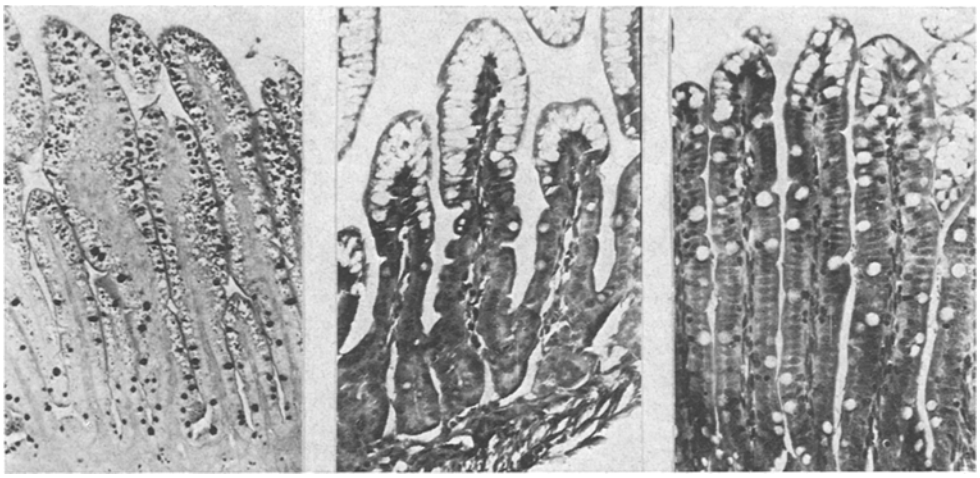

Fig. 2. Changes of the ileum of the suckling rat in relation to age. (a) Prior to the 18th day the intestinal villi are covered almost over their entire lengths by cells containing supranuclear vacuoles. The vacuoles often contain inclusion bodies. PAS reaction. (b) and (c) On the 19th and 20th days, cells with supranuclear vacuoles are seen exclusively at the tips of the villi and no inclusion bodies are present in the vacuoles. Haematoxylin-eosin stain.

tended to decrease, the activities of invertase, amylase and lipase to increase. The proteolytic activity rose again after an initial fall.

Our earlier studies[12] have shown that the small intestinal epithelium of the suckling dwarf goat was replaced by adult-type epithelium by the 72nd h and the adult-type cells were no longer able to absorb colostral proteins. The direction of differentiation of epithelial cells was found to have changed also in the rat's ileum. Cells containing invertase appeared first at the base of the villi[13] and those containing supranuclear vacuoles were seen for the last time at the tips of the villi (Figure 2). The exchange of the ileal epithelium from suckling to adult type took place between the 18th and 21st days of life. This point of time fairly coincided with the cessation of antibody absorption on the 19th and 20th days[1]. Simultaneously, the adhesion strength of intestinal epithelial cells increased and the hydrolytic enzyme activities had distinctly altered (Figure 1).

The yellowish-brown colour of the ileum appears to be due primarily to the inclusion bodies in the supranuclear vacuoles[6]. The disappearance of the yellowish-brown colour and of the inclusion bodies preceeds that of the vacuolized cells by 1 or 2 days (Table). The presence of plant rests in histological sections appears to indicate that the disappearance of inclusion bodies is related to the gradual superseding of suckling by intake of solid food.

In the distal part of the ileum, Peyer's patches well visible to the naked eye were found first on the 19th day. Accordingly, their appearance coincides with the beginning of changes in the serum immune globulin levels[2,3].

The above observations imply that in the rat's ileum multiple changes are taking place between the 18th and 21st day of life. The question arises whether or not the changes are limited to the ileum. Moog[14,15] described enzymic and morphological changes in the proximal part of the small intestine of 16–18-day-old mice, which coincides with the cessation of antibody absorption in this species. The hydrolases studied by us showed changes also in the proximal part of the small intestine (Figure 1). Some changes perhaps extend to the entire organism.

We believe that these changes represent an important step in ontogenesis and their physiological significance is the preparation for weaning. There is no indication that in non-rodents the preparation for weaning actually manifests itself by such abrupt and pronounced changes as in rats.

Zusammenfassung. Die Zusammenhänge zwischen den histologischen Veränderungen und dem Wechsel des Enzymmusters im Darm der Ratte während des Überganges von Milch- zur Festnahrung werden beschrieben.

K. Baintner jr. and B. Veress

Research Institute for Animal Breeding, Department of Animal Physiology and 2nd Institute of Pathology, University Medical School, Budapest (Hungary), 4 August 1969.

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The Control of Acoustic Input in the Medial Geniculate body and Inferior Colliculus by Auditory Cortex

The importance of sensory input control in the perceptive evaluation of information is known. In fact, a great number of experimental data suggest that the information coming from many afferent systems is controlled by centrifugal nervous pathways, and that centrifugal control may be a general principle of action of the central nervous system[1]. Within the acoustic system, together with the afferent pathway, anatomical data suggest a

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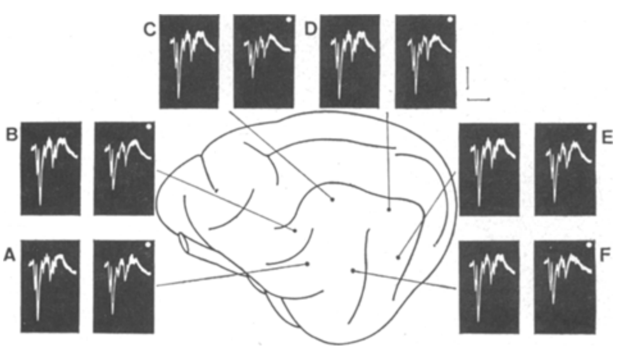
descending system, which passes from the auditory cortex to the medial geniculate body, the bilateral inferior colliculi, the lateral lemniscus and the trapezoid body[2–4].

The present work is an attempt to show the function that these descending fibres have in the control of acoustic input in the medial geniculate body and in the inferior colliculus.

Material and method. The experiments have been done on 26 curarized cats with local anaesthesia of painful points. We recorded the evoked potentials in the medial geniculate body and in the inferior colliculus with or without conditioning stimulation of acoustic cortex, periodically varying the intensity of the click sound energy (expressed in *dB* below the arbitrary reference level). We further evoked the acoustic potentials through shock tests applied on underlying acoustic relays (cochlear nucleus and superior olivary complex). The explored structures were stereotaxically localized[5]. The conditioning stimulation was performed by bipolar method, using a series of repetitive shocks delivered by Grass S8 stimulator, fitted with an *rf* coupling unit and programmed by Tektronix 162 units. Electrode locations were checked in serial paraffin sections through the fixed brain (Prussian blue marks). For technical details refer to previous work or in extenso work[6,7].

Results and discussion. The conditioning stimulation of certain points of the auditory cortex has induced an inhibition of the potentials evoked both in the medial geniculate body and in the inferior colliculus. 3 variable conditions must be fulfilled for the appearance of the inhibition, i.e. (A) *Conditioning stimulation of certain points in the cerebral cortex.* We explored the auditory cortex of the cat, consisting of the primary (A_1) and secondary (A_2) acoustic areas and of the posterior ectosilvian gyrus (Ep). It was found that few points of the auditory cortex determined the inhibition of the evoked activity in the medial geniculate body and in the inferior colliculus. These points were all localized inside the primary acoustic area (A_1). Stimulation of points of secondary acoustic area (A_2) and of the posterior ectosilvian gyrus (Ep) determined less or no effect. The localization of the points of the auditory cortex was equal both for the medial geniculate body and the inferior colliculus (Figure). The percentage of inhibition of the evoked potentials, in optimum conditions, was 50–60%. (B) *Localization of the electrodes in medial geniculate body and inferior colliculus.* The entity of the inhibitory phenomenon, performed by stimulation of the primary acoustic area, reached the highest degree (50–60%) when the deriving electrode in the medial geniculate body and in the inferior colliculus was placed at the borders, while the degree of inhibition diminished when the electrode was placed at the centre of the relays. In particular we found that the entity of inhibition in the medial geniculate body was greater when the deriving electrode was placed at H_{12-13} and $H_{9,5-8,5}$; frontal and lateral stereotaxic planes were $A_{3,5-4,5}$, L_{9-10}. The maximum degree of inhibition for the inferior colliculus was obtained when the electrode was placed at H_{14-15} and $H_{9,5-10,5}$; frontal and lateral stereotaxic planes were P_{1-2}, $L_{4,5-5}$. (C) *Parameters of conditioning stimulation.* The degree of inhibitory effects was dependent on well-defined parameters of conditioning stimulation. We have obtained the maximum degree of inhibition with 10–12 shocks at 200/sec; 1 msec; 8–10 V; 10–20 msec interval between conditioning and test stimulus. When the optimum experimental conditions (A, B, C) were realized, the entity of inhibition was 50–60% if the test stimulus was represented by an electric shock on an underlying relay, whereas if the test stimulus was represented by a click, the evaluation of the inhibition degree, performed with the equivalence method in *dB*, was 10 *dB* equivalents, not only for a determined sound energy but for different ranges of values.

Our results lead to the conclusion that the conditioning stimulation of primary acoustic cortex inhibits the potentials evoked both in the medial geniculate body and in the inferior colliculus. The degree of inhibition is greater when the stimulating and the deriving electrodes are placed in well-defined points of the cerebral cortex and respectively of the considered nuclei. The results seem to render a functional significance to efferent fibres that leave the auditory cortex to enter in the medial geniculate body and the inferior colliculus[8].



Cat immobilized with syncurarin and local anaesthesia of painful points. Inhibition of several potentials evoked in the inferior colliculus by conditioning stimulation (10 shocks at 200/sec; 1.5 msec; 10 msec interval) of different points in the auditory cortex. In the left oscillograms are represented superimposed unconditioned potentials, in the right oscillograms superimposed conditioned potentials (full circles). The inhibitory effects are better evident after conditioning stimulation of primary acoustic area (B and C), while they are less evident after conditioning stimulation of secondary acoustic area (A and F) and posterior ectosilvian gyrus (D and E). Vertical calibratio 100μV; horizontal calibration 2 msec.

Riassunto. In Gatti curarizzati la stimolazione condizionante dell'area uditiva primaria inibisce i potenziali evocati tanto nel corpo genicolato mediale quanto nel collicolo inferiore. I risultati possono attribuire un significato funzionale alle fibre che dalla corteccia uditiva convergono sui due relays del sistema sensoriale acustico.

G. AMATO, V. LA GRUTTA and F. ENIA

Istituto di Fisiologia umana dell'Università, I-90134 Palermo (Italy), 2 July 1969.

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