consume dry matter at 5 to 7 % of body weight. However this ability to consume more feed is of value only when high quality feeds and good feeding practices are used.

Nutriton cannot correct everything. Good breeding, good management and disease control are essential for good performance as well as feeding. A dairy goat that lacks genetic ability to produce cannot be fed a special feed that makes her a good producer. Likewise an infectious disease cannot be cured with vitamins, minerals or other nutrients. However it is just as important to reverse these statements, that is no breeding program can produce a doe that

makes milk without proper feeding. Good nutrition can help prevent stress and provide the animal with more disease resistance. Starvation or critical shortages of specific nutrients can lower disease resistance and thus indirectly lead to problems that would not exist in a well fed herd.

Balanced rations provide all nutrients at or near the established requirements. Too often the nutritionist feeders and others are guilty of jumping on the band wagon for a specific nutrient or feed. The tendency to "Ride the Tiger" is too common in many feeding and management programs. An individual herd may logically have great success or improvement when a special nutrient is added. However this does not mean that every herd will obtain similar results. If you read a story that reports great improvement by adding selenium to the ration, you must assume that the specific ration was deficient in selenium. If your ration is already adequate in selenium adding more will not help. In fact as more trace nutrients and chemicals of various kinds are being used there must be concern and possible problems from excesses as well as deficiencies.

Nutritional deficiencies respond very slowly. Frequently a problem that appears nutritional is brought to my attention by a statement like "I have tried five different mineral feeds and none of them help". When you try a new feeding program be sure to give it time to work. Six weeks or longer may be needed to correct a deficiency problem. It is also possible to make changes at the wrong time. For example milk fever develops at freshening but is primarily the result of feeding programs during late gestation.

Decreasing calcium and providing adequate phosphorus during late gestation has helped reduce milk fever. Decreasing calcium after freshening can result in more milk fever and other problems. When milk fever is problem review the ration being fed to other does in late lactation rather than changing the milking ration.

"Eye of the master fattens his cattle". This old adage still applies to all feeding programs. Science and technology have helped improve feeding programs. Forage analysis, new feed processing, computer balanced rations should be utilized to the fullest extent possible. However good judgment and experience are still very important and often make the difference between success and failure of the feeding program.

MAKING HARD CHEESE

Robin Raudabaugh

A Simple hard cheese to start with requires:

3 gallons whole milk
1/2 rennet tablet or 1 tsp liquid rennet
1/2 cup buttermilk
2 Tbsp salt
cheese press and muslin

Heat Treatment
Heat fresh milk to 155°and cool at once to 90°F

Starter and Ripening
Add starter and stir in well.
Leave to ripen 30 minutes to 2 hours

Renneting
Dissolve rennet in lukewarm water. Pour into milk. Miw well. Leave 30 to 40 minutes. Test curd with finger. If it breaks cleanly the curd is ready.

Cutting Curd
Using a wire whisk cut curd until it is all in small pieces. Leave to stand 5 minutes until some whey has formed on top.

Scalding
Within 30 minutes gradually raise temperature to 100°. A wood stove works really good but using a double kettle system with the bottom kettle filled with warm water also works. Don't put cheese kettle directly over heat as the curd will stick to the bottom and scorch. Do not allow the temperature to go above 100°. Stir with your hand the whole time you are heating. Remove from heat and stir 5 more minutes.

Pitching
Leave curd for 30 minutes to let it settle on bottom of pan.

Running off Whey
Pour off most of whey. Dump remaining curds and whey into a sterilized muslin cloth and squeeze to form into a ball. Hang to drain.

Milling and Salting
When curd is firm (1/2 to 1 hour) break it up into cherry size pieces. Sprinkle with salt and mix well.

Molding
Boil muslin for 10 minutes. Line cheese mold and pack in curds. Cover with a corner of muslin and place wooden follower on top.

Pressing

Press 2 hours . Remove from press and turn cheese over. Press again increasing pressure. Turn cheese once more and press overnight. By morning the cheese should be ready to remove from press. if you use more milk and make a bigger cheese you will have to press it an additional day.

Ripening

Leave cheese on an open shelf at 50° to 60°. Turn several times daily for two days. Rub cheese with salt and turn for two more days. You will have to wipe off excess moisture the salt draws out of the cheese. Now the cheese is ready to eat or you may rub it with oil or wax it and store it for up to 3 months. So far we have eaten all the cheese I make as fresh cheese so I've never run into long term storage problems yet. What we don't eat within a week,I Wax and store in the produce bins of the refrigerator.

More Cheeses

This is a good basic cheese to practice on. Once you have become so good at making it that you can make it right along with your regular morning house chores you are ready to move on to some more complicated cheeses. There are many books available on cheesemaking. Many can be gotten from the library. A good place to order supplies for all types of cheeses is:New England Cheesemaking Supply Company P.O. Box 85, Ashfield, Ma 01330

TANNING HIDES

Anna Mosher

To tan with hair on

After the hide has been skinned and fleshed as clean as possible, it should be salted and hung to dry or stretched and dried to preserve the hide. Remember to check often while drying to see that it doesn't rot around the ears and in any folds.
When you are ready to tan, mix 1/2 lb. salt to 1 gallon soft water or rain water. Let hide soak in this solution for six to eight hours. Let excess water drip away, then salt hide and roll into a bundle and leave over night. This will loosen the rest of the flesh. Now flesh the hide completely. Lay on a plank or 2 x 4 which has smooth edges so the hide will not be damaged. Use a dull fleshing tool that you are comfortable with.

Tanning should be done in a container that is at least 10 gallons. Use 1/2 lb. salt to one gallon water and 2 lbs. alum to ten gallons water. Dissolve the alum in boiling water while the salt is being mixed into the ten gallons. Let the hide soak for a few days, longer for thicker hides. Be sure to mix every day as often as you can to make sure the solution gets all over the hide. The hide is ready when it is the same color all through.
Remove hide from solution and drain. rinse to remove all salt. Taste with tongue to see if salt is thoroughly rinsed out. Let dry by hanging over a small pole and turning often to dry evenly.

When dry, dampen with a warm _ not hot - cloth, then fold once, roll, and let sweat for twelve hours in a burlap bag. Now the hide must be stretched by rubbing over a smooth board such as a rounded 2 x 4 set at a height comfortable for you to work at. For a bigger hide, two people are easier than one. You must work at all times while the hide is drying or it will dry hard and clear.

The hide must be oiled to keep it soft. Use any vegetable or animal fat such as lard, goose grease, peanut or cottonseed oil. Warming the oil will give it a greater penetration.

Use your hands to rub the oil in with on small hides. For large hides you may want to place the hide in a barrel or trough and walk on the hide. This way the oil will work into the fibers better. To dry the oil on the hair, place hide in a barrel along with any hardwood sawdust. Shake barrel well until excess oil is absorbed. Now smooth the hide by sanding rough spots with sandpaper. Use different grades of sandpaper until the hide is smooth and soft. Cut off hard outer edges and dampen and stretch any hard clear spots that you may have missed.

Buckskin Tanning

To remove the hair, do not if possible salt. Let the hide soak in clear water to soften. To prepare hair-removing solution, slowly add 5 pounds of lime to 30 gallons of water. Miw carefully. Add hides, leave in mix till hair easily pulls free. Scrape all hair away as if you were fleshing. Return to lime for three days to loosen the grain which is on the hair side.

Remove the same as for fleshing, taking care not to tear hide. Now flesh hide. (Be sure to remove all lime from hands by washing with soap and water and then rubbing with vinegar). Nest you must remove all the lime from the hide to stop the lime reaction. Soak hide in a vinegar solution made of one gallon of vinegar to 25 gallons of water. Stir often for a couple of days, then rinse with clear water until vinegar is all gone. Now stretch and pull the hide as in the other tanning directions to soften. Then smoke the hide with a green hardwood fire. Smoke for a couple of day turning twice. For hanging the hide, make a wire frame to suspend above the fire. Smoking the hide will give color and waterproofing.

Notes:

In place of alum you may use battery acid.

Instead of lime you can use hard wood ashesfrom a wood stove. They must be clean, no charcoal. Use 5 lbs. to 5 gallons of water.

Tanning with hardwood oak tree bark is fine if you have it available. Use white oak for a tan color and red oak for a reddish brown color. To prepare bark: In the spring when the sap is running in the trees, strip off the bark, cut, chop and beat it into fine pieces. Mix with water and fleshed hide. It may take 2 weeks for a small hide, and up to a year for a larger hide such as cow or horse. You may boil bark till it is dark as coffee and cool before adding the hides. This is said to work faster in tanning.

Be sure the container you use is wooden, stainless steel, enameled, or plastic.

Do not use any container such as aluminum that will react with your tanning solution.

BEGINNERS BASIC MANAGEMENT OF DAIRY GOATS

Maxine Sheldon
Maple Island Alpines

Basic management of dairy goats has five separate areas that will make the difference between success or failure in your endeavor. It is the successful combination of these five things that makes for a good management program. The five areas to which I am referring are housing, feeding, health maintenace, milk handling and your breeding program.

HOUSING

In our climate, we must provide duel purpose housing that will keep the goats warm in the winter and cool in the summer. A building that is double-walled and insulated is ideal. This could be either a new structure or an adapted farm building already in existence. If an older barn, hog house or chicken coop is to be used, diligent cleaning and sanitizing should be completed before the goats are housed in them. If you are building a new building, the University of Minnesota has building plans for calf barns that work very well for dairy goats. Each goat should have fifteen square feet of space. Plan generously. Goat herds have a tendency to grow quickly!

One of the most important things to be concerned about is ventilation. Not only will you need windows that are functional and provide good cross-ventilation, you will need a ventilation fan. Excessive humidity, not temperature control, is the biggest problem, and that is where a good exhaust fan will keep you out of trouble during the winter.

Along with dry air, the goats need a dry floor that is well-bedded and warm. Gravel flooring in loose housing pens works very well. With the use of adequate bedding it will be necessary to completely clean the barn about four times a year.

Insect control, mainly flies, is also important. The windows should be screened and the barn kept clean. You will still need help from fly strips, dairy fly spray or fly traps. Mosquitoes also like the taste of goats, and must be controlled in the barn.

Keeping goats confined does not have to be a hassle. A majority of our fencing is electric. We also use some hog panels and for our bucks we use woven wire with one strand of electric on the inside. The bucks thought the woven wire was an excellant scratching post, and the electric wire keeps them from stretching the fence out of shape. We have found that keeping our goats well fed with adequate exercise area prevents them from wanting to get out. We also do not teach our kids how to jump or come over the fence. We always walk them through a gate instead of lifting them over the fence. Another thing to keep in mind when fencing, is not only keeping your goats in, but keeping out unwanted preditors. Strange dogs in goat pens are deadly.

FEEDING

Most important is getting on a good feeding program and being consistent. Talking to your extension agent will help you determine what dairy farmers in your area are feeding their cows, and where they are getting their feed. A good 16% protein dairy ration should be adequate. Most feed mills have a dairy ration available. There are also some commercial dairy goat rations on the market. If you use a cow feed, make sure it does not contain urea or estrogen. Goats do not tolerate these additives. We use a 14% or 20% protein pelleted dairy ration from the Doboy feed company. The protein varies depending on the quality of the forage we are feeding. This has worked the best for us and is the most economical way for us to feed grain. We feed about four pounds of grain per goat per day for eight pounds of milk. We increase that according to the individual goat's production. One pound of grain for two pounds of milk. A doe milking sixteen pounds per day would get eight pounds of grain. During the dry period we feed less than four pounds if the does are getting too fat.

Along with our pelleted grain our goats have alfalfa hay available to them at all times. A good quality dairy hay is best. Grass hay with many weeds and coarse stems is not as palatible for the goats and strong weeds make strong tasting milk. Loose salt and minerals should also be available at all times. Your feed person would be the best person to advise you on what minerals to use with your particular hay and grain.

Grain and hay should be fed in feeders off the floor, with both being non-accessible for playing in or sleeping in. Manure droppings should also be kept out. Key hole feeders work well to keep feed and water clean. Clean water should be available at all times, and if possible it should be warm, summer and winter.

HEALTH MAINTENANCE

Prevention is much easier and much cheaper than curing, which means you should keep your goats as healthy as possible. There are some routine management procedures that should always be done.

Hoof trimming is important. That should be done as needed, which turns out to be about every two months. Some goats hooves grow faster than others and will need to be done more frequently.

All kids should be disbudded at four to five days of age. If you have adults with horns, they can be dehorned when there are no flies, but you should have some help from your veterinarian when doing this.

Routine worming should be done at least twice yearly. This should be done before breeding season in the fall, and after kidding in the spring. It is better to rotate worming medication, not using the same wormer twice in a row. Thibenzole and Panacur are very effective. If you have coccidia in your herd, a wormer for that specifically must be used. Keeping hay, grain and water feces free, and keeping your barn clean is also important for controlling parasites.

You should also check for external parasites and treat as necessary. If your animals are rubbing and scratching excessively, loosing their hair or have dull coats, they may have lice, fleas or mange. If these goats are in milk, make sure you use a treatment that is for dairy animals. Clipping your goats in the spring will help you to evaluate their skin condition more accurately.

Vaccinations should be discussed with your veterinarian and given as he suggests. He will be aware of the health problems you are having and the health problems in your area. We vaccinate everything yearly for enterotoxemia and tetanus. Tetanus is especially important if you have horses, or if there has ever been horses on your farm.

Another thing that should be done annually is testing for tuberculosis and brucellosis (bangs), particularly if you drink your milk unpasteurized. These tests are also required before you can take your animals to any fairs or goat shows.

When you are planning your housing, you should include an area where you can isolate an animal if it is sick or injured. It is also a good idea to isolate any new animal that is coming into your herd, for a minimum of thirty days.

An important part of health care is finding a good veterinarian before you have sick animals and need him. Get to know him and give him a chance to get to know your animals so that when you call him at 3:00 a.m. for a sick doe, he knows to whom he is speaking and he knows where you live, and what kind of set-up you have. In an emergency time saved is very precious.

MILK HANDLING

Milk is one of the rewards for the hard work with your goats. Taking care of the milk properly is of utmost importance to insure a quality product for human consumption.

A separate, clean room for milking is needed. A cement floor is preferred, with an elevated milking stand, and a shelf for milking utensils during milking. The doe should have a dairy clip including her flanks, tail, udder and underneath her belly. The entire animal should be brushed to remove loose hair and dirt from her coat. Just prior to milking all of the equipment that touches the milk should be sanitized in a water and chlorox solution and allowed to drain and air dry.

The doe's udder and teats should be washed with warm water containing an udder wash solution such as chlorahexidine. Next dry the doe with a disposable paper towel. Leave the paper towel under the doe and use it for a blotter for milk splashes. After the doe is dried with the paper towel, strip two squirts of milk from each teat into the strip cup to check for blood spots or milk clogs. This also removes the milk with the most bacteria from the teat. Proceed to milk the doe into a stainless steel pail. If a stainless steel goat milking pail is not available, a stainless steel mixing bowl or sauce pan would suffice. When you have emptied the udder,

massage it for two or three minutes to work down any milk that was high up in the udder. After the massage, milk the udder empty again. Then the teats should both be dipped in teat dip to seal the teat oriface. The milk should then be strained into a glass jar and cooled immediately. Submerging the jar in ice water cools the milk faster than just setting it in the refrigerator. When you have finished milking, the equipment should be rinsed in tepid water, then washed in a dairy detergent and again sanitized in the water/chlorox solution and allowed to air dry. A brush works best for washing the utensils. The milk stand should be wiped off and the floor swept after milking. Fly control is mandatory for clean milk.

BREEDING PROGRAM

A successful breeding program is vitally important because it determines the type of animals that will be in your herd in the future. Each mating should have a purpose other than getting the doe bred to bring her into milk. A successful breeding is one in which the offspring is an improvement over the dam.

The buck used for servicing should have characteristics of superior quality in the areas in which your does need to improve. If the pasterns are weak on your doe, breed to a buck with strong pasterns and whose offspring have strong pasterns. A purebred buck should always be used so that you can check backgrounds of his parents, plus have a record of his own offspring.

If you are planning to purchase buck service from another breeder, make the arrangements prior to the day you would like your doe serviced. Be prepared to meet the requirements of the breeder, such as having a negative brucellosis and tuberculosis certificate. Talk over the strengths and weaknesses of your doe and let the buck owner help you decide which of his bucks could do the most for your doe's kids. Discuss what time of day is best to bring your doe over, and if possible, let the breeder know in advance when your doe is due to come into heat. Discuss cost of the service and be prepared to pay cash at the time of servicing. After the service has been completed and paid for, be sure you get a signed Sire Service Memo from the breeder. This piece of paper proves you have had your doe bred by this buck and makes it possible for you to register the offspring with the American Dairy Goat Association.

There is nothing more difficult in the breeding process than determining for sure that the doe is in standing heat. The signs are red,swollen vulva, clear vaginal discharge, "flagging" with the tail, more talkative and change in her disposition. Sometimes milkers will also have a marked reduction in their production when they are in heat. Heat cycles last from twelve hours to two days, and occur at about twenty-one day intervals. Unfortunately, it is usually the doe with the slightest signs of heat that stays in heat only twelve or fourteen hours. If you are having trouble detecting heat in your does and you do not own a buck, try to get a buck rag from a buck owner. All this is is a rag rubbed on the buck's head so it acquires the buck smell. Keep the rag in a tight container and open it for your does to smell two or three times per day during the breeding season, which is from

September through December. If your doe is in heat she will probably (hopefully!) respond positively to the buck smell. If it is in the month in which you wish to breed her, you should have her serviced as soon as possible after you have detected heat. If you decide to wait until tomorrow because it might be nicer outside or more convenient for you, you may possibly have to wait three more weeks to catch her in heat.

If you own your own buck it is best to house him separate from the does and take the doe to him when you have detected her in heat. The bucks can really hassle your does and cut down on your production. By hand breeding you will know for sure if an animal has been serviced and by whom on what day. It makes it much easier to plot your milk supply and plan your kidding times for your convenience.

Doe kids should be bred when they are six or seven months old, providing they are a minimum of eighty to eighty-five pounds in weight. It is better to freshen the animal close to its first birthday than to let them go until they are two years old. It is difficult to get an overweight doe bred and into good production and most yearlings become overweight if they are not bred.

Milking does should be bred to freshen about the same time every year. They should give you a full ten month lactation with a two month rest period prior to kidding. They should be dried off no later than six weeks before kidding. Most milkers will start to dry themselves off and are very cooperative about getting their two months rest. Others need more persuasion and you will need to quit their grain tempoarily, feed a poorer quality hay and allow them to have only cold water. When the does start dropping in milk quantity, then go to once per day milking. When the doe is giving less than five pounds of milk at the once per day milking, you can stop milking her. If she is still giving more than five pounds at the once a day milking, you may have to skip two milkings, so that you are milking her once every thirty-six hours. Never milk out just part of the milk to take the pressure off. If you have determined that she needs to be milked because her udder is too full and tight, milk her out completely.

When your does are bred make sure they receive adequate daily exercise, outside if possible. Walk them to the mailbox and back or take them for a stroll in the woods. Just don't make them walk in deep snow so that they freeze their teats, or make them stay out for long periods of time.

Prevent over-crowding in your barn so that injuries to pregnant does do not occur. When it comes time for kidding you may want to pen them separately but that is not necessary until the actual kidding is about to happen. Plan to be present when the kids arrive. A doe that is having trouble kidding needs your help then, not after work when you get home. If you cannot be present, at least make arrangements for someone to check the doe two or three times a day, and he should know how to reach you in the event your doe is having trouble kidding. The gestation period for goats is one hundred fifty days and they usually kid within five days before their due date to five days after their due date.

After the doe has freshened, it is best not to milk her empty for the first twenty-four hours. If you leave the kids on the dam, make sure you check the udder and don't let it get too full. This is the one time you do not milk the udder empty. If you are planning to bottle or pan feed the kids, do not leave them on the doe for more than twenty-four hours or you will have a great deal of difficulty convincing the kids that the bottle is just as good as mom.

If the kids are left on the dam until weaning time at three to four months of age, the dam's udder should be milked twice a day to make sure the udder gets emptied and to check for mastitis or udder injury. We have found that we get the best production by taking the kids from the dam at twenty-four hours and bottle feeding them. There is also less trouble with mastitis and udder injury.

If space permits it is best to house kids away from the does. If you don't have a separate pen in your barn for the kids, calf hutches provide good housing for kids. A hutch will comfortably handle six or seven kids. Calf panels make good portable fencing for the hutches and makes moving them from one area to another possible. The kids should have access to loose salt and minerals, and good quality hay and fresh warm water at all times. They should have feed troughs that are up off the ground and easily cleaned. A dry floor and fresh bedding is essential. Buck and doe kids should be separated by two to three months of age or breedings can occur.

Last but not least, take time out to enjoy your goats. Goats are devoted and loving animals that will give you many years of service for the price of some common sense and lots of TLC.

SOURCES OF INFORMATION ON DAIRY GOATS

By: R.D. Appleman, Extension Dairyman, University of Minnesota

LEAFLETS, CIRCULARS, AND BULLETINS

A. Dairy Goat Management and Production

1. Dairy Goat Production Guide, NE-2
   L. R. Brown, Department of Animal Industries, University of Connecticut,Storrs, Connecticut 06268; and B. Harris and R. L. Richter, Dairy Science Department, Gainesville, Florida 32611 (1975) -- 18 pages.

2. "Dairy Goat Management"
   G. F. W. Haenlein, Department of Animal Science and Agricultural Biochemistry, University of Delaware, Newark, Delaware 19711, Journal of Dairy Science, Vol. 61, No. 7, (July 1978) --1011-1022.

3. The Dairy Goat, Information Bulletin 78
   W. F. Brannon, Animal Science Department, Cornell University, Ithaca, New York 14853 (1975) -- 12 pages.

4. Dairy Goats: An Introduction to Management
   W. A. Gross and R. I. Millar, Animal Science Department,University of Rhode Island, Kingston, Rhode Island 02881, mimeo (1978) -- 13 pages.

5. Dairy Goat Care and Management
   A. M. Meekma and Jack L. Groff, Department of Animal Science, Texas A & M University, College Station, Texas 77843 (1975) -- 8 pages.

6. Dairy Goats - Breeding, Feeding, Management
   B. E. Colby, D. A. Evans, S. L. Lyford, W. B. Nutting, and D. W. Stearn. University of Massachusetts. Available from American Dairy Goat Association, Box 186, Spindale, N.C. 28160 -- 78 pages.

B. Dairy Goat Genetics

1. Own a Dairy Goat
   The American Dairy Goat Association, P. O. Box 865, Spindale, North Carolina 28160 -- 8 pages.

2. "Genetics of Dairy Goats: A Review"
   M. U. Iloeje and L. D. VanVleck, Animal Science Department, Cornell University, Ithaca, New York 14853, Journal of Dairy Science, Vol. 61, No. 8 (1978) -- pages 1521-1528.

3. Breeds of Dairy Goats, Guide 400, D-702
   Borden Ells, Department of Animal and Range Sciences, New Mexico State University, Las Cruces, New Mexico 88003, (revised 1975) -- 3 pages.

C. Dairy Goat Reproduction & Breeding

1. The Artificial Insemination of Dairy Goats
H. A. Herman, American Supply House, Box 1114, Columbia, Missouri 65201 (1972) -- 24 pages.

2. "Reproduction and Breeding of Goats"
Maurice Shelton, Texas A & M University, Texas Agricultural Experiment Station, San Angelo, Texas 76901. Journal of Dairy Science, Vol. 61, No. 7, (1978) --pages 994-1010.

3. Management of Reproduction in Sheep and Goat Symposium
Sheep Industry Development Program, American Society of Animal Science and American Association of Sheep and Goat Practitioners, Chairman Clair E. Terrill, National Program Staff, Agricultural Research, Science and Education Administration, USDA (1977) --149 pages.

D. Dairy Goat Feeding

1. Feeding Dairy Goats - Current Inf. Series No. 296
E. A. Fiez, Department of Animal Sciences, University of Idaho, Moscow, Idaho 83843 (1975) -- 2 pages.

2. "Dairy Goats Do Well on Free-Choice Feeding"
G. F. W. Haenlein, Hoard's Dairyman, October 10, 1978 -- 2 pages.

3. "Forage Utilization and Nutrient Requirements of the Goat"
J. E. Huston, Texas Agricultural Experiment Station, Texas A & M University, Agricultural Research and Extension Center, San Angelo, Texas 76901, Journal of Dairy Science, Vol. 61, No. 7, (1978) -- 988-993 pages.

4. Feeding the Dairy Goat, Special Circular 233
D. L. Ace Dairy Animal Sciences Department, Pennsylvania State University, University Park, Pennsylvania 16802 -- 2 pages.

E. Dairy Goat Housing and Equipment

1. Barns and Buildings for Dairy Goats
A. L. Klingbeil, Tiger Press, Columbia, Missouri 65201, for American Supply House, P. O. Box 1114, Columbia, Missouri 65201 -- 47 pages.

2. Housing Equipment and Care of Dairy Goats, D-235
D. V. Armstrong, Department of Animal Sciences, University of Arizona, Tucson, Arizona 85721 -- 4 pages.

3. Housing and Equipment for Dairy Goats, Guide 400 D-703
Borden Ells, Department of Animal Science and Range Sciences, New Mexico State University, Las Cruces, New Mexico 88003, (1977) -- 2 pages.

4. Dairy Goat Housing and Care
D. A. Anderson, Animal Science Department, Oregon State University, Corvallis, Oregon 97331 (revised April 1976) -- 4 pages.

5. Housing for Dairy Goats, Special Circular 236
D. L. Ace, Dairy and Animal Sciences Department, Pennsylvania State University, University Park, Pennsylvania 16802, (1978) -- 2 pages.

F. 4-H Publications

1. Dairy Kids and Goats, 4-H Publication B-12
4-H Office, 475 Coffey Hall, University of Minnesota, St. Paul,MN 55108 -- 37 pages.

2. Indiana 4-H Dairy Goat Club Record (4-H 589) -- 16 pages.
Jack L. Albright and co-workers, Cooperative Extension Service, Purdue University, West Lafayette, Indiana.

3. The Dairy Goat -- 4-H Member's Guide
C. W. Richardson, Department of Animal Sciences and Industry; Sue Blakely, Agricultural Information Services, Oklahoma State University, Stillwater, Oklahoma 74074 (1976) -- 24 pages.

4. 4-H Dairy Goat Work Manual, Units 1 through 7
Darrel Bolz and Ed Fiez, University of Idaho, Moscow, Idaho (1978).

G. Books

1. Making Your Own Cheese and Yogurt
Max Alth, Funk and Wagnalls, New York.

2. Raising Milk Goats the Modern Way
Jerry Belanger, Garden Way Publishing Co., Charlotte, Vermont 05445.

3. Kidding Around: Goat Cartoons
Betsy, Hall Press, P. O. Box 5275C, San Bernadino, California 92412.

4. Dairy Goat Judging Techniques
Harvey Considine and George Trimberger, Dairy Goat Journal, Box 1808 Scottsdale, Arizona 85252 (1978).

5. Goat Production in the Tropics
C. Devendra and Marca Burns, Commonwealth Agricultural Bureaux, Farnham Royal, Bucks, England (1970) -- 184 pages.

6. Good Beginnings with Dairy Goats
Josephine Emily Eberhardt, Dairy Goat Journal, Box 1908, Scottsdale, Arizona 85252 (1975) -- 192 pages.

7. Observations on the Dairy Goat, FAO 1970
Unipub. Inc., 650 1st Avenue, Box 433, Murray Hill Station, New York, New York 10016.

8. Feed and Nutrition, Chapter 22, "Feeding Goats"
Dr. M. E. Ensmiger and Dr. C. G. Oletine, The Ensmiger Publishing Company, 3699 East Sierra Avenue,Clovis, California 93612 (1978) -- pages 787-813.

9. Management and Diseases of Dairy Goats
Dr. Samuel B. Guss, V. D. M., Dairy Goat Journal Publishing Corporation, Scottsdale, Arizona 85252 (1977) -- 222 pages.

10. Dairy Goats: Selecting, Fitting and Showing
Alice Hall, Hall Press, P. O. Box 5375, San Bernadino, California 92412 (1975) -- 87 pages.

11. Goats
H. E. Jeffrey, Diamond Farm Book Publishers, Dept. DG, Box 266, Alexandria Bay, New York 13607.

12. The Goat Owner's Scrapbook
Dr. C. E. Leach, American Supply House, Columbia, Missouri 65201 (Second printing 1971) -- 386 pages.

13. Aids to Goatkeeping
Dr. C. E. Leach, Dairy Goat Journal, P. O. Box 1908, Scottsdale, Arizona 85252 (8th Edition 1974) -- 277 pages.

14. "Nutrition and Feeding of Goats in Digestive Physiology and Nutrition of Ruminants," Vol.3, Practical Nutrition (Ivan L. Lindahl, SEA-AR, USDA, Beltsville, Maryland).
D. C. Church, Senior Author and Editor, Oregon State University Bookstores, Inc., Box 489, Corvallis, Oregon 97330.

15. Goat Husbandry
Davis MacKenzie, 5th Edition, 1975, Diamond Farm Book Publishers, Dept. DG, Box 266, Alexandria Bay, New York 13607.

16. The Book of the Goat
H. S. Holmes Pegler, "The Bazaar Exchange and Mart," LTD Link House, 24 Store Street, London WC-1,England, published by American Supply House, P. O. Box 304, Columbia, Missouri 65202 (1965) -- 251 pages.

17. The Modern Dairy Goat
Joan and Harry Shields, C. Arthur Pearson, LTD Tower House, Southhampton Street, Strand WC-2, London, England, published by Tiger Press, Columbia, Missouri 65201, or the Dairy Goat Journal, Inc., P. O. Box 190, Scottsdale, Arizona 85252 (1949) -- 172 pages.

18. Living on a Few Acres, the 1978 Yearbook of Agriculture, USDA
"Dairy Goats Require Lots of Care Just to Break Even," Donald L. Ace, pages 357-364.

19. The Illustrated Standard of the Dairy Goat -- A Guide for Evaluating and Judging Conformation
Nancy Lee Owens, Dairy Goat Journal Publication Corporation, P. O. Box 1908, Scottsdale, Arizona 85252 (revised edition 1977) -- 131 pages.

20. Starting Right with Milk Goats
Helen Walsh, Garden Way Publishing Co., Charlotte, Vermont 05445,1972.

21. The Role of Sheep and Goats in Agricultural Development
Winrock International Livestock Research and Training Center, Morrilton, Arkansas 72110 (1976) -- 43 pages.

H. Miscellaneous Materials

1. Proceedings, 1st Annual Dairy Goat Conference.
Office of Special Programs, 405 Coffey Hall, University of Minnesota, St. Paul,MN. 55108 -- 56 pages.

2. California Dairy Goat Publications -- 1975, 1976, 1977, and 1978
Frank D. Murrill, Animal Science Department, University of California, Davis, California 95616.

3. Dairy Goat -- Correspondence Course 105
Correspondence courses in Agriculture and Home Economics, 307 Agricultural Administration Building, The Pennsylvania State University, University Park, Pennsylvania 16802.

4. Dairy Goat Films
Genus Capra Films, 8780 Trinkle Road, Dexter, Michigan 48130. ("AI Techniques," "Fitting and Showing," "Breeding and Kidding," and "Basic Management.")

ORGANIZATIONS AND SUPPLIERS

A. Dairy Goat Associations

1. The American Goat Association
Don Wilson, Secretary Treasurer, Box 186, Spindale, North Carolina 28160.

2. The American Goat Society
H. Wayne Hamrick, Secretary, Route 2, Box 112, DeLeon, Texas 76444.

3. Dairy Goat Club Directory is published annually in the February issue of the "Dairy Goat Journal."

B. National Dairy Goat Breed Associations

1. Alpine International Club
Jan Palmer, Secretary-Treasurer, Skamokawa, Washington 98647.

2. American Lamancha Club
Mrs. Virginia Marhefka, Secretary-Treasurer, 93 Faller Road, Lowell, Massachusets 01854.

3. National Nubian Club
Mrs. Linda Brake, Secretary-Treasurer, 5225 East Pershing Avenue, Scottsdale, Arizona 85254.

4. National Saanen Club
Mrs. Minnie Waterman, Secretary-Treasurer, RFD 2, Kerr Road, Canterbury, Connecticut 06331.

5. National Toggenburg Club
Alan J. Gillroy, Secretary, RFD Box 305, Mansura, Louisiana 71350.

C. National Dairy Goat Magazines

1. "Dairy Goat Journal"
   Kent Leach, Editor, Box 1808, Scottsdale, Arizona 85252.

2. "The News Dispatch"
   Published by the American Goat Society, Inc., Route 2, Box 112, DeLeon, Texas 76444.

D. Dairy Goat Equipment Suppliers

1. NASCO
   901 Janesville Avenue, Fort Atkinson, Wisconsin 53538.

2. American Supply House
   P. O. Box 114, Columbia, Missouri 65201

3. Hoegger's Supply Company
   P. O. Box 490232, "Dept. J," College Park, Georgia 30349.

4. Goat Gifts Galore (Thomas E. Hicks)
   P.O. Box 284, Clearwater, MN 55320 (612/558-2280)