

## The Effect of Cry Stimulus on the Temperature of the Lactating Breast of Primipara. A Thermographic Study

While studying the mother's identification of her baby's cry<sup>1</sup>, we observed that many mothers, when exposed to cry stimulus from a magnetic tape, claimed having a sudden, heavy dripping of milk from the mammary glands. This led us to investigate the response of the lactating breast to different kinds of cry stimuli using infrared thermography.

**Subjects.** 40 primipara mothers from the Department of Obstetrics, University of Oulu, Finland, aged 17–32 years, were taken at random. All the mothers were healthy and have had a normal delivery after a full-term pregnancy. Their new-born babies were also without any complications. A group of 10 controls was similarly selected. All the subjects were tested 5–45 min before the noon feeding time on the 3rd, 4th or 5th day after delivery.

**Methods.** A thermograph AGA Thermovision Type 661<sup>2</sup> was used to record the changes of temperature of the skin over the anterior chest wall<sup>3,4</sup>. The right supraclavicular

before feeding (hunger cry); then, following immediately, a recording of 3 min of pain cry, evoked by pinching the baby's upper arm once every minute. Method and technique in recording hunger and pain cries have been reported earlier<sup>5,6</sup>.

**Registration and analysis of thermal changes.** We recorded the change in the temperature of the skin over the breasts 15 sec before starting to play the cry stimulus recording and 6 times at 1 min intervals during the cry stimulus. A final picture was taken 1 min after termination of the cry stimulus. The same time intervals were also used in the control material where no cry stimulus was applied. As a measure of the thermal changes, we estimated the size of isotherm area from the photographic recordings before the cry stimulus and 1 min after termination of stimulus.

**Results.** 4 of the 40 mothers did not have observable thermal changes during the recording. The rest of the mothers showed an increase of the isotherm area over the

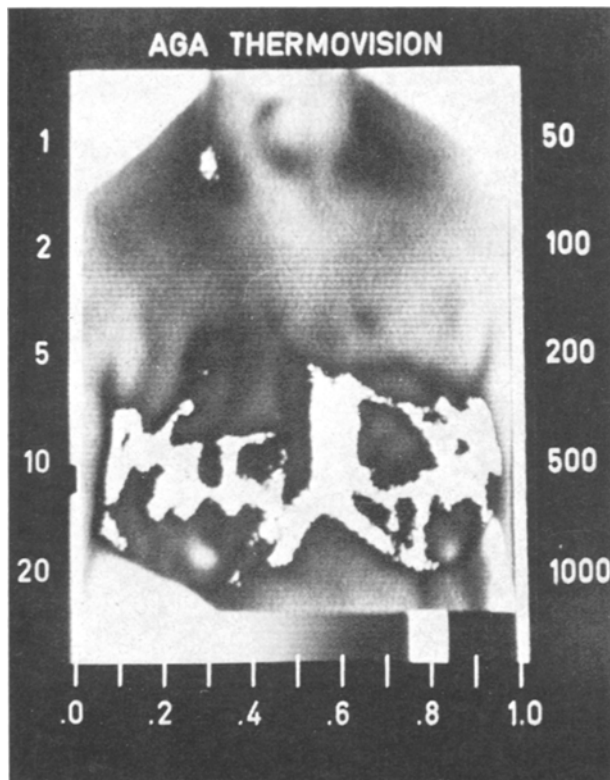


Fig. 1. Thermogram of the anterior chest wall of a primipara mother.

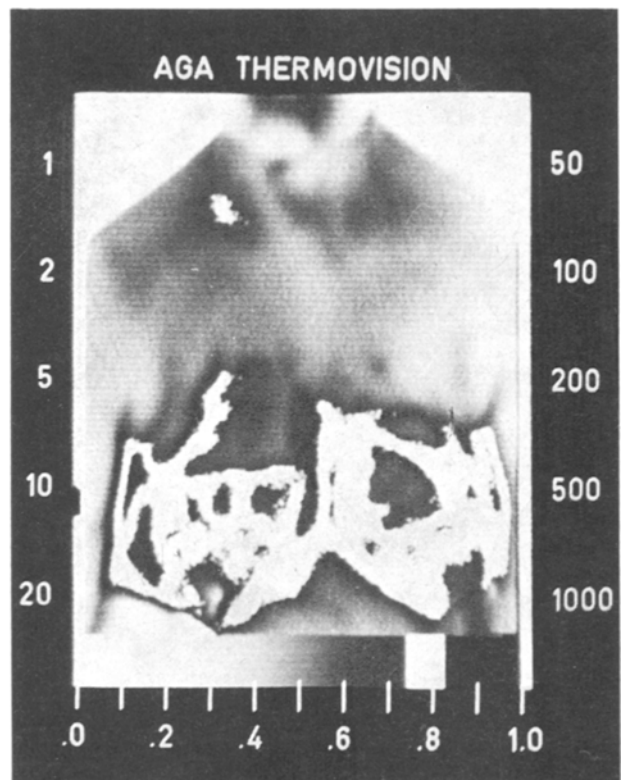


Fig. 2. Thermogram of the same subject after the end of cry stimulus.

fossa was chosen for reference temperature. The inverted greytone pictures with isotherm function (white bands connecting areas with same temperature) were registered using a 35 mm Nikon F camera. SONY 262 tape recorder and SONY DR-IC dynamic earphones were used in playing back the cry recording.

**Cry stimulus.** For a cry stimulus, a 7 min continuous recording of crying from a healthy new-born was used and played to each of the tested mothers through earphones at a constant intensity level. The tape consisted of 2 parts: first, 4 min of spontaneous crying recorded just

<sup>1</sup> E. VALANNE, V. VUORENKOSKI, T. J. PARTANEN, J. LIND and O. WASZ-HÖCKERT, *Experientia* 23, 768 (1967).

<sup>2</sup> AGA Infrared Instruments Department, Lidingö (Sweden).

<sup>3</sup> Colloque International de Thermographie Médicale, Strasbourg 1966, *J. Radiol. Électrol. Archs. Elect. med.* 48 (1967).

<sup>4</sup> J. GERSHON-COHEN, *Scient. Am.* 216, 94 (1967).

<sup>5</sup> J. LIND, O. WASZ-HÖCKERT, V. VUORENKOSKI, T. PARTANEN, K. THEORELL and E. VALANNE, *Annls. Paediat. Fenn.* 12, 55 (1966).

<sup>6</sup> O. WASZ-HÖCKERT, J. LIND, V. VUORENKOSKI, T. J. PARTANEN and E. VALANNE, *The Infant Cry* (Spastics International Medical Publications, Heinemann, London 1968).

The number of changes of temperature in the breasts of 40 mothers measured at 1 min intervals

Stimulus	Hunger cry			Pain cry			Over	
	0	1	2	3	4	5	6	7
Minutes								
No. of changes	16	19	19	22	17	15	16	
Total		54			54		16	

breasts. Figures 1 and 2 show a typical increase of the isotherm area. We observed no decreases of this area.

In 16 cases, the first change occurred 1 min after initiating the hunger cry stimulus whereas in 5 cases the first change was observed only during the pain cry. Of the observed changes, 43.5% occurred during the hunger cry, 43.5% during the pain cry and 13% 1 min after termination of the cry stimulus. Most reactions (22) were noted at 4 min (see Table).

On the control material, only 1 case out of 10 showed a minimal change during the same period of time. All of these 10 cases showed increased isotherm area during the cry stimulus.

*Discussion.* Hunger and pain cries from new-born babies cause an increase of temperature over the breasts of lactating mothers. In this first preliminary study, we exposed mothers to a continuous recording of separate periods of hunger and pain cries. The increase in skin temperature over the breasts was grossly the same during both stimuli. It might have been expected that the pain cry would be experienced by the mothers as an anxiety stimulus and thus decrease the activity in the breasts<sup>7</sup>. But it has been observed that in a healthy baby a long

lasting hunger cry can often get several characteristics of pain cry. Using a combination of hunger and pain cry we cannot be sure that the increase in isotherm area during pain cry may not be a delayed response to hunger cry. We are carrying out further experiments along this line.

The results indicate that it might be important that normal biological communication between mother and child be maintained during the period when lactation is establishing. This means that the mother and the child ought to be together in the maternity hospital at least during day-time (rooming-in) and that the feedings are scheduled according to the infant's cry periods.

*Résumé.* Les résultats d'une analyse thermographique pratiquée sur 40 primipares durant les premiers jours de lactation suivant la naissance indiquent clairement que le cri du nouveau-né cause une élévation de la température dans la zone mammaire.

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<sup>7</sup> M. NEWTON and N. R. NEWTON, *J. Pediat.* 33, 698 (1948).

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## Increased Vascular Permeability in the Primary Cutaneous Allograft Response in the Rat

The allograft response is well established as a cell-mediated immunological phenomenon<sup>1,2</sup>. The grafting of skin is accompanied by an initial acute inflammation evoked by the surgical preparation of the graft bed which includes a short-lived increase in vascular permeability<sup>3</sup>. The development of the subsequent allograft response is accompanied histologically by an intense cellular infiltration, but the presence of further and accompanying changes in vascular permeability has not been studied.

The problem has been investigated in male rats (150–200 g) using inbred strains of Wistar Albino Glaxo and Piebald Variant Glaxo rats as donors and recipients respectively. Orthotopic skin was grafted into round excised wounds ( $9.0 \pm 0.5$  mm diameter) on the flanks of recipient animals, immediately cephalad to the anterior fold of the hind limb. The graft and its bed were protected from external irritation by attaching 'Perspex' wound-healing chambers<sup>3</sup> to the skin surrounding the grafted area; the grafts were held in position and prevented from drying by firmly packing 'Sofratulle' dressing over the graft before the chamber was closed.

Increased vascular permeability was assessed for grafts of various ages by measuring the exudation of circulating Evan's blue injected i.v. (2.5 mg/100 g body wt.) 1 h before the animals were killed. The graft sites were then excised and the exuded dye measured by extraction in

formamide and spectrophotometric estimation<sup>3</sup>. The permeability response associated with the surgical excision of the skin to prepare the graft bed is maximal in 10 min and largely subsides in 30 min although slight exudation persists for some 4–6 h<sup>3</sup>. The insertion of the graft and protective chambers took about 1 h, by which time the initial permeability response had practically subsided.

*Increased vascular permeability in the allograft response.* In the initial 4 days after grafting increased vascular permeability is insignificant (Figure). On the 5th day there is a striking and sudden increase in permeability which extends over the 6th and 7th days and then quickly subsides. It is noteworthy that despite the use of inbred animals, individual rats may show a relatively slight permeability response. Nevertheless the response is well-defined and usually substantial (Figure).

During the well-defined phase of increased permeability the grafts appear healthy macroscopically. A patchy tan-coloured mottling appears between the 9th and 11th

<sup>1</sup> P. B. MEDAWAR, *Proc. R. Soc. B.* 149, 145 (1958).

<sup>2</sup> J. L. TURK, *J. clin. Path.* Suppl. 20, 423 (1967).

<sup>3</sup> A. W. J. LYKKE and R. CUMMINGS, *Br. J. exp. Path.*, 50, 309 (1969).