Reproductive Losses in Female Goats

by

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SUMMARY

RETROSPECTIVE surveys carried out in two divisions, Ibarapa and Badeku in Oyo State of Nigeria revealed that abortion, stillbirths, dystokias and perinatal deaths accounted for reproductive losses in goats between 1971 and 1974. The information collected has proved useful as a basis for designing or executing prospective surveys of these losses.

INTRODUCTION

Falade, Sellers and Ojo (1976) reported that, of 2550 sera collected from goats throughout Nigeria, 109 (4.27 per cent) showed *Brucella abortus* serum agglutinating antibodies above 50 international units (I.U.). One area surveyed was the Ibarapa Division of the Oyo State, 64 Kilometres west of Ibadan in South-Western Nigeria; 304 goats in 112 households were sampled and 27 (8.9 per cent) showed antibodies above 50 I. U. It was decided therefore to investigate in detail the overt signs of brucellosis, namely abortion, and other reproductive losses including stillbirths, dystokias and perinatal deaths amongst goats in the Ibarapa Division. A parallel investigation was also performed in Badeku and associated villages in the Oyo State, approximately 24 kilometres east of Ibadan. The Ibarapa Division lies in the derived savannah zone and Badeku in the rain forest zone. The investigation was performed in July, August, September, 1974.

MATERIALS AND METHODS

Ibarapa Division:- Five hundred and ninety four (594) households in the Eruwa area of the Division were chosen at random from lists compiled during a census (Sellers, Dipeolu, Falade and Babalola, (1976).

The information was collected by high school pupils under close supervision by the authors and after full instructions.

Badeku:- This included Badeku and associated hamlets numbering 40. Each compound head was consulted before the inquiry. Again the information was collected by high school pupils under close supervision of an educated farmer working in collaboration with the authors.

Questionaire:- This contained questions on the number of adult female in each household or compound, the number of first and subsequent abortions, the number of stillbirths dystokias and perinatal deaths of offspring, occurring in 1971, 1972, 1973 and 1974.

The information on receipt was checked, coded, punched on 80 column cards and sent for computerisation by the statistical Department of the Rothamsted Experimental station, U.K. using the "Genstat" programme.

RESULTS

These are shown in Table 1. It will be noted that the numbers of female goats in each of the areas surveyed increased each year and the number of abortions, stillbirths, dystokias and perinatal deaths decreased.

DISCUSSION

There are a number of possible explanations. Firstly, that the numbers and events prior to 1974 were not recorded or enumerated accurately and in these years there was a bias. Secondly, the increase in numbers might be associated with a rising economic value of goats and therefore householders kept more. The reduction in damaging events over the four years might possibly have been due to the increased use of veterinary services. However, it is impossible to ascertain the

TABLE 1

Reproductive losses in female goats

District	*Year*	*No. Households questioned*	*No. Households with goats* %	*No. Adult females*	*No. of First abortion* %	*No. Subsequent abortion* %	*Still births* %	*Dystokias* %	*Peri-natal death* %
ERUWA	1971	594	342 (57·6)	128	17 (13)	14 (11)	35 (27)	5 (4)	8 (6)
	1972	594	454 (76·5)	347	30 (9)	27 (8)	59 (17)	10 (3)	14 (4)
	1973	594	594 (100)	701	82 (12)	20 (3)	117 (17)	20 (3)	26 (4)
	1974	594	594 (100)	1585	70 (4)	32 (2)	253 (16)	49 (3)	49 (3)
BADEKU	1971	192	174 (90·6)	177	80 (45)	5 (3)	722 (12)	7 (4)	28 (16)
	1972	192	185 (96·4)	245	98 (40)	4 (2)	30 (12)	8 (3)	48 (20)
	1973	192	190 (99)	277	72 (26)	4 (1)	22 (8)	7 (3)	26 (9)
	1974	192	192 (100)	345	78 (23)	1 (1)	15 (4)	3 (1)	15 (4)

reasons for these measurements although it is considered possible that the figures for 1974 closely approximate the truth.

It is concluded therefore, that the findings for 1974 are a relatively true indication of the numbers of female goats and events which occurred during gestation, parturition and the post-parturient period whereas the earlier figures must be viewed with some scepticism. This is a common fault of retrospective surveys, where results may be influenced by faulty memories or inadequate records. However, the information collected has proved useful as a basis for designing or executing prospective surveys of these losses.

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Nutrition Qualities of Different Cuts of Beef Meat Consumed in Nigeria

by

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SUMMARY

VARIOUS body organs and meat cuts of cattle consumed in Nigeria as sources of animal protein were analysed for their total protein, ash, total lipids, total and ester cholesterol levels and digestibility.

Total protein was significantly higher in the liver and muscles (skeletal and cardiac) than in the skin, kidney, lung and ligament. Ash content was higher in the muscle, skin, and lung than in the kidney, liver, heart, spleen and ligament. Their total lipid content also varied for different cuts, as was the total and ester cholesterol levels. The *in vitro* digestibility study with pepsin showed that the liver, heart, kidney, spleen and the skeletal muscle were significantly more digestible than the lung, skin and ligament.

INTRODUCTION

In some parts of Africa and Asia, especially in the Southern States of Nigeria, unusual parts of cattle, goats and sheep are eaten as sources of animal protein. These include the skin and the lower limb regions (from the hock downwards to the hoof) which anatomically is composed mainly of bones, tendons and ligaments. The main impetus for their demand seems to be their lower price per kilogramme and also the fact that they could be chewed for a longer period than the common cuts such as muscle and liver. However, these other parts of the animal (skin, tendon, ligament, etc.) have now become delicacies for all the socio-economic groups and they must be purchased by the housewife, even at higher market prices.

The demand for the skin of cattle for food purposes is currently affecting seriously the hide and skin industries both in Nigeria as well as in other countries of the world.

Although, various factors are known to be crucial in the choice of food, information is required on the chemical composition and the digestibility of the popular meat cuts currently consumed. Such information including data on specific breeds of cattle is presently lacking. This study reports on the crude protein, total ash, total lipid, total and ester cholesterol levels and the digestibility of various beef cuts and offals which are consumed in Nigeria.

This could be of use in the compilation of our food consumption data as well as throw some light on whether, from the nutritional standpoint, there is any justification for the preference by people for skins, ligaments and tendons, to the higher quality cuts of beef and offals.

MATERIALS AND METHODS

Samples of skin (from the midside) ligament (from the lower limbs), muscle (from the rump), heart, lung, liver, spleen and kidney were obtained from 30 bulls at the Government Abbatoir at Bodija, Ibadan, at the time of slaughter. They therefore represent the raw meat and offals which are usually sold to Nigerian families to meet part of their daily protein requirements.

Crude protein was determined on aliquots before and after incineration overnight at about 550°C (AOAC, 1970).

Total lipid in the various samples was determined on aliquots (about 5g por-

tions), using the method of Harris and Wilcox (1963).

Total cholesterol was determined on aliquots of their lipid extracts, using the saponification and extraction procedure of Abell *et. al.* (1952), and the colour reaction method of Zlatkis *et al.* (1953) as recorded by Mann (1961). The free cholesterol content was determined on the precipitates obtained after digitonin treatment (Soebe land Mayer, 1945) of the lipid extracts. Ester cholesterol values were obtained by difference.

Digestibility values were obtained using the modified *in-vitro* pepsin digestion method of Goll *et al.* (1971).

The means of analyses from all animals for the various parameters were taken in computing the overal values for each organ or cut.

RESULTS

The levels of moisture, total protein and ash contents in the various cuts are shown in Table 1.

The highest protein level was noted in heart muscle, skeletal muscle, liver, and spleen which had over 700 mg/g on dry weight basis. The skin and kidney had lower values of about 650 mg/g, which were higher than values for the ligament and the lung. Generally, the protein levels were significantly higher ($P < 0.01$) in the heart, muscle, liver and spleen, than for the other cuts studied. The moisture content was higher in the heart, lungs and muscle than in other parts, with the lowest levels in the skin.

Total ash levels were highest in the skeletal muscle, the skin and the lung, followed by the kidney, liver and heart while the spleen and ligament had the lowest levels.

There were significant differences ($P < 0.01$) among the different cuts in total lipid content with higher levels in the liver, lung and the skeletal muscle. The skin had the lowest lipid content (Table 2).

Cholesterol was highest in the liver, followed by the kidney, spleen, heart and ligament, in decreasing order. The lowest levels were noted in the lung and skin. The ester cholesterol level differed in the various cuts; it was highest in the liver and lowest in the lungs. Furthermore, the cholesterol/lipid ratio was significantly higher ($P < 0.01$) in the spleen, liver and ligament than in the other cuts.

Table 2 also shows that the liver, heart, kidney, spleen and the skeletal muscle were much more digestible than the lung, skin and ligament.

DISCUSSION

As in some other countries, cattle are transported from one part of the country to another, usually trekking hundreds of kilometres.

During these periods, they are made to graze mainly on poor pastures, and are also exposed to diverse challenging disease conditions. Consequently, the typical animals from which meat resources are derived are often emaciated and weak, having lost a considerable amount of

TABLE 1

Crude Protein (N x 6·25) and Ash contents of edible cuts of cattle (mg/g dry matter)

	(Means of 30 samples ± S.E.)		
Cuts	*Moisture Content %*	*Total protein*	*ash content*
Skin	63·1	648·0 ± 1·5	16·2 ± 0·3
Ligament	68·4	571·0 ± 1·5	9·6 ± 0·4
Skeletal muscle	74·6	735·6 ± 8·0	16·5 ± 0·3
Heart	77·8	787·4 ± 6·0	11·9 ± 0·2
Lung	76·9	553·0 ± 19·0	15·7 ± 0·1
Liver	70·9	718·0 ± 3·5	12·8 ± 0·4
Spleen	72·5	703·0 ± 7·0	9·3 ± 0·1
Kidney	70·5	667·0 ± 7·5	13·0 ± 0·3

TABLE 2

Lipids and Cholesterol contents and the digestibility of various edible cuts of cattle

Cuts	*Total lipids mg/fresh wt.*	*Cholesterol mg/g fresh wt.*		*Cholesterol/ Total lipid %*	*Digestibility % (by pepsin)*
		Total	*Ester*		
Skin	9·13 ± 0·75	1·530 ± 0·09	1·09 ± 0·06	16·90 ± 0·30	59·10 ± 1·20
Ligament	±20·75 — 5·88	11·63 ± 2·44	± 4·10 ± 1·26	65·40 ± 12·60	54·40 ± 3·90
Skeletal muscle	34·12 ± 10·87	8·2 ± 1·01	4·41 ± 0·80	27·80 ± 11·90	76·80 ± 2·10
Heart	26·22 ± 1·28	14·68 ± 0·62	9·04 ± 0·13	56·25 5·15	84·25 ± 0·35
Lung	35·01 ±13·39	1·91 ±0·35	0·62 ± 0·06	6·85 ± 3·65	60·20 ± 1·30
Liver	37·21 ±4.96	±26·77 ±0.52	15·87 ±0.09	73·10 ± ±8.30	86.05 ± ±0.35
Spleen	21·56 ±2·81	16·87 ±0·31	8·25 ±0·49	79·75 ± 11·85	77·40 ± 6·70
Kidney	26·24 ±2·37	16·48 ±0·23	12·49 ±0·40	63·35 ± 6·65	80·95± 1·05

weight. The muscle, gristle and fat contents of joints and cutlets as purchased in the market vary with the part of the carcass from which they are obtained, and with the age and condition of the animal (Nicholls *et. al.*, 1961); and it is also common knowledge that apart from nutritional considerations, the selection of any item for food depends on its palatability and cost, and on the social and religious customs and beliefs of the consumers.

On the basis of the protein content of the various cuts and offals considered in this study, it would appear that the liver, heart, skeletal muscle, kidney and the spleen are superior to the others, while the skin is clearly inferior to the highly priced offals reported to be of high biological value and palatability (Antia, 1973). The values obtained are in agreement with those of McCance & Widdowson (1960) and with figures recorded in the standard food composition table for Africa (USDH/FAO, 1968). Although an offal like the spleen has a high protein content, it is not, in general a popular offal for food.

The results of this investigation reveal that the muscle, heart, liver and kidney are rich sources of minerals, and it will be of interest to know their proximate mineral compositions. The higher ash levels found in the lung and skin as opposed to the liver and kidney is at variance with the report of Sinclair and Hollingsworth (1969), but their higher mineral value does not seem to compensate for their lower protein levels. The moisture content of the liver, lung, kidney and muscle as recorded in this study were comparable with standard levels (Sinclair & Hollingsworth, 1969).

The current global trend in the production and consumption of beef is towards lower cholesterol content, due probably to the reported association between cholesterol and various heart diseases (Mattingly *et al.*, 1964; Friedman, 1968, Yudkin, 1971). Although the liver, kidney, spleen, heart and muscle have high protein levels (Table 1), they also have very high levels of total lipid, cholesterol, and cholesterol/lipid ratio, when compared with other cuts.

It is of interest to note that the skin, currently a popular food item in Southern Nigeria, has the lowest level of lipid, cholesterol, and cholesterol/lipid ratio, except for the lung which is not as popular.

The cholesterol/protein ratio of animal protein sources is an important factor in human nutrition and the results of this study show that the skin, lung and the skeletal muscles have low ratios (Table 3); they could therefore be considered "safer"

TABLE 3

The cholesterol/protein ratio of the various edible cuts of cattle

Cuts	*Cholesterol/protein ratio*
Skin	0·24
Ligament	2·00
Skeletal muscle	1·21
Heart	1·86
Lung	0·35
Liver	3·73
Spleen	2·40
Kidney	2·47

sources of protein than liver, kidney and spleen. The other parts such as the heart and ligament would then fall between these two. The cholesterol levels observed in this study for the liver, kidney and the heart for Nigerian cattle were much higher than the average values reported by Antia (1973).

The low lipid content observed for the skin of cattle seems to confirm earlier reports of Amakiri (1975) who, using histochemical and histological techniques showed that the skin of Zebu cattle *(Bos indicus)* is poor in fats (subcutaneous fat). Figures obtained in this study for the lipid contents of the various cuts of beef are consistent with earlier reports that most of the fats in the White Fulani cattle is located around the kidneys (Harbers *et al.*, 1972) and also intramuscularly (Ledger, 1959), and that very little fat is presently subcutaneously.

The lower digestibility of the lung, skin and ligament is not unexpected. However, the digestibility levels for muscle, liver and kidney appeared considerably lower than those reported by Nicholls *et al.* (1961). This could be attributed to the fact that nomadic cattlemen usually sold their animals for slaughter for meat supply at a fairly advanced age by which time the connective tissues and muscles have become toughened and therefore less digestible.

The findings of this study seem to reveal that the consumption of the skin of cattle by various communities in different countries is not without its merits, although it is poorer in protein and generally less digestible than some other cuts. The high consumption of skin may be due to the fact that Nigerians have cultivated a traditional preference for the distinctive flavour arising from the method of preparation of the skin of cattle for food. Such high demand could cause an enormous economic loss to the various countries in terms of their hides and skin industry; this together with the low protein levels in the skin of animals, is perhaps the strongest reason for advocating that attention should again be drawn to the other edible parts of cattle, sheep or goats as sources of meat proteins in Nigeria, rather than the skin.

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