consistent, differences were found with other experimental groups, possibly indicating the effects of the deprivation on other systems that are not so important in the behavioral tasks used here. A comparison of the performance of the 8- and 12-day groups on the first and second jump suggests the operation of differential effects of early experience.

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6 June 1955

Synthalin A as Selective Mitotic Poison Acting on α-Cells of the Islets of Langerhans

In recent years it has been discovered that the alpha-cells of the islets of Langerhans, which are considered to be the producers of glucagon (HGF), are seriously affected by synthalin A in adult rats, guinea pigs, and rabbits. Observations on the rabbit have revealed that these cells are at times totally destroyed and that they disappear. Sometimes they are partially destroyed or injured (*1–3*). This phenomenon is accompanied by a sharp decrease in the blood sugar level. The beta-cells and the exocrine part of the pancreas do not demonstrate any pathological changes.

The action of synthalin A on the alpha-cells of young animals has not been previously studied. Therefore we tested 20 young albino rats (ages ranged from the first to the fifth day of life) by giving each a single subcutaneous injection of decamethylenediguanidinedichlorehydrate in aqueous solution at 10 mg/kg of body weight (*4*). The animals, including the controls, were sacrificed 12 to 18 hr after injection by decapitation. The abdominal viscera were fixed in Bouin's fluid. Thin paraffin sections were stained by Gomori's chromehematoxylin and phloxin method.

The pancreas of normal 1-day-old rats contains well-defined and relatively large islets of Langerhans. They show the "Mantelinsel"-type, since it is characteristic of the Muridae. The core of beta-cells is surrounded by an incomplete layer of alpha-cells, the covering layer of which often varies in thickness. The beta-cells, especially the granules, in the young and the adult rat are cytologically similar. The granules of the alpha-cells in young animals are coarser and fewer in number in comparison with those in the adult. It was observed that, between the first and fifth days of life, the number of alpha-cells was absolutely and relatively increased through intensive mitotic division. The increase of the beta-cells was substantially smaller. There were many alpha-cell mitoses and few divisions of the beta-cells. The alpha-to-beta relationship changed from 1 to 2.06 on the first day of life to 1 to 1.61 on the fifth day of life. The proportion of alpha-to-beta cells in the adult rat is 1 to 4 or 1 to 5.

After a single subcutaneous injection of synthalin A, the 1-day-old rats did not manifest clinical symptoms. In contrast, the 2- to 5-day-old rats, at a period 12 hr later, exhibited increasing lassitude, shivering, and altered respiration. In none of the young rats treated with synthalin A were the alpha-cells altered; none showed signs of lesions. There were no alterations in granulation, and no hydropic changes or detritus of alpha-cells, which are found in adult rats after treatment with synthalin A.

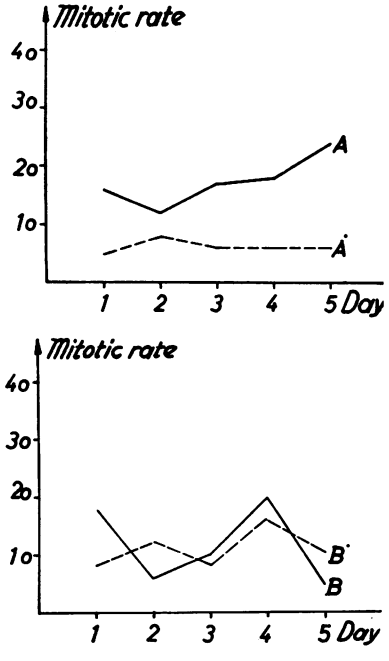

Fig. 1. Above, mitotic rate of alpha-cells in 100 sections through pancreatic islets in rats 1 to 5 days old. (*A*) controls; (A') effect of synthalin A. Below, mitotic rate of beta-cells in 100 sections through pancreatic islets of rats 1 to 5 days old. (*B*) controls; (B') effect of synthalin A.

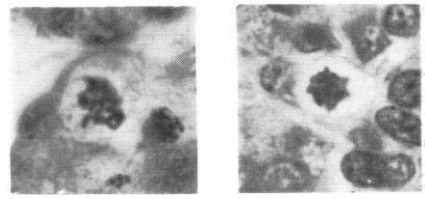

Fig. 2. (Left) Mitotic alpha-cell of 5-day-old rat, control animal, ×700. (Right) Mitotic alpha-cell of 4-day-old rat injected with synthalin A (10 mg/kg), ×700.

In a comparison of the controls and the treated animals, a notable finding concerning alpha-cell mitosis was made —that is, synthalin-treated rats show a significant decrease in mitotic frequency of the alpha-cells, and the remaining mitotic alpha-cells are injured. In contrast, no mitotic divisions of the beta-cells or of the acinar cells of the pancreas were affected either quantitatively or qualitatively. It is interesting to note that the mitotic rate of the acinar cells was much higher than it was in the alpha-cell layer. The rate of beta-cell mitosis in the synthalin-treated rats was nearly the same as it was in the controls. In the treated animals the frequency of the dividing alpha-cells is decreased to 25 percent of the normal on the fifth day of life. The curve of the mitotic activity rose continually from the second to the fifth day of life in the controls. In injected rats the curve remained on a low level (Fig. 1). Microscopic examination of the mitotic figures of the alpha-cells following synthalin treatment revealed a pycnotic degeneration of the late prophase and early-to-middle metaphase (Fig. 2).

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Thermal Shock and Tooth Decay

In an article by D. G. and H. A. Pohl (*1*) they state that one of the possible reasons for the increasing incidence of tooth decay is the alternate eating of very hot and cold foods during the same meal. They submit as evidence an experiment in which extracted teeth are subjected to intense thermal shock and then tested by methods that seem to indicate a de-