ABSTRACTS

Åkerblom, Hans K.; and Hiekkala, Hilkka (The Children's Hosp., Univ. of Helsinki, Helsinki, Finland): DIURNAL BLOOD AND URINE GLUCOSE AND ACETONE BODIES IN LABILE JUVENILE DIABETICS ON ONE- AND TWO-INJECTION INSULIN THERAPY. Diabetologia 6:130-34, 1970.

Verbatim summary. Diurnal levels of blood and urine glucose and acetone bodies were studied in thirteen labile juvenile diabetics to see whether the control of diabetes could be improved by giving insulin twice instead of once daily. Lente insulin was used in most patients for one-injection therapy, and the biphasic Rapitard insulin (Novo) for two-injection therapy. Blood specimens were obtained six times daily, and urine was collected in four six-hour periods. Each patient was his own control. The patients presented hyperglycemia, excessive glucosuria, hyperketonemia and ketonuria on one-injection therapy, most remarkably in the morning. When the patients were given insulin twice a day and the total daily dose of insulin was unchanged, even if the control of diabetes was not good, hyperglycemia and hyperketonemia in the morning were significantly lower than during one-injection therapy, and diurnal glucosuria and ketonuria decreased also.

Aleyassine, H. (Dept. of Path., Queen's Univ., Kingston, Ontario, Canada): ENERGY REQUIREMENTS FOR INSULIN RELEASE FROM RAT PANCREAS IN VITRO. Endocrinology 87: 84-89, July 1970.

Two modalities of insulin secretion from explants of rat pancreas are described, the first occurring spontaneously without glucose stimulation and the second stimulated by glucose with the rate of secretion directly proportional to glucose concentration. Insulin secretion, either spontaneous or glucose stimulated, is not the result of the continuous synthesis of the hormone as shown by studies using cyclohexamide as an inhibitor of protein synthesis. The continued output of hormone for at least sixty minutes suggests the presence of a large pool of available insulin. The failure of glycolytic inhibitors such as 2-deoxyglucose, fluoride and iodoacetate to prevent release of insulin in response to glucose suggests the operation of an energy-dependent process operating through oxidative phosphorylation as the stimulus for insulin secretion. Insulin synthesis and release appear to be separable processes independently regulated; the release of insulin may be related to the generation of mitochondrial-derived ATP as demonstrated in the release of granule-bound substances in a wide variety of cells. C.R.S.

Appenzeller, Otto; and Goss, J. E. (Depts. of Neurol. and Med., Univ. of New Mexico Med. Sch., Albuquerque, N. Mex.): GLUCOSE AND BARORECEPTOR FUNCTION. Arch. Neurol. 23:137-46, August 1970.

Verbatim summary. Baroreceptor mechanisms, cardiac output, and insulin levels were examined before and one hour after the ingestion of 75 gm. of glucose in nine control subjects, eight patients with cerebrovascular disease and five with peripheral neuropathies. The administration of glucose worsened baroreceptor responses in almost all subjects, and in some this led to complete baroreceptor reflex block. The ingestion of carbohydrates is a potent stimulus to insulin release, and the deterioration in baroreceptor function may be due to release of endogenous insulin in response to the ingested glucose. The high incidence of cerebrovascular and other ischemic episodes in patients with abnormalities in glucose tolerance who often have abnormally high levels of insulin may be related to the effects of endogenous insulin on baroreceptor mechanisms. Significant falls in blood pressure may occur with changes in posture after carbohydrate meals in elderly subjects in whom baroreflex responses are less effective in counteracting sudden falls in cardiac output, and this might explain the occasional occurrence of a cerebrovascular accident after a large meal.

Beck, Paul (Endocr. Div., Dept. of Med., Univ. of Colorado Sch. of Med., Denver, Colo.): REVERSAL OF PROGESTERONE-ENHANCED INSULIN PRODUCTION BY HUMAN CHORIONIC SOMATOMAMMOTROPIN. Endocrinology 87:311-15, August 1970.

Administration of human chorionic somatomammotropin (HCS) and progesterone to female monkeys had somewhat opposing effects upon glucose-insulin interrelationships. HCS produced decreased sensitivity to exogenous insulin but had no effect on glucose tolerance or the serum insulin response to intravenous glucose. Progesterone injections over five days increased the mean initial insulin release rate as well as the serum insulin response to glucose but with a slow glucose disappearance rate following intravenous glucose. Combined HCS and progesterone treatment reversed the augmented insulin responses induced by progesterone alone while glucose tolerance remained impaired. The results indicate that HCS (a) increases peripheral resistance to insulin, and (b) decreases beta cell sensitivity to glucose in the presence of progesterone. These findings indicate that metabolic changes of pregnancy represent the result of a complex interaction between HCS and progesterone leading to suppression of insulin production as well as peripheral insulin antagonism. C.R.S.

Björntorp, Per; DeJounge, Kristina; Sjöström, Lars; and Sullivan, Lars (First Med. Serv. and Depts. of Med. Rehabilitation and Clin. Physiol., Sahlgrenska Sjukhuset, Univ. of Göteborg, Göteborg, Sweden): THE EFFECT OF PHYSICAL TRAINING ON INSULIN PRODUCTION IN OBESITY. Metabolism *19*:631-38, August 1970.

Obese subjects during physical training manifested increased maximal oxygen consumption and isometric muscle strength. Body weight increased due to an increase in body fat and to an increase in body cell mass, determined by isotope dilution methods. Glucose tolerance tests with insulin determinations disclosed no changes in glucose values after physical training but marked decreases in plasma insulin values were observed. The augmentation of insulin sensitivity cannot be explained by a decrease in body fat mass or adipose tissue factors. It is probable that muscle is an important determinant for insulin sensitivity and that physical training may increase the activity of enzymes of direct importance for glucose uptake by muscle. C.R.S.

Caren, Raymond; and Corbo, Lucille (Cedars-Sinai Med. Res. Inst., and Div. of Med., Cedars Sinai Med. Cent., Los Angeles, Calif., and Dept. of Med. Univ. of California, Los Angeles, Calif.): TRANSFER OF PLASMA LIPID TO PLATELETS BY ACTION OF GLUCAGON. Metabolism *19*:598-607, August 1970.

Intravenous glucagon administered to dogs and humans produced a significant depression of plasma total lipid and cholesterol but no change in whole blood lipid. Incubation of aliquots of blood restored plasma lipid and cholesterol levels previously depressed by glucagon. In vitro study of human blood showed that glucagon caused significant depression of plasma lipids and cholesterol from one-half through three hours after which incubation restored the depressed levels. The findings suggested that glucagon lowered the plasma lipid and cholesterol by transfer of these substances to the blood cells. Significant depression of plasma lipid occurred only in platelet-rich plasma while there was no transfer in platelet-poor blood, cell-free plasma or saline controls following the addition of glucagon. The data demonstrate that the hypolipemic effect of glucagon is due to transfer of plasma lipid and cholesterol to blood platelets with release of these substances back to plasma when the action of glucagon ceases. C.R.S.

Carnelutti, Margherita; del Guercio, M. José; and Chiumello, Giuseppe (Dept. of Pediat. and Child Health, Univ. of Milano, Milano 20122, Italy): INFLUENCE OF GROWTH HORMONE ON THE PATHOGENESIS OF OBESITY IN CHILDREN. J. Pediat. 77:285-93, August 1970.

Verbatim summary. Plasma levels of growth hormone were investigated in fourteen normal and thirteen obese children after insulin-induced hypoglycemia and arginine infusion. All control subjects had a significant increase of growth hormone in both tests. By contrast, none of the obese children responded normally to both stimuli; six of the obese children failed to respond to either stimulus, and seven responded to one stimulus but not to the other. The impairment of growth hormone secretion after insulin-induced hypoglycemia and arginine infusion may represent a pathogenetic and aggravating factor of obesity.

Cerasi, E.; and Luft, R. (Dept. of Endocr. and Metab., Karolinska Hosp., Stockholm, Sweden): THE OCCURRENCE OF LOW INSULIN RESPONSE TO GLUCOSE INFUSION IN CHILDREN. Diabetologia 6:85-89, 1970.

Verbatim summary. Insulin response to glucose infusion was studied in forty-two children with a normal intravenous glucose tolerance, seven to sixteen years of age. The majority of these children had at least one first degree relative with diabetes mellitus. Low and delayed insulin response similar to the one found in 15-20 per cent of healthy adult subjects also occurred in 15-20 per cent of the children in this material. These findings support our previous suggestion that the low and delayed insulin response to glucose is probably genetically determined.

Challoner, David R.; and Allen, Donald O. (Indiana Univ. Med. Center, Indianapolis, Ind.): AN IN VITRO EFFECT OF TRIIODOTHYRONINE ON LIPOLYSIS, CYCLIC AMP-C^{14} ACCUMULATION AND OXYGEN CONSUMPTION IN ISOLATED FAT CELLS. Metabolism *19*:480-87, July 1970.

Isolated rat epididymal fat cells preincubated with triiodothyronine (T_3) manifested a significant augmentation of epinephrine-stimulated lipolysis, labeled CAMP accumulation and oxygen consumption. Preincubation with a noncalorigenic analog of T_3 had no effect. The influence of T_3 preincubation was not blocked by inhibitors of protein synthesis such as puromycin and cyclohexamide. These results indicate that sensitivity of adenyl cyclase of adipose tissue to epinephrine is stimulated by T_3 resulting in enhanced rates of lipolysis and calorigenesis. C.R.S.

Chambers, John W.; Georg, Ralph H.; and Bass, Allan D. (Dept. of Pharmacol., Vanderbilt Univ. Sch. of Med., Nashville, Tenn.): EFFECT OF GLUCAGON, CYCLIC 3′, 5′-ADENOSINE MONOPHOSPHATE AND ITS DIBUTYRYL DERIVATIVE ON AMINO ACID UPTAKE BY THE ISOLATED PERFUSED RAT LIVER. Endocrinology *87*:366-70, August 1970.

Glucagon and the cyclic nucleotides exhibit similar effects upon amino acid uptake, urea production and glucose release from the liver. Using the nonmetabolizable amino acid, γ-aminoisobutyric acid (AIB), the increase in uptake of amino acid induced by glucagon or dibutyryl cyclic AMP was demonstrated to be blocked by dihydroergotamine at levels which did not interfere with enhanced glucose release from the isolated rat liver. These data suggest that cyclic AMP mediates the transport of amino acid into the liver following glucagon administration. The inhibitory effect of dihydroergotamine on the action of glucagon and cyclic AMP on hepatic transport of AIB supports this concept. C.R.S.

Chazan, Bernard I.; Balodimos, Marios C.; Holsclaw, Douglas S.; and Shwachman, Harry (Elliott P. Joslin Res. Lab. of the Joslin Diabetes Foundation, Inc.; the Children's Hosp. Med. Ctr.; and the Depts. of Med. and Pediat., Harvard Med. Sch., Boston, Mass.): MICROCIRCULATION IN YOUNG ADULTS WITH CYSTIC FIBROSIS: RETINAL AND CONJUNCTIVAL VASCULAR CHANGES IN RELATION TO DIABETES. J. Pediat. 77: 86-92, July 1970.

Verbatim summary. Conjunctival biomicroscopy and retinal photography were utilized in sixty-seven patients with cystic fibrosis, ages fifteen to twenty-six years, to detect a possible prediabetic vascular change. Examination revealed venular congestion and tortuosity as well as venular and arteriolar red cell aggregation. These changes were related to the severity of the cystic fibrosis and not to glucose intolerance. Both clinical and chemical diabetes occur more frequently in older patients with cystic fibrosis than in normal subjects. The diabetes is not related to the severity of the cystic fibrosis. A prediabetic vascular change could not be reliably detected by this study.

Cheng, Kwok-Kew; and Yang, Mabel M. (Department of Physiol., Univ. of Hong Kong, Hong Kong): STUDY OF PREGNANCY KETOSIS IN THE RAT. Quart. J. Exp. Physiol. 55: 83-92, April 1970.

Verbatim summary. Fasting caused a significantly greater hyperketonemia and hypoglycemia in late pregnant rats than in nonpregnant rats, and the hyperketonemia after one day of fasting was greater in primiparous than in pregnant multiparous rats. In the primiparous rats with hypertrophic adrenals produced by ACTH pretreatment, the degree of fasting ketosis was reduced to that in nontreated pregnant multiparous rats. The adrenal weight of late pregnant rats was significantly heavier, and the adrenal gland of nonpregnant multiparous rats was bigger than that of virgin rats but smaller than that of pregnant rats. Progesterone administration in virgin and adrenalectomized virgin rats caused greater fasting ketosis and less hypoglycemia. Progesterone administration in pregnant rats caused toxemic changes, and in pregnant multiparous rats a more severe fasting ketosis. Estrogen administration in virgin rats increased the ketosis and decreased the hypoglycemia after fasting. The present study indicates that increased fetal demands for glucose and increased endocrine activity contribute to metabolic changes which cause pregnancy ketosis.

Chlouverakis, C.; Dade, E. F.; and Batt, R. A. L. (MRC—Metabolic Reactions Unit, Dept. of Biochem., Imperial Coll. of Science, London, S.W. 7, England): GLUCOSE TOLERANCE AND TIME SEQUENCE OF ADIPOSITY, HYPERINSULINEMIA AND HYPERGLYCEMIA IN OBESE-HYPERGLYCEMIC MICE (obob). Metabolism 19:687-93, September 1970.

A fixed glucose load given intragastrically to obese-hyperglycemic mice (obob) resulted in blood glucose curves almost identical to those of lean animals. In contrast a glucose load proportional to body weight produced marked and sustained hyperglycemia in the obese mice. Intravenously administered glucose showed similar volumes of distribution and clearance rates in obese and lean animals. This apparently normal clearance rate for glucose in obob is abnormally low considering the marked increase in their adipose mass. In studies performed on young animals, the enlargement of the adipose tissue mass preceded the occurrence of elevations of blood glucose and serum insulin levels indicating that adiposity precedes the occurrence of significant insulin resistance. C.R.S.

Czech, Michael P.; and Fain, John N. (Div. of Biological and Med. Sciences, Brown Univ., Providence, R. I.): INSULIN PROTECTION AGAINST FAT CELL RECEPTOR INACTIVATION BY TRYPSIN. Endocrinology 87:191-94, July 1970.

Digestion of white fat cells with trypsin results in marked inhibition of the action of insulin in converting glucose to carbon dioxide. Incubation of fat cells with insulin prior to treatment with trypsin prevented the inhibitory effect of trypsin on insulin-induced conversion of glucose to carbon dioxide. Insulin apparently protects the insulin effector sites on the fat cell membrane from destruction by trypsin by binding of the receptor protein with the hormone. C.R.S.

Davidson, Mayer B.; and Poffenbarger, Philip L. (UCLA Sch. of Med., Los Angeles, Calif., and Dept. of Med., Harvard Med. Sch. and Peter Bent Brigham Hosp., Boston, Mass.): ROLE OF SYNALBUMIN INSULIN ANTAGONIST IN PATHOGENESIS OF DIABETES MELLITUS. Metabolism 19:668-86, September 1970.

While a considerable body of evidence has appeared to support the role of synalbumin insulin antagonist (SIA) in the pathogenesis of diabetes these are equally cogent data refuting this concept. An extensive survey of the available information and a critical assessment of the current status of SIA are presented together with suggested criteria which a proposed insulin antagonist should meet to be of physiological significance. The four criteria which have been formulated for a circulating insulin antagonist are: (1) a greater activity in diabetic plasma with little or no activity in nondiabetic plasma; (2) a demonstrated antagonistic activity consistent with the metabolic alterations found in diabetes; (3) in vivo activity demonstrated against endogenous insulin; (4) reversal of glucose intolerance with neutralization or removal of the antagonist. In addition to the many contradictory reports concerning SIA, it fulfills apparently only the first of the proposed criteria as an insulin antagonist and should not be assigned a causative role in diabetes on the basis of the available information. C.R.S.

Drenick, Ernst J.; Gold, Ernest M.; and Elrick, Harold (Veterans Administration Center, Los Angeles Calif.): ACUTE SYMPTOMATIC KETOACIDOSIS FOLLOWING GROWTH HORMONE ADMINISTRATION IN PROLONGED FASTING. Metabolism 19:608-13, August 1970.

Administration of human growth hormone (HGH) to four obese males after a prolonged fast caused postural hypotension, nausea and vomiting, faintness and muscle cramps. Improvement occurred spontaneously despite continued fasting. The serum FFA and ketones rose while blood CO_2 content decreased suggesting an increase in previous acidosis of fasting. Urinary losses of Na, Ca, Mg and phosphate increased together with a rise in titratable acidity. The exchangeable Na pool was expanded suggesting moblization of Na from storage sites. The clinical adjustment during prolonged fasting is disturbed by increasing ketosis resulting from the calorigenic stimulus and lipolytic effect of HGH. The accentuation of acidosis by HGH may induce mineral losses and mobilization of Na with clinical symptoms resulting from redistribution of water and electrolytes among body compartments in marginally depleted subjects. C.R.S.

Esmann, V.; Nielsen, J.; and Petersen, G. Bruun (Dept. of Med., Marselisborg Hosp., the Cytogenetic Lab., Aarhus State Hosp., Inst. of Gen. Path., Aarhus Univ. Med. Sch., Aarhus, Denmark): A CASE OF KLINEFELTER'S SYNDROME WITH 48, XXXY AND DIABETES MELLITUS. Acta Med. Scand. 186: 27-33, July-August 1969.

Verbatim summary. The twentieth case of Klinefelter's syndrome with 48,XXXY in a 39-year-old Caucasian is described. The outstanding clinical feature was a diabetes of the maturity onset type of nine years duration, but with a somewhat slow plasma insulin response and an early peak of plasma growth hormone.

The patient was slightly dysphoric and immature, with no sexual libido or potency and with a total I.Q. of 74. During a six months course of testosterone his general condition improved and alterations in his mental and sexual condition were also noted.

Cells from buccal smears and fibroblasts from the testis and the skin cultures were sex chromatin positive with a considerable number of double positive nuclei. In 209 analysed metaphases 78 per cent had the modal chromosome number of 48 with a karyotype of 48,XXXY, whereas 22

per cent were nonmodal cells, preferentially with a hypomodal chromosome number. Analysis of metaphases with one missing chromosome indicated random loss of chromosomes, except in cells from testis biopsy, where the lacking chromosome belonged to the group 21-22-Y, which makes a testis mosaicism possible.

Espinosa De Los Monteros, A. M.; Driscoll, S. G.; and Steinke, J. (E. P. Joslin Res. Lab., Harvard Med. Sch., 170 Pilgrim Road, Boston, Mass.): INSULIN RELEASE FROM ISOLATED HUMAN FETAL PANCREATIC ISLETS. Science *168*: 1111-12, May 1970.

Verbatim summary. Pancreases were obtained from five human fetuses twelve to sixteen weeks old. The islets of Langerhans were isolated with collagenase, and then incubated with buffer, glucose, tolbutamide, or glucagon added to the medium. The insulin released into the medium was measured by immunoassay. Glucagon produced the only significant increase above baseline; glucose and tolbutamide failed to enhance secretion of insulin. The data suggest that isolated human fetal islets of this gestational age develop responsiveness to glucagon earlier than to glucose or tolbutamide.

Fasel, J.; Hadjikhani, H.; and Felber, J. P. (Clinique Medicale Universitaire and Dept. de Biochimie Clinique, Hôpital Cantonal Universitaire, Lausanne, Switzerland): THE INSULIN SECRETORY EFFECT OF THE HUMAN DUODENAL MUCOSA. Gastroenterology 59:109-13, July 1970.

To study the effect of intestinal hormonal factors on insulin secretion, duodenal mucosal biopsies were obtained from six normal subjects before, 30, 60 and 180 minutes after a 100 gm. oral glucose tolerance test. The tissue fragments were homogenized in saline. The glucose content of the supernatant did not vary significantly. Aliquots of the homogenates were injected into the pancreaticoduodenal artery of anesthetized rats and the effect on immunoreactive insulin (IRI) in the portal vein of the rat was measured for fifteen minutes. The 30-and 60-minute biopsy specimens stimulated IRI release but the fasting and 180-minute samples had no consistent effect.

From these results it was concluded that oral glucose may activate a prohormone or rapid synthesis of a hormone(s) which stimulates pancreatic insulin release. The concentration of IRI in the human mucosal extracts and the effect of the extracts on the rat blood glucose levels was not reported. J.E.V.

Frasier, S. Douglas; Hilburn, Jean M.; and Smith, Fred G., Jr. (Pacific State Hosp., Pomona, The Los Angeles County-Univ. of Southern Calif. Med. Ctr., Dept. of Pediat., Univ. of Southern Calif. Sch. of Med., and Dept. of Pediat., Univ. of Calif. Sch. of Med., Los Angeles, Calif.): DWARFISM AND MENTAL RETARDATION: THE SERUM GROWTH HORMONE RESPONSE TO HYPOGLYCEMIA. J. Pediat. 77:136-38, July 1970.

Mental retardation and short stature are frequently associated, and this study sought evidence for growth hormone deficiency as a possible cause for dwarfism in these instances. Standard intravenous insulin tolerance tests (.05 U. per kg. body weight) were performed on fifty-eight mentally deficient children who were two standard deviations or more below accepted mean heights for their ages. Similar studies were done on twenty-three mentally retarded pediatric patients with normal heights.

There was a normal hypoglycemic response to parenteral insulin in both groups and there were no significant abnormalities in the plasma growth hormone responses. Differences between the two groups of subjects were not significant statistically. It was concluded that growth hormone deficiency does not contribute to the dwarfism associated with mental retardation. R.K.K.

Frasier, S. Douglas; Hilburn, Jean M.; and Smith, Fred G., Jr. (Pacific State Hosp., The Los Angeles County-Univ. of Southern California Med. Center; Dept. of Pediat., Univ. of Southern California Sch. of Med., and Dept. of Pediat. Univ. of California Sch. of Medicine): EFFECT OF ADOLESCENCE ON THE SERUM GROWTH HORMONE RESPONSE TO HYPOGLYCEMIA. J. Pediat. 77:465-67, September 1970.

Plasma human growth hormone (HGH) responses were measured during insulin-induced hypoglycemia in forty-two preadolescent and thirty-two adolescent subjects. All patients were institutionalized, mentally retarded individuals with ages ranging from three to seventeen years. When HGH responses of males and females within either group were compared, there were no significant differences. However, HGH responses of the adolescent subjects were significantly greater at thirty- and sixty-minute intervals when compared to corresponding values of the preadolescent children. The authors conclude that sexual maturity augments peak HGH responses to a hypoglycemic stimulus. R.K.K.

Gagliardino, Juan Jose; Hernandez, Rodolfo Eduardo; Rodriguez, Ricardo R.; and Lauri, Hector C. (National Univ., La Plata, Argentina): STIMULATORY EFFECT OF NIALAMIDE ON SERUM LEVELS OF INSULIN. Amer. J. Physiol. *219*:314-17, August 1970.

Verbatim summary. The effect of nialamide (7 mg./rat, intraperitoneally), glucose (2.5 gm./kg. per gastric tube), and glucose plus nialamide administration on the circulating levels of glucose and insulin was studied in fasted normal white male rats of about 250 gm. body wt. Although all three treatments produced increases in both plasma glucose and insulin levels, these increases were not of the same magnitude. The increases in plasma glucose were 87.56, 74.22, and 19.00 mg./100 ml. for the groups treated with glucose, glucose plus nialamide, and nialamide, respectively. For the same groups, the increase in plasma insulin was 24.33, 41.00, and 12.56 μU./ml. It was demonstrated that the increase in plasma insulin followed a positive relationship with that of plasma glucose in the glucose-treated animals. On the other hand, the increase of plasma insulin bore no relationship to that of plasma glucose after nialamide injection. Finally, in the animals treated with the combination of glucose and nialamide, the increase in plasma insulin exhibited a correlation with that of plasma glucose parallel to the relationship obtained with glucose alone, but at a numerically greater value. These results show that nialamide elevates the plasma insulin levels above the basal values and also potentiates the insulinogenic effect of glucose administration.

Gilboe, David D.; Andrews, Richard L.; and Dardenne, Guy Depts. of Neurosurgery, Physiol., and Statistics, Univ. of Wisconsin, Madison, Wis.): FACTORS AFFECTING GLUCOSE UPTAKE BY THE ISOLATED DOG BRAIN. Amer. J. Physiol. *219*: 767-73, September 1970.

Verbatim summary. Entry of glucose into the brain is related to the arterial glucose concentration times the rate of blood flow per unit weight of brain A (F/W). The glucose uptake of isolated dog brains perfused with (a) blood from a live

donor or (b) blood containing 4 ug./100 ml. of extra insulin was compared with glucose uptake of isolated dog brains perfused with (c) compatible donor blood. There was no statistically significant difference between the straight line portion of the curve describing cerebral glucose uptake versus A (F/W) for c and similar lines for a and b. Neither insulin nor cofactors from the live donor appear to alter the rate of cerebral glucose uptake.

Goldstein, David E.; Drash, Allan; Gibbs, Julia; and Blizzard, Robert M. (Dept. of Pediat., Duke Univ. Sch. of Med., Durham, N.C., Depts. of Pediat., the Johns Hopkins Univ. Sch. of Med., and the Univ. of Pittsburgh Sch. of Medicine, Bethesda and Baltimore, Md., and Pittsburgh, Pa.): DIABETES MELLITUS: THE INCIDENCE OF CIRCULATING ANTIBODIES AGAINST THYROID, GASTRIC, AND ADRENAL TISSUE. J. Pediat. 77:304-06, August 1970.

Serum samples were analyzed for the presence of thyroid, gastric, adrenal and kidney antibodies in 155 insulin-requiring juvenile patients below the age of twenty and ninety-seven adult-onset diabetic patients above the age of forty. Results were compared to similar determinations performed on sera from a large number of control subjects.

In the juvenile diabetic group a significantly greater incidence of positive thyroid and gastric antibody titers were found than in control patients. No adrenal antibodies were detected in any group and differences in remaining antibody titers between control subjects and either adult-onset or juvenile diabetic patients were not remarkable.

Results obtained in the younger diabetic group are consistent with the known increased association of diabetes mellitus with pernicious anemia, Hashimoto's thyroiditis and myxedema. The authors stress the utility of antibody screening tests for long term follow-up of patients with diabetes mellitus. R.K.K.

Grant, D. B.; and Barbor, P. R. H. (Queen Elizabeth Hosp. for Children, Hackney Road, London, England): ISLET-CELL TUMOR CAUSING HYPOGLYCEMIA IN A NEWBORN INFANT. Arch. Dis. Child. 45:434-36, June 1970.

Verbatim summary. The clinical features of an infant with an islet-cell tumor are described. Hypoglycemia, which began two hours after delivery, failed to respond to treatment with diazoxide, chlorothiazide, and a low leucine diet but was relieved by removal of the tumor at the age of fourteen weeks. Rapid developmental "catch up" occurred after the operation.

Harper, A. E.; Benevenga, N. J.; and Wohlhueter, R. M. (Depts. of Biochem. and Nutritional Sciences, Univ. of Wisconsin, Madison, Wis.): EFFECTS OF INGESTION OF DISPROPORTIONATE AMOUNTS OF AMINO ACIDS. Physiol. Rev. 50: 429-558, July 1970.

It is impossible to abstract an article of this length and depth, but it would be unfortunate not to call it to the attention of those concerned with any phase of amino acid metabolism. This is a complete treatment of a variety of problems in the classification of conditions resulting from ingestion of disproportionate amounts of amino acids. The discussion of amino acid toxicity and antagonisms, with data given for individual amino acids is very thorough. The bibliography alone contains over 600 references. T.J.M.

Hellman, Bo (Dept. of Histology, Univ. of Umeå, Umeå, Sweden): METHODOLOGICAL APPROACHES TO STUDIES ON THE PANCREATIC ISLETS. Diabetologia 6:110-20, 1970.

Verbatim summary. With a total volume of only a few per cent of the whole gland the mammalian endocrine pancreas is dispersed in a great number of islets of Langerhans. Studies of this endocrine organ are further complicated by the fact that each islet is composed of cells representing different endocrine functions. The present communication deals with some attempts to overcome these analytical difficulties by the following experimental approaches: (*A*) The observation of a strict balance between the number of large and small islets made it possible to introduce rapid methods for estimation of the total islet volume. It was found necessary merely to *count* the number of large islets in pancreatic sections taken at regular intervals. There was also a linear relationship between the total islet volume and the number of long islet intercepts obtained by scanning sections with parallel lines. (*B*) Attempts were made to identify the different types of islet cells by restaining thin paraffin sections after initial silver impregnation. Most important for the final success was the elaboration of a technic which gave a consistent argyrophilia in some islet cells, and the observation that these silver deposits could be removed by oxidation in potassium permanganate. It is now well established that the pancreatic islets contain α_1, α_2 and β-cells as well as some cells which lack discernible granules both in the light and electron microscope. (*C*) Evaluation of how various substances affect insulin release was simplified by the introduction of a system in vitro employing a single islet microdissected from an obese-hyperglycemic mouse. This technic allowed both a description of insulin release in terms of islet weight, and a correlation of the rate of insulin secretion with other metabolic events in the β-cells. The amount of insulin released during thirty minutes was found to be about one per thousand of the islet dry weight, or less than 1 per cent of the β-cell content of insulin. The rate of insulin secretion was significantly enhanced by increasing the movements of the incubation medium by shaking. A water extract of the α_1-cells served as an effective inhibitor of insulin release. (*D*) A combined approach in vivo and in vitro was found to provide a useful system for analyzing how the β-cell levels of glycolytic intermediates and cofactors were related to the rate of insulin secretion. After the freeze-dried pancreas sections had been exposed to formaldehyde vapors and refixed in Bouin's solution, the islet cells could be identified by silver impregnation and restaining. The sulfonylurea-stimulation of insulin release was found to be associated with a significant depression of the β-cell content of ATP and glycogen. There was, on the other hand, a striking accumulation of fructose-1,6-diphosphate and other intermediates of glucose above this metabolic stage when insulin secretion was inhibited either by epinephrine or diazoxide or by omission of Ca^{2+}. These data were tentatively interpreted as indicating the existence of a rate limiting step in β-cell glycolysis of direct significance for regulation of insulin release. This control site might be the sequence phosphoglyceraldehyde dehydrogenase-phosphoglycerate kinase.

Hermansen, L.; Pruett, E. D. R.; Osnes, J. B.; and Giere, F. A. (Inst. of Work Physiol., Oslo, Norway): BLOOD GLUCOSE AND PLASMA INSULIN IN RESPONSE TO MAXIMAL EXERCISE AND GLUCOSE INFUSION. J. Appl. Physiol. 29:13-16, July 1970.

The effects of endogenous glucose production by exercise and exogenous glucose infusion on blood glucose and immunoreactive insulin (IRI) levels were studied in five subjects. Blood

samples were obtained before, during, and after five intermittent periods of maximal exercise over a twenty minute period. On another day samples were drawn after a four minute infusion of glucose, 300 mg./kg. body weight. Exercise resulted in a steady rise in blood sugar and IRI to a maximum of 108.9 per cent and 273 per cent above control values, respectively. The average time of the peak glucose response was seven minutes and IRI seventeen minutes after stopping exercise. Glucose disappearance rates were 1.98 ±0.36 per cent per minute (Mean ± S.E.M.) as calculated from the time of the peak glucose values. Blood pH fell from an average of 7.4 to 6.88 during the exercise. After the intravenous glucose infusion, blood glucose levels increased an average 117.6 per cent above the control values and IRI increased 179 per cent. Both appeared to reach a maximum at the end of the infusion. The mean glucose disappearance was 2.62 ±.71 per cent per minute. Thus, endogenously released glucose after exercise has an effect on IRI release which is similar to that produced by rapid exogenous glucose administration. The increased arteriovenous glucose difference during exercise (measured in one subject), fall in blood pH, and presumed catecholamine release during exercise exert undetermined effects on the net changes in blood glucose and IRI levels. J.E.V.

Hiatt, Nathan; Katz, Joseph; Sheinkopf, J. A. (Depts. of Surg. and Med. and Med. Res. Inst., Cedars-Sinai Med. Center, Los Angeles, Calif.): INSULIN BLOCKADE OF EPINEPHRINE. Endocrinology *87*:186-91, July 1970.

The cardio-accelerator effect of epinephrine was abolished by insulin whether administered before, with, or after the beta-adrenergic stimulation. The chromotropic response to isoproterenol was blockaded only when insulin was administered in advance. The effect of insulin on the positive chromotropic effect was independent of the fall in blood glucose and was not related to insulin-induced hypoglycemia. These findings suggest an insulin-epinephrine antagonism in heart tissue probably mediated via adenyl cyclase and cyclic AMP blockade imposed by insulin. C.R.S.

Kaneto, Akio; and Kosaka, Kinori (Dept. of Med., Tokyo Women's Med. Coll., 10 Kawadacho, Shinjuku-ku, Tokyo, Japan): STIMULATION OF GLUCAGON SECRETION BY OXYTOCIN. Endocrinology *87*:439-44, August 1970.

Oxytocin, injected into the jugular vein, resulted in a prompt and brief elevation of immunoreactive glucagon in pancreaticoduodenal effluent plasma, prior to appearance of hyperglycemia. A slight rise in glucagon level was noted also in the femoral artery. Similar doses of lysine-vasopressin produced no significant rise in glucagon release. Infusion of propranolol blocked the glucagon-stimulatory action of oxytocin but pretreatment with antigastrin was without effect. C.R.S.

Krebs, H. A.; and Perkins, J. R. (Metabolic Res. Lab., Nuffield Dept. of Clin. Med., Radcliffe Infirmary, Oxford): THE PHYSIOLOGICAL ROLE OF LIVER ALCOHOL DEHYDROGENASE. Biochem. J. *118*:635-44, July 1970.

This article is of interest in that it answers a question concerning the metabolism of alcohol. The physiologic significance of the high activity of alcohol dehydrogenase in the mammalian liver has been puzzling, since it was thought that substrates of this enzyme do not occur normally except in traces. The authors used yeast alcohol dehydrogenase to measure ethanol in the portal and hepatic veins and in the contents of the alimentary canal of rats given a diet free of ethanol.

Mean alcohol concentration in portal blood was 0.045 mM. All sections of the alimentary canal contained measurable amounts of ethanol, with the highest values being in the stomach (Average = 3.7 mM). Infusion of pyrazole (an inhibitor of alcohol dehydrogenase) raised the alcohol concentration of the portal vein tenfold. Addition of antibiotics diminished the ethanol concentration of the portal vein to ¼ and that of the stomach to 1/40 of the control levels. Germ free animals had lower ethanol levels in all areas studied. Of interest was the fact that alloxan diabetic rats had an eightfold increase of alcohol concentration in the stomach. T.J.M.

Kyriakides, Emilios C.; Filippone, Nicholas; Paul, Betty; Grattan, William; and Balint, John A. (The Depts. of Med. and Pediat., Albany Med. Coll. of Union Univ., Albany, N.Y.): LIPID STUDIES IN WOLMAN'S DISEASE. Pediatrics *46*:431-36, September 1970.

Wolman's Disease is a rare entity characterized by abnormal accumulations of lipid in liver, spleen and adrenal glands. Two siblings are described in this report who died in infancy of this condition. Marked elevations of triglyceride, cholesterol and cholesterol esters were found in mesenteric lymph nodes, liver, spleen, adrenal glands, and renal medulla. Plasma and red cell lipids were undisturbed, but alpha-lipoproteins were greatly reduced.

Skin fibroblasts obtained from both patients were cultured. Mevalonate C-14 incorporation into cholesterol was increased above control values, and cholesterol content of fibroblasts was elevated.

Although the cause of this disease remains unknown, the authors believe the fibroblast culture technic may provide a useful research tool for uncovering possible metabolic defects. R.K.K.

Larsson-Cohn, U. L.; Tengström, B.; and Wide, L. (Dept. of Obstet. & Gynecology, and Dept. of Clin. Chem., Univ. Hosp., Uppsala, Sweden): GLUCOSE TOLERANCE AND INSULIN RESPONSE DURING DAILY CONTINUOUS LOW-DOSE ORAL CONTRACEPTIVE TREATMENT. Acta Endocr. *62*:242:50, October 1969.

Verbatim summary. Intravenous glucose tolerance tests and insulin determinations were performed on thirty-seven women at different stages of menstrual cycle and after one, three and twelve months of daily continuous treatment with 0.5 mg. of norethindrone or 0.5 mg. of chlormadinone acetate. The fasting blood glucose concentration, the k-values (percentage disappearance rate of glucose per minute) and the insulin response to glucose administration were compared. No statistically significant differences were found between the values obtained on two occasions before treatment, and during treatment.

Lavis, Victor R.; Ensinck, John W.; Williams, Robert H. (Dept. of Med., Div. of Endocr., Univ. of Washington Sch. of Med., Seattle, Wash.): EFFECTS OF INSULIN AND PROINSULIN ON ISOLATED FAT CELLS AND HEMIDIAPHRAGMS FROM RATS. Endocrinology *87*:135-42, July 1970.

Biological activities of porcine proinsulin and crystalline insulin tested on isolated fat cells and diaphragmatic muscle of rats indicated that proinsulin displays similar metabolic effects to those of insulin. In fat cells, proinsulin inhibited gly-

cerol release in the presence of epinephrine and stimulated conversion of glucose to CO_2 and lipids. In muscle, proinsulin stimulation of glucose uptake was parallel to that for insulin. The effects of any given concentration of proinsulin was indistinguishable from those of approximately 1/12 that amount of insulin on a molar basis. No inhibition of submaximal concentrations of insulin was produced by the addition of proinsulin to the medium. The metabolic actions of proinsulin may represent a direct effect at insulin receptor sites or may be the result of conversion to insulin by the target cells with no apparent antagonism to insulin action. C.R.S.

Leclercq-Meyer, V.; Mialhe, P.; and Malaisse, W. J. (Inst. de Physiologie et de Chimie Biologique, Univ. de Strasbourg, France et Lab. de Méd Expér., Univ. Libre de Bruxelles, Belgium): DEXTRAN-COATED CHARCOAL RADIOIMMUNOASSAY OF GLUCAGON. Diabetologia 6:121-29, 1970.

Verbatim summary. A dextran-coated charcoal radioimmunoassay of glucagon is described. Antigen (I-131 or I-125 glucagon, 0.060 ng)—antibody (rabbit antiserum 1:550, final dilution 1:6,600) reactions reached equilibrium within three days at 4°C. The use of a proteinase inhibitor (Trasylol) prevented incubation damage of the immunoreactive glucagon. The sensitivity of the assay (< to 0.020 ng) corresponds to about 0.100 ng/ml. of plasma. The precision, the reproducibility, the specificity of the assay and some problems related to the dextran-charcoal separation have been studied. Recovery of glucagon added to plasma was approximately 90 per cent. The mean glucagon concentration measured in peripheral venous plasma was 0.208 ng/ml. in normal human subjects after an overnight fast, 0.396 ng/ml. in anaesthetized dogs after an overnight fast, 0.354 ng/ml. in fed rats and 0.909 ng/ml. in the overnight-fasted duck. Up to now, the use of the assay seems to be restricted to studies of glucagon secretion in vitro since our antiserum crossreacts with a material extracted from the duodenum. The relative contribution of this material in the plasma glucagon determinations remains, however, to be established.

Lernmark, Ake; and Hellman, Bo (Dept. of Histology, Univ. of Umeå, Umeå, Sweden): EFFECT OF EPINEPHRINE AND MANNOHEPTULOSE ON EARLY AND LATE PHASES OF GLUCOSE-STIMULATED INSULIN RELEASE. Metabolism 19:614-18, August 1970.

Isolated mice islets incubated with mannoheptulose or epinephrine exhibited inhibition of the initial transient release and the second persistent phase of insulin secretion. These observations indicate that glucose metabolism is essential for both phases of insulin release. Mannoheptulose as an inhibitor of beta cell phosphorylation of glucose is supported by the observation that this agent prevented the normal increase in fructose-1, 6-diphosphate observed with increasing glucose levels. The demonstration that early glucose metabolites accumulate in beta cells exposed to epinephrine and mannoheptulose suggests that the metabolism of glucose plays a fundamental role in the insulin release mechanism. C.R.S.

Lestradet, H.; Tichet, J.; Ludwiczak, H.; and Deschamps, I. with the collaboration of Cunin, D.; and Grossin, Fr. (l'Institut National de la Santé et de la Recherche Médicale, la Fondation Education et Recherche, and la Fondation pour la Recherche Médicale Française, Paris, France): INSULINAEMIA DURING THE MANIFESTATION PERIOD OF INFANTILE AND JUVENILE DIABETES. Diabetologia 6:90-97, 1970.

Verbatim summary. Plasma-insulin levels during oral glucose tolerance tests have been measured in forty-five young diabetics at the beginning of their disease, and who were not yet under insulin therapy. The results were: a partial or total deficiency of insulin secretion in all cases; a relationship between the post-stimulatory insulin levels and the clinical and biochemical status of the patients. In cases of severe acidosis no insulin was detected. Insulin response was absent or very low in cases accompanied by ketonuria. In the nonketotic diabetics we generally found an insulin response, but it was less than that of healthy controls in spite of marked hyperglycemia. In these cases we distinguished two principal modes of insulin release: 1. slow and late increase, 2. initial increase followed by secondary collapse in spite of considerably high glucose levels.

Levine, Robert A.; and Washington, Annabelle (Dept. of Med., Brooklyn-Cumberland Med. Center, State Univ. of New York, Downstate Med. Center, Brooklyn, N. Y.): GLYCOGENOLYTIC ACTIVITY OF CYCLIC 3', 5'-MONOPHOSPHATES IN PERFUSED RAT LIVER. Endocrinology 87:377-82, August 1970.

Significant glycemic activity was detected using a variety of cyclic nucleotides tested for their glycogenolytic effects in perfused livers of fed rats. Dibutyryl and inosine cyclic derivatives showed greater hepatic glycogenolytic activity than cyclic AMP. The similar chemical structure of the former two derivatives suggests that a common receptor site for glycogenolysis may exist in the rat liver. The results cast doubt on the specificity of cyclic AMP as the sole nucleotide activator of hepatic glycogenolysis. C.R.S.

Lundbaek, K.; Christensen, N. J.; Jensen, V. A.; Johansen, K.; Olsen, T. S.; Hansen, A. P.; Orskov, H.; and Osterby, R. (Second Clin. of Intern. Med., Dept. of Ophthal., and Inst. of Path., Aarhus Univ. Sch. of Med., Kommunehospitalet, Aarhus, Denmark): DIABETES, DIABETIC ANGIOPATHY, AND GROWTH HORMONE. Lancet II:131-33, July 18, 1970.

This paper presents evidence supporting the hypothesis that increased secretion of growth hormone is a causal factor in the development and progression of microangiopathy in the juvenile diabetic. The authors measured plasma concentrations of human growth hormone by immunoassay at multiple times during the day in an unspecified number of juvenile diabetics under conditions of varying diabetic control and during exercise and rest. They report that the diabetics had a mean twenty-four-hour HGH level which was about three times that of nondiabetics. Furthermore the diabetic HGH levels tended to fluctuate more widely and rose to greater levels with exercise. Data from five juvenile diabetics are given in graphic form. T.G.S.

Kummerle, F.; Beck, K.; and Trenner, R. (Dept. of Surg., Univ. of Mainz, and the Div. of Gastroenterology of the Dept. of Med., Univ. of Freiburg, i. Br., Germany): LIFE WITHOUT PANCREAS. Germ. Med. Mth. 15:121-25, March 1970.

The authors report observations in two cases with survival of ten and eleven years following total pancreatectomy. Long-term substitution therapy for both endocrine and exocrine function has been successful. The problems are discussed. The authors question the wisdom of submitting patients to the hazards of pancreas organ transplant "if long-term substitution therapy can offer satisfactory compensation after total removal of the organ." D.R.C.

McGarity, William C.; and Brantley, James W. (Joseph B. Whitehead Dept. of Surg., Emory Univ. Sch. of Med., and Emory Univ. Clin., Atlanta, Ga.); SURGICAL APPROACH TO INSULINOMAS. Amer. J. Surg. *119*:705-08, June 1970.

Verbatim summary. The clinical findings and diagnosis of nsulinomas are reviewed. The use of selective celiac and superior mesenteric angiography is an important adjunct in the diagnosis, localization, and treatment of islet cell tumors. Two cases illustrating enucleation and two cases illustrating two types of resection of the pancreas are presented. A blind distal resection is recommended for patients with organic hypoglycemia when no tumor can be located at operation. It may be necessary to resect up to 95 per cent of the distal pancreas. Distal resection is performed for palpable adenomas in the body and tail of the pancreas which are impossible to enucleate. Pancreatoduodenectomy is performed for palpable lesions in the pancreatic head which are impossible to enucleate.

Moody, A. J.; Markussen, J.; Schaich Fries, A.; Steenstrup, C.; and Sundby, F. (Novo Res. Inst., Fuglebakkevej 115, Copenhagen, Denmark): THE INSULIN RELEASING ACTIVITIES OF EXTRACTS OF PORK INTESTINE. Diabetologia 6:135-40, 1970.

Verbatim summary. Acid-ethanol extracts were prepared from pork ileum + jejunum (TOT), heart and duodenum. TOT was fractionated by column chromatography. The insulin-releasing activities (IRA) of these materials were determined using rat islets and pieces of rat pancreas incubated with 16.6 mM glucose. The heart and duodenum extracts were without effect on insulin release. Pancreatic glucagon and TOT significantly increased insulin release. Synthetic secretin did not increase insulin release by isolated islets. Pancreozymin had only slight effects on the insulin output by islets. Some of the fractions of TOT increased the insulin output of islets and pancreas pieces. The effects of these fractions were concentration-dependent in the range 5 to 250 μg./ml. The contents of GLI, pancreozymin and secretin in these materials are compared with their IRAs. The IRA described here is not caused by secretin, and is probably not caused by pancreozymin. There is no quantitative correlation between the GLI and the IRA of the fractions.

Nielsen, J.; Johansen, K.; and Yde, H. (Cytogenetic Lab., Aarhus State Hosp., Risskov, Denmark; and The Second Clin. of Intern. Med. Kommunehospitalet, Aarhus Univ. Sch. of Med., Aarhus, Denmark): THE FREQUENCY OF DIABETES MELLITUS IN PATIENTS WITH TURNER'S SYNDROME AND PURE GONADAL DYSGENESIS. Acta Endocr. 62:251-69, October 1969.

Verbatim summary. Glucose tolerance, plasma insulin and growth hormone response to a glucose load were studied in ten patients with Turner's syndrome and three patients with pure gonadal dysgenesis. It was found that 60 per cent of the patients with Turner's syndrome had a diabetic GTT. This is a frequency which is significantly higher than expected. None of the patients with pure gonadal dysgenesis had a diabetic GTT.

The diabetes in patients with Turner's syndrome was of a mild type as is most frequently found in maturity-onset diabetes. The insulin response was, however, different from what is usually found in maturity-onset diabetes. The patients with Turner's syndrome showed a brisk rise and prolonged high levels of plasma insulin after glucose ingestion. An early plasma growth hormone peak was found in patients with Turner's syndrome. The significance of this finding for the pathogenesis of mild diabetes in patients with Turner's syndrome is discussed together with other possible etiologic and pathogenetic factors.

Peluffo, R. O.; Sixta, A., and Brenner, R. R. (Catedra de Bioquimica, Inst. de Fisiologia, Facultad de Ciencias Medicas, Univ. Nacional de La Plata, La Plata, Argentina): METABOLISM OF FATTY ACIDS OF THE LINOLEIC ACID SERIES IN TESTICLES OF DIABETIC RATS. Amer. J. Physiol. *218*: 669-73, March 1970.

Polyunsaturated acids are important in the male reproductive system. It has been reported that the atrophy of the testes of diabetic rats has similarities to atrophy produced by essential fatty acid deficiency. Dr. Peluffo and colleagues designed studies to determine the capacity of the testes to desaturate linoleic acid into γ-linoleic acid. They then determined the effect of alloxan diabetes on the synthesis of polyunsaturated acids by the testes and investigated the ability of arachidonic acid to cure advanced testicular atrophy in these rats.

When linoleic acid-I-C-14 was injected into the testes it was converted to arachidonic and docosa-4,7,10,13,16-pentaenoic acids. In the alloxan diabetic rat, atrophy of the testes was coincident with a decrease of this conversion. Daily administration of ethylarachidonate to alloxan diabetic rats for three months did not cure the testicular atrophy. T.J.M.

Pimstone, B. L.; Sobel, J.; Meyer, E.; and Eale, D. (Dept. of Med., Univ. of Cape Town; the Groote Schuur Hosp.; the Dept. of Med., Baragwanath Hosp.; and Dept. of Pediat., Transvaal Memorial Hosp., for Children, Cape Town and Johannesburg, South Africa): SECRETION OF GROWTH HORMONE IN THE DIENCEPHALIC SYNDROME OF CHILDHOOD. J. Pediat. 76:886-89, June 1970.

Verbatim summary. Two children with the clinical and laboratory features of the diencephalic syndrome of Russell are described. Both had high fasting levels of human growth hormone (HGH), incompletely suppressed by hyperglycemia; in the one patient tested, HGH was not further elevated by hypoglycemia. The elevated, poorly suppressed HGH levels returned to normal, accompanied by weight gain, in one child after successful radiotherapy. It is suggested that the tumor impinging on the hypothalamus caused release of HGH not responsive to the usual physiologic effects of blood glucose fluctuations. This might account for the apparent anomaly of marked diminution in body fat with normal or excessive growth.

Reske-Nielsen, Edith; Gregersen, Gunnar; Harmsen, Aage; and Lundbaek, Knud (Dept. of Neuropathology, Dept. G of Neurosurgery and Second Clinic of Intern. Med., Kommunehospitalet, Aarhus Univ. Sch. of Med., Aarhus, Denmark): MORPHOLOGICAL ABNORMALITIES OF THE TERMINAL NEUROMUSCULAR APPARATUS IN RECENT JUVENILE DIABETES. Diabetologia 6:104-09, 1970.

Verbatim summary. Muscle biopsies from eight cases of acute juvenile diabetes (a few weeks after the beginning of the disease) revealed well marked degenerative changes combined with vigorous regeneration of the terminal neuromuscular apparatus. This observation is in accordance with previous demonstrations of neurophysiological disturbances at this early stage of diabetes.