DEVELOPMENT OF HAIR AND OTHER EXTERNAL FEATURES IN PRENATAL ZEBU CATTLE AS AIDS IN FETAL AGEING

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SUMMARY

THE sequence and rate of hair growth studied in 150 fetuses, 100 to 231 days of age, from slaughtered Rahaji, Bunaji and Wadara cows. Initial appearance of the following external features were observed in embryo and fetuses from day 24 to 230 gestation: limb buds, mammary ridge, olfactory pits, eyes, eyelids, facial closure, intradigital grooves, ear pinnae, genital tubercle, teats, scrotum, testicular descent, hoof formation, horn buds, teeth eruption, fusion of hard palate, carpal and patella separation, and meconium detection, pattern of hair growth was founded to be indecisive as an aid to ageing Zebu fetuses. Initial appearance of certain external features could serve as a rough but quick ageing guide.

INTRODUCTION

Information on hair development in the bovine fetus is restricted to *Bos taurus* breeds (Bergmann, 1922; Postma, 1947; Goetze, 1960; Jakobsen, 1962).

Bergmann (1922) observed hair growth on the muzzle and around the eyes of bovine fetuses by the end of the fourth month of gestation, and by the middle of the sixth month on the eyelids, at and around the base of the horns and on the edges of the ears.

Postma (1947) gave an account of hair eruption in bovine fetuses. Hair eruption was first observed at 15 weeks on the upper and lower lips and on the eyebrows. The first eyelid cilia (dorsal) were visible intraepithelially at 23 weeks and were erupting during the 24th week. On the tip of the tail and along the edges of the ears hairs were erupting during the 26th week. At the same time hair eruption started around the coronets and below the ventral commissure of the vulva. Small intraepithelial zones of facial hairs and
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dense hair growth on the inner surface of the ear occurred at 27 weeks. During the 28th week hair eruption was observed over the extremities and around the umbilical region. Short, diffuse hair cover was present all over the body at 30 to 33 weeks, and dense and full growth at 35 weeks.

Goetze (1960) summed up the sequence of hair growth as reported by other investigators and stated generally, that age determination based on hair eruption was safer than measurements and weights in "unusual cases".

Jakobsen (1962) described the length of individual hairs on the upper lip of fetuses 122 to 229 days of age, and on the eyelids of fetuses between 194 to 229 days. He observed appearance of hair on the metacarpus and metatarsus in fetuses at 163 and 173 days of age, respectively. He described further hair growth as follows: Hair occurred in the horn region at five to five and half months of age, around the external entrance to the ear at five and half months, around the eyes at six to six and half months and total hair cover at seven and half months. As a conclusion of his investigations on hair growth and measurements of extremities and head, he stated that hair patterns gave a reliable basis for determining fetal age because they were not influenced by mummification.

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Schmaltz (1921) stated that hairs were loosened and lost during maceration.

Reported here are observations of hair development and other external features of Zebu fetuses collected from local slaughter establishments.

MATERIALS AND METHODS

Fetuses:

One hundred and fifty fetuses, 100 to 231 days of age, from slaughtered Rahaji, Bunaji and Wadara cows were used for studying hair development, and 270 fetuses for investigating the external features. All gross observations were

made within one to four hours *postmortem*. Fetal age and daily growth scale were estimated as described by (Ojo and Dennis, 1978).

Hair Growth:

Observation of hair eruption and growth were made of specific areas illustrated in Fig. 1. Intraepithelial hair growth was assessed grossly and microscopically in hematoxylin and eosin stained sections. Records were kept of the first observation of intraepithelial growth and up to 20 mm length after eruption or day 190 of gestation.

Fig. 1. Diagram indicating areas observed for hair eruption and growth.

Other External Features:

Initial appearance of the following external features was recorded in developing zebu embryos and fetuses from day 24 to 230 gestation; limb buds, mammary ridge, olfactory pits, eyes, eyelids, groove between teats, scrotum, testicular descent, hoof formation, horn buds, teeth eruption, fusion of hard palate, carpal and

patella separation, and detection of meconium.

RESULTS

The sequence and rate of hair growth in selected body areas of the developing zebu fetus is summarized in Table 1. The development sequence of other external features is given in Table 2.

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TABLE 1
SEQUENCE AND RATE OF HAIR GROWTH IN
SELECTED BODY AREAS OF THE DEVELOP-
ING ZEBU FETUS

<i>Area*</i>	<i>Hair growth in mm</i>	<i>Gestational Day</i>
1.	Visible intraepithe- lially	100 — 115
	Eruption	116 — 123
	3 — 5	125 — 140
	6 — 7	146 — 150
	8 — 10	152 — 158
	10 — 12	161 — 174
		174
2.	Visible intraepithe- lially	100 — 113
	Eruption	115 — 123
	3 — 5	127 — 140
	6 — 7	142 — 150
	8 — 10	152 — 158
	10 — 12	160 — 174
	12 — 20	178
3	Visible intraepithe- lially	100 — 113
	Eruption	152 — 168
	1 — 3	173 — 180
	4 — 5	187 — 192
4.	Visible intraepithe- lially	100 — 142
	Eruption	145 — 152
	1 — 3	158 — 170
	4 — 7	173 — 192
5.	Visible intraepithe- lially	100
	Eruption	113
	2 — 3	123
	3 — 5	130 — 144
	5 — 8	145 — 156
	7 — 10	160 — 169
	10 — 12	170 — 175
	12 — 15	176 — 180
	16 — 20	180 — 187
	20	190
6.	Visible intraepithe- lially	187
	Eruption	205
7.	Eruption over horn region	135

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8.	Eruption	174 — 180	
	2 — 3	180 — 185	
	3 — 5	185 — 190	
9.	Visible intraepithe		
	lially		163
	Eruption	170 — 178	
	Dense hairs		180
10.	Eruption		160
	2 — 3	165 — 174	
	3 — 5	175 — 185	
11.	Eruption		158
	2 — 3	160 — 165	
	3 — 5	170 — 165	
	6		190
12.	Visible intraepithe		
	lially		200
13.	1 — 2 Single hair		
	Eruption		130
	2 — 3	130 — 140	
	3 — 5	130 — 140	
	6 — 8		140
	8 — 12		170
14.	Eye cleft opening		161
	General body sur-		
	face		
	Small zones of		
	intraepithelially		
	developing hairs	187 — 200	
	Zones of hair erup-		
	tion	195 — 210	
	Dense short hair		
	covering the body	210 — 231	

**Outlined in Fig. 1.*

TABLE 2
SEQUENTIAL DEVELOPMENT OF EXTERNAL
FEATURES IN PRENATAL ZEBU CATTLE

<i>Gestational age in Days</i>	<i>External features</i>
24	Forelimb bud present.
25	Embryo is C-shaped; third brachial present.
27	Hindlimb bud and mammary ridge present.
30	Olfactory pits forming optic cup eyes pigmented.

34	Facial clefts closed, groove between forelimb digits appears.
38	Pinna present as ridge, genital tubercle and grooves between hindlimb digits.
50	Eyelids begin to cover the eyes.
56	Hard palate fused.
60	Eyelids closed, hoof formation beginning, horn bud present.
80	Teats present, hoofs, begin to cornify
83	Scrotum present.
111	Tooth eruption begins (Incisor).
150	Hairs around eyes and muzzle.
152	Descent of testes completed.
161	Eye cleft opening.
182	Horn bud covered with hairs.
187	Hairs on coronet.
196	Meconium can be obtained from anus.
197	Eyelids separated.
200	Carpal and patella bones discernible.
215	All four legs covered with hairs.
230	Body fully covered with hairs.

DISCUSSION

Localisation and pattern of hair growth on *Bos taurus* fetuses has been recommended for use in fetal ageing (Bergmann, 1922; Postma, 1947; Goetze, 1960; Jakobsen, 1962). Lack of similar information in zebu breeds prompted this study on the appearance of external features including hair growth as a possible adjunct for ageing zebu fetuses.

The pattern and sequence of hair growth was found to be indecisive as an aid for ageing zebu fetuses and inferior to the regression equation based on body weight and length (Ojo and Dennis, 1978). Hair eruption and sequence of appearance in different region of the body is easily observed on fresh fetuses but measuring length of individual hairs and differentiating between intraepithelial hair formation and hairs in the process of eruption may present some technical difficulties. This may result in subjective appraisal even with fresh fetuses.

The initial appearance of external body features in zebu fetuses could serve as a guide especially in evaluating the age of malformed fetuses.

The following easily recognisable features should be of value:

day	25	C-shaped embryo
	34	Facial clefts closed.
	50	Eyelids begin to cover eyes.
	60	Eyelids closed, hooves forming, horn buds present.
	80	Teats present, hooves beginning to cornify.
	150	Hairs on eyes muzzle.
	187	Hairs on coronets.
	197	Eyelids separated.
	215	Legs covered with hair.
	230	Body fully covered with hair.

It is obvious from the results reported here that more observations on hair and other external features of zebu fetuses are needed before meaningful comparisons can be made with the information published on *Bos taurus* breeds. Finally, the initial appearance of certain external features observed on 150 fetuses will find use as a rough but quick method for ageing Zebu fetuses in the field.

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HELMINTHS AND PROTOZOAN PARASITES OF REPTILES: (LIZARDS *AGAMA AGAMA*) AND THEIR PUBLIC HEALTH ASPECTS

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SUMMARY

TWO hundred and ten (210) lizards captured around human habitations in south-western region of Nigeria were examined for helminth and protozoan parasites.

Eimeria agamae; *Leishmania agamae*; *Tritrichomonas*; *Entamoeba invadens* and *Plasmodium* were the protozoan parasites found. Among the helminth parasites were *Trichuris*; *Ascaris cephaloptera*; *Heterakis spimosa*; *Dracunculus ophidensis*; *Infidum nigerianum*; *Plagiorchis mentulatus* and *Acanthotaenia agamae*.

The public health aspect of some of these parasites especially with human contact is discussed.

INTRODUCTION

In spite of the closeness of lizards to human habitations and possible spread of diseases to man, very little has been done in Nigeria either to study the parasites they carry or to examine their potential zoonotic problems.

Babero and Okpala (1962 a,b) had reported on the helminth parasites of lizards in Nigeria and had also described a new parasite of the liver of lizards. Elsewhere Grasse (1926), Hill (1953), Reichenow (1953) and Laird (1960) had also reported various protozoan parasites found in different species of lizards.

This investigation is carried out to assess the roles *Agama agama* could play in disease transmission and highlight the public health importance of the zoonotic parasites.

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MATERIALS AND METHODS

Each lizard captured was put in a jar containing chloroform. After about fifteen minutes, the lizard was bled from the tail and blood smears made on glass slides. The slides were quickly dried, fixed in methanol and stained with Giemsa. The lizard was then placed dorsally on the mounting board and with the aid of forceps and scissors, the abdomen was opened to expose the intestines. The intestines were examined and adult worms present were collected and preserved in 5% formalin.

Fresh faecal samples were collected from each lizard and simple saline floatation method (Soulsby 1968) employed to identify any eggs found. Intestinal smears were also made on glass slides and examined for any motile organisms. All other organs especially the liver and the spleen were examined for parasitic cysts. The worms were identified according to Soulsby (1968).

RESULTS

The results are shown in Table I. *Ascaris cephaloptera* was found to be the predominant helminth parasite. *Infidum nigerianum* had the least percentage of infection. However, there are high percentage infections with *Plasmodium*, *Eimeria*; *Leishmania* and *Entamoeba*.

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TABLE I
PARASITES OF LIZARDS AND THEIR PERCENT INFECTION

<i>Helminth parasites</i>	<i>No. of Lizards examined</i>	<i>No. of Lizards infected</i>	<i>Percent infection</i>	<i>Protozoan parasites</i>	<i>No. of Lizards infected</i>	<i>Percent infection</i>
<i>Ascaris cephaloptera</i>	210	116	55.2	<i>Plasmodium spp.</i>	112	53.3
<i>Acanthotaenia agamae</i>		18	8.57	<i>Eimeria agamae</i>	65	30.95
<i>Heterakis spimosa</i>		15	7.14	<i>Leishmania agamae.</i>	33	15.7
<i>Plagiorchis mentulatus</i>		9	4.28	<i>Entamoeba invadens</i>	24	11.4
<i>Trichuris</i>		8	3.81	<i>Tritrichomonas spp</i>	17	8.1
<i>Dracunculus ophidensis</i>		8	3.81			
<i>Infidum nigerianum</i>		6	2.85			

DISCUSSION

The results obtained from this investigation show the possibility of some of these parasites being of public health importance. *Trichuris* is a zoonotic parasite which has been found to cause acute or chronic inflammation in the intestinal tract of dog and man (Soulsby 1968) and occasionally haemorrhagic diarrhoea and anaemia.

Dracunculus ophidensis is also of public health importance in that it can be acquired by man, aquatic and some terrestrial animals.

D. medinensis, the human species has been found in the dermis of reptiles

(Reichenbach-Klinke and Elkan 1965). The species was suggested to be a synonym to *D. ophidensis*. This parasite causes a lot of discomfort in humans and animals, burrows into their tissues, cells and nerves which make the affected hand and legs swollen and man is unable to walk or stand (Levine 1968).

Both *Leishmania* and *Plasmodium spp.* found in lizards are transmitted by *Phlebotomus* flies (Reichenow 1953) and mosquitoes (Laird 1960) respectively and these are the same vectors for the transmission of these parasites to humans. It is therefore possible that

lizards serve as carriers of human *Plasmodium* and *Leishmania*.

Although *Entamoeba* and *Tritrichomonas* were found in some of the lizards, it is not very clear what role they could play in public health. Also the importance of *Infidum nigerianum*, a trematode of lizards (Babero and Okpala 1962a) in disease transmission is not yet known.

However the public health importance of some of these parasites lie in the fact that children are most predisposed in picking and eating soils infested with eggs or larvae of the parasites. Dirty househelps who play with the children are predisposed. Lizards faeces have been found on food materials which when not properly cooked or boiled may cause infection.

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