

THE INFLAMMATORY REACTION IN CALVES DURING ONTOGENESIS

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Reports in the literature [1, 2, 3, 5, 8, 9] have established that in early stages of phylo- and ontogenesis, the inflammatory reaction in the tissues is very feebly expressed on account of the refractoriness of the animal to the action of several stimuli.

In calves, in the process of ontogenesis, the inflammatory reaction has not been investigated. The present work is devoted to this subject.

EXPERIMENTAL METHOD

The inflammatory reaction was investigated in ten healthy cross-bred calves (red steppe breed, improved with Simmental). The age and weight of the animals at the time of the experiment are shown in Table 1. The animals were reared in unheated buildings, in individual stalls, on a diet to produce a mean daily gain in weight of 700 g. Until 10 days of age, the calves were given freshly obtained colostrum and milk four times a day ad lib., and subsequently three times a day; water was added after the first few days. After the fifth day, the calves were weaned on hay and concentrates.

The general body temperature and the skin temperature in 11 places previously freed from hair were determined in the animals by means of a radiometer.

The hair was carefully clipped from the tip of the ear, where pigmentation was least, and this area was freed from fat. An injection of 0.1 ml of colorless turpentine was given subcutaneously into this area. By means of the radiometer, the temperature of this area was determined, and observations were conducted on the course of the inflammatory reaction, at first every minute, and later every 5 minutes, for 2 hours (in some animals for longer). On the following days the calves were investigated daily until complete recovery had taken place.

EXPERIMENTAL RESULTS

The results showing the changes in the temperature of the different areas of the body are summarized in Table 2.

It may be seen from these findings that the temperature of the "terminal" areas of the body of the newly born calf (nose, tip of the tail, hoof, ears), by virtue of their poikilothermism, was 20-21° below the body temperature. In calf No. 6, whose birth weight was 19 kg, the values of the skin temperature were lower than in calves of the age of one day and three days. This feature is directly connected with the backwardness of its embryonic maturation. In our previous investigations

TABLE 1. Characteristics of the Experimental Calves

Calf No.	Sex	Name	Live weight (in kg)		Age
			at birth	at subsequent investigations	
1	Female	Sazha	31	—	1 hr 30 min
2	Male	Venik	33	—	18 hr
3	Female	Ob'	23	—	24 hr
4	Male	Mart	35	—	68 hr
5	"	Plot	33	—	72 hr
6	"	Met	19	—	142 hr
7	Female	Manta	22	42.5	38 days
8	"	Sevryuga	25	51.0	44 days
9	Male	Fantik	39	93.0	59 days
10	"	Gusek	30	77.0	64 days

TABLE 2. Temperature of Different Parts of the Body in the Calves

Calf No.	Room temperature	Temperature of the skin of							Temperature			Body temp.	
		nose	forehead	ear	crest	croup	tip of the tail	groin	chest in the heart region	wrist	hoof of the		
											fore leg		hind leg
1	15°	18,0°	30,0°	23,0°	32,0°	30,6°	18,0°	32,0°	30,0°	22,0°	18,1°	19,0°	39,1°
2	15°	33,6°	34,0°	30,0°	35,6°	36,8°	33,0°	36,4°	36,2°	31,0°	23,4°	32,0°	38,5°
3	15°	31,2°	30,0°	26,0°	34,0°	35,8°	30,6°	34,4°	34,8°	32,6°	22,5°	21,0°	38,5°
4	15°	33,4°	31,0°	27,4°	31,0°	35,0°	24,2°	34,6°	34,2°	33,0°	24,2°	26,6°	39,4°
5	15°	32,6°	31,6°	25,6°	35,6°	35,2°	26,4°	37,8°	36,0°	31,4°	27,2°	20,8°	39,5°
6	16°	32,8°	34,0°	24,0°	35,0°	35,0°	32,2°	36,2°	32,4°	31,4°	26,0°	25,8°	38,6°
7	18°	32,0°	32,4°	32,0°	36,2°	34,2°	29,6°	36,4°	36,6°	34,2°	20,4°	21,1°	39,2°
8	18°	32,2°	34,0°	33,6°	35,4°	34,0°	31,6°	36,2°	35,4°	34,4°	27,4°	30,0°	39,0°
9	18°	33,4°	31,0°	28,0°	34,6°	34,0°	31,2°	37,4°	35,5°	34,2°	23,6°	19,0°	38,4°
10	18°	28,2°	30,8°	29,6°	34,2°	33,0°	19,8°	35,0°	34,2°	26,2°	18,6°	18,8°	38,7°

TABLE 3. Temperature Changes in the Region of the Inflammation

Time (in min) of investigation of skin temperature after injection of turpentine																	
Calf No.	normal	1	5	10	15	20	25	30	40	50	60	70	100	200	Body temperature		
																before	at end
																expt.	of expt.
Skin temperature																	
1	23, 0°	29, 0°	32, 2°	34, 4°	34, 4°	34, 6°	34, 4°	34, 4°	34, 0°	33, 6°	33, 6°	—	—	—	39, 1°	39, 3°	
2	30, 0°	33, 6°	35, 4°	35, 4°	—	35, 8°	—	35, 2°	34, 4°	34, 4°	34, 2°	34, 8°	34, 6°	33, 2°	38, 5°	38, 5°	
3	26, 0°	32, 4°	32, 6°	34, 6°	34, 8°	35, 0°	35, 1°	35, 2°	35, 2°	35, 2°	35, 0°	—	35, 0°	—	38, 5°	38, 7°	
4	27, 4°	35, 2°	35, 4°	35, 2°	—	36, 0°	36, 2°	36, 3°	36, 3°	36, 4°	36, 4°	34, 4°	34, 2°	33, 2°	39, 4°	39, 5°	
5	25, 6°	35, 4°	35, 6°	35, 4°	—	35, 6°	—	36, 0	36, 2°	35, 8°	35, 6°	35, 6°	34, 2°	33, 2°	39, 5°	39, 3°	
6	21, 0°	33, 0°	34, 2°	34, 8°	—	35, 2°	35, 0	35, 0	35, 0°	35, 2°	34, 4°	34, 6°	33, 2°	—	39, 0°	39, 0°	
7	32, 0°	34, 2°	35, 4°	35, 2°	35, 4°	—	35, 2°	—	35, 4°	35, 2°	35, 6°	35, 8°	—	—	39, 2°	39, 8°	
8	33, 6°	35, 0°	35, 8°	35, 2°	35, 4°	35, 2°	36, 2°	35, 8	35, 6°	35, 8°	36, 2°	36, 2°	—	—	39, 0°	39, 6°	
9	28, 0°	35, 2°	35, 6°	35, 4°	35, 6°	36, 1°	35, 9°	36, 0	35, 8°	35, 8°	36, 0°	36, 2°	—	—	38, 4°	39, 4°	
10	29, 6°	35, 2°	35, 4°	35, 4°	35, 8°	36, 2°	35, 8°	36, 2	36, 2°	35, 8°	36, 0°	35, 8°	—	—	38, 7°	39, 3°	

[7], and also in work by other researchers [4, 6], it has been shown that the duration of poikilothermism in newly born mammals is dependent on the prenatal development.

At the site of injection of the turpentine into the experimental calves, an increase in temperature and the development of an inflammatory lesion were observed. Figures showing the temperature changes are given in Table 3.

The maximum skin temperature at the site of turpentine injection into the calves was noted at different times. In a newly born calf (No. 1), in calf No. 2, aged 18 hours, in the bull-calf Met (No. 6), and calf No. 10, a rise of temperature was observed at the same time. In the other calves the apogee of the thermal reaction occurred at different times.

When the temperature of the inflammatory area was compared with the normal temperature (with the temperature before injection of turpentine), it was found that the highest rise was present in calves Nos. 1 and 6, i.e., in the newly born calf and the premature, underdeveloped animal.

In calves Nos. 1, 3, and 6 the lowest temperature at the site of injection of the turpentine was observed. In calves Nos. 2, 4, and 5 the temperature was higher. These animals were of a considerable live weight at birth. In the older calves — Nos. 7, 8, 9, and 10 — the temperature of the inflammatory focus was very close to the temperature of the inflammatory foci in the calves Nos. 2, 4, and 5. At the site of injection of the turpentine into the younger calves, edema (puffiness) and other signs of inflammation developed around the needle puncture. In the course of its development the edema increased, and an abundant discharge of exudate took place, which was measured by counting the drops of exudate discharged per minute.

In the older calves the inflammatory reaction was imperceptible, the ear remained mobile, and redness and tenderness were absent.

In calves Nos. 1-6 a violent vascular reaction developed at the site of inflammation, accompanied by increasing edema and an abundant exudation. The inflammatory area was increased four- to sixfold in thickness, erythema was slight, tenderness insignificant, but the mobility of the ear was restricted.

When the temperature figures and the clinical findings were compared, it became obvious that in calves Nos. 1-6 the body temperature was not increased.

Apparently turpentine does not cause a pyrogenic reaction in animals of this age.

Further investigations showed that in calves during the first days of life, profound alterative changes and deformation of the ear arose at the site of the inflammatory lesion. In the older calves the inflammatory reaction was mild and did not lead to visible disturbances of the underlying and surrounding tissues.

SUMMARY

The development of an experimentally induced inflammatory reaction was studied in newborn calves, during the first hours after birth ($1\frac{1}{2}$ -142 hours), 38-42 days. In newborn calves the temperature of definite areas of the skin was lower (by 20-21°C) than the body temperature, and was subject to more pronounced fluctuations than in the older ones.

At the site of turpentine injection (the agent causing inflammatory reaction) the temperature was two degrees lower in the newborn calves than in the older ones, whereas the vascular reaction was more active. The inflammatory process in the newborn is more prolonged than in the older calves, and terminates with considerable changes and deformation of the tissue. No visible changes were observed in the tissue of older calves at the site of inflammation.

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