in the livers of rats suffering from nutritional cirrhosis and studied in more detail by Endicott and Lillie (1944). Pearse (1953) says ; " I conclude, however, not only that ceroid is a mixture of substances, but that it represents a typical lipofuscin in an early stage of oxidation." The substances described as ceroid in intestinal muscle fibres seem to be similar to the pigment described here. On the basis of this and Pearse's (1953) comment it seems unnecessary to try to separate ceroid from lipofuscin.

There seems to be no relation between the pigment of jejunal muscle and that in melanosis coli. "Pseudomelanin" is found in the macrophages of the lamina propria of the mucous membrane. It is thought to be a protein degradation product absorbed from the large intestine (Stewart and Hickman, 1931). The distribution of muscular pigmentation of the small intestine does not suggest that it has been absorbed. It is absent from the macrophages of the mucosa and confined to the muscle fibres.

Some of the recorded cases of intestinal pigmentation have had similar pigment at other sites. Ansanelli and Lane (1957) found it in smooth-muscle fibres in blood-vessels of skeletal muscle and intestine, but not in striated-muscle fibres. The case described by Tverdy *et al.* (1949) also had pigment in smooth muscle of various arteries and in bronchial muscle fibres. Pappenheimer and Victor (1946) describe unusual amounts of pigment in various other organs in several cases—for example, testis, liver, kidney, adrenal cortex, and uterus. This pigment seems to be the same as that in the intestine. In many reports there was similar pigment in the stomach, ileum, and sometimes colon, though it was always maximal in the jejunum (Himes and Adlersberg, 1957 ; Gresham *et al.*, 1958). In the cases recorded here no excessive pigment was found at other sites in post-mortem specimens. Intestine other than jejunum was not examined. The widespread distribution of a similar type of pigment in some cases suggests a general metabolic disturbance rather than a purely local pathological change. It also supports the idea (Ansanelli and Lane, 1957) that the pigment is the result of disease and not its cause, as was suggested by Gresham *et al.* (1958), who thought abnormal fat absorption might result from mitochondria breaking down to form the pigment.

There are many unanswered questions about this pigment. Why does it develop ? Is it the result of some nutritional defect ? What determines its maximal localization in jejunal muscle fibres ? It may represent the combined result of disturbed local conditions and a metabolic abnormality, but more must first be known about the details of lipochrome metabolism.

Summary

Pigment granules in fibres of the muscularis propria of the small intestine are described. These have been seen in a variety of diseases, having in common some abnormality of the gastro-intestinal tract.

About half the cases are associated with steatorrhoea. Three cases of jejunal diverticulosis were among the eight cases recorded here.

The staining reactions of the pigment suggest that it is a lipofuscin. Unlike similar pigment in other organs, age is not a primary factor in its development.

The pigment is thought to result from some metabolic abnormality possibly related to defective absorption.

I thank Dr. R. A. B. Drury for encouragement and help, and Dr. F. Avery Jones for clinical details.

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Medical Memoranda

Fatal Diphtheria in the Fully Immunized Child

Below is described a fatal case of diphtheria in a girl who had been fully immunized in infancy and had been given a booster dose at the age of 5.

CASE REPORT

A girl aged 8½ years complained of sore throat on November 14, 1958. Two days later she appeared listless and refused to eat ; the next day she developed stridor and was admitted to the infectious diseases unit of the Royal Free Hospital.

She had contracted measles, mumps, chicken-pox, and whooping-cough in infancy, and had been treated in a children's hospital for nephrosis but had fully recovered in 1955. In 1950 she had been given two injections of A.P.T., each containing 0.5 ml., separated by an interval of four weeks, and a booster dose of 1 ml. of T.A.F. in 1956.

On admission she was gravely ill and cyanosed, with obstructed respiration. The temperature was 100.8° F. (38.2° C.), pulse rate 152 a minute, and blood-pressure 90/60. A grey, adherent membrane covered both tonsils, extending over both anterior pillars of the fauces, soft palate, and uvula. The tongue was furred and the breath fetid. Glands in both sides of the neck were enlarged, with marked periadenitis, giving rise to a characteristic "bull-neck" appearance. A diagnosis of laryngo-tonsillo-pharyngeal diphtheria with laryngeal obstruction was made.

Emergency tracheotomy was performed and 96,000 units of A.D.S. given (80,000 units intravenously). Erythromycin was administered orally, 250 mg. every six hours, and the patient was placed in an oxygen tent.

Investigations.—Hb, 15.5 g./100 ml. (105%); W.B.C., 28,000 per c.mm. (90% polymorphs). The urine contained albumin + ; no red blood cells, casts, or organisms were

seen. *Corynebacterium diphtheriae mitis* was isolated from the throat swab, the virulence test being positive. The E.C.G. demonstrated sinus tachycardia and a prolonged P.R. interval. Electrophoresis of the serum showed increased α_2 -globulin, but no hypogammaglobulinaemia.

Progress.—After tracheotomy the cyanosis disappeared, but the patient continued to be restless, necessitating sedation with chloral hydrate. The blood-pressure rose to 140/90. Two days after admission her condition worsened, rales were heard in the left mid-zone, and x-ray examination of the chest showed consolidation in the left lingula. There was now much less exudate on the tonsils, and the pillars of the fauces, palate, and uvula were clear. The periadenitis had subsided and a throat swab taken at this stage revealed no pathogens. The chemotherapy was supplemented by chloramphenicol, 500 mg. six-hourly. Deterioration in the patient's condition continued; the next day she was cyanosed even in the oxygen tent, and there were signs of extensive consolidation in the right upper lobe. Later signs of peripheral circulatory collapse developed and death occurred that evening.

Post-mortem Examination.—The posterior surface of the epiglottis was covered by a cream-coloured membrane, adherent in patches, which extended over the vocal cords and down into the trachea and bronchi, more extensive on the right side. There was also some pus in the bronchial tree. A few flecks of membrane were present on the tonsils, but there was none in the pharynx or on the palate. The right lung weighed 330 g., and the upper lobe was completely consolidated; the left lung weighed 220 g. and showed a mild bronchopneumonia with minimal free pus formation. Histology of the right upper lobe showed early pneumonia with intra-alveolar fibrinous exudate and a few degenerate alveolar cells. Section of the myocardium disclosed changes consistent with early toxic myocarditis. The kidneys showed a moderate degree of cloudy swelling, but there was no evidence of nephrosis. Culture of a swab from the lower trachea revealed no pathogens.

The cause of death was toxic myocarditis and pneumonia secondary to diphtheria.

COMMENT

The low incidence and mortality rate of diphtheria in the fully immunized community has been well described. There were 51 cases of diphtheria in England and Wales in 1956 (Ministry of Health, 1957),

of which 40 occurred in non-immunized patients. There were three deaths, one of which was that of an immunized child aged 2 years. The Ministry of Health (1956) recorded 10 deaths out of a total of 123 cases of diphtheria in children under 15. Five deaths out of 26 cases occurred in the 1-4 age-group, four of which had never been immunized and the other child had had only one dose of antigen. In the 5-9 age-group (54 cases) there were three deaths; none of these patients had ever been immunized. There were two deaths in the 10-14 age-group (42 cases), one of a girl who had not been immunized since 1945, and another of a girl who had never been immunized at all.

The points of interest in our case are, firstly, the occurrence of toxic diphtheria with classical bullneck in a fully immunized child, and, secondly, that the responsible strain was *mitis*. This led us to suspect a defect in the antibody-promoting mechanisms, but serum electrophoresis did not confirm hypogammaglobulinaemia. It is unfortunate that serum for antitoxin estimation was not taken before giving A.D.S., as the Schick test was rendered invalid by the necessity for giving immediate intravenous antitoxin.

Other points of interest were the presence of myocarditis at an early stage of the disease, and the rapid advance of pneumonia under an adequate antibiotic cover.

We thank Drs. W. Gunn, A. M. Ramsay, and R. Finlayson for their help in preparing this report. We are also indebted to the late Dr. D. H. Geffen, M.O.H. Metropolitan Boroughs of St. Pancras and Hampstead, for supplying particulars of immunization.

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Reviews

HUMAN REPRODUCTION

Essentials of Human Reproduction. Clinical Aspects, Normal and Abnormal. Edited by Joseph Thomas Velardo. (Pp. 270; illustrated. £5 10s.) London and New York: Oxford University Press. 1958.

This is an important book for those who, while actively engaged in the practice of obstetrics and gynaecology, wish to keep abreast of modern knowledge in the field of sex physiology. There are 10 sections written by 14 contributors who are experts in their particular field. Each writer has attempted with considerable success to state concisely and accurately the present views on problems such as the endocrine control of the reproductive apparatus in both male and female; ovulation—its mechanism, control, and clinical manifestations; fertilization; menstruation; the hormone changes in pregnancy; placentation; the anatomy and endocrinology of the human placenta; and the placental circulation. These are merely a few samples of the

material in the first half of this book. The second half is concerned more directly with clinical problems such as amenorrhoea, abnormal uterine bleeding, diseases of pregnancy, abortion, and premature labour. Endocrine pathology, of both male and female genitalia, is also included. The accounts of these and other subjects in which knowledge is advancing, or on which views are confused, are not of the ordinary mundane variety. They provide a wealth of information, not easily available elsewhere, on matters such as the excretion of adrenal corticoids during pregnancy in normal and in diabetic women; gonadotrophin levels in pregnancy toxemia; the effect of placental hormones on the foetus; the Chiari-Frommel syndrome, and the like. Each section concludes with a large bibliography which is mainly American.

In this book one can find the answer to most of the theoretical problems and more abstruse questions which practice may pose to the clinician. Moreover, one can do so with pleasure because the production is excellent and the illustrations, especially the photomicrographs, are outstanding.

T. N. A. JEFFCOATE.