administering iron is shown in Fig. 1. In normal rats there was no significant change in activity. In severely iron-deficient rats there was a pronounced increase in activity after iron was given but a decline towards previous levels in the two days after iron was withheld. In the mildly anaemic rats iron administration was continued and there was a smaller but sustained increase in activity.

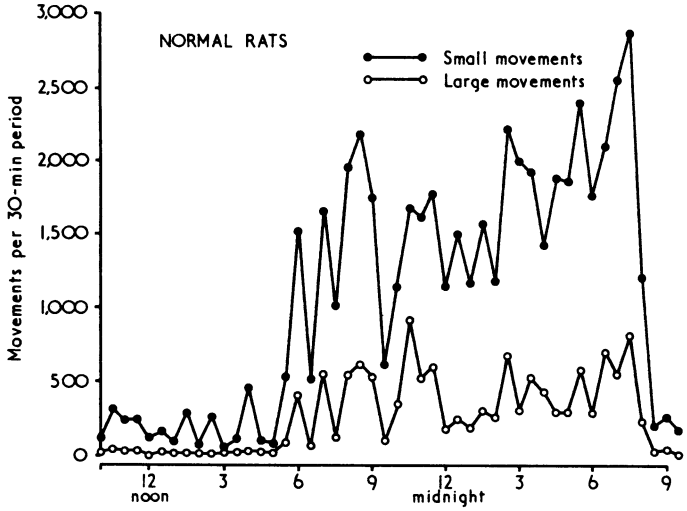

FIG. 2—Diurnal activity pattern in normal rats.

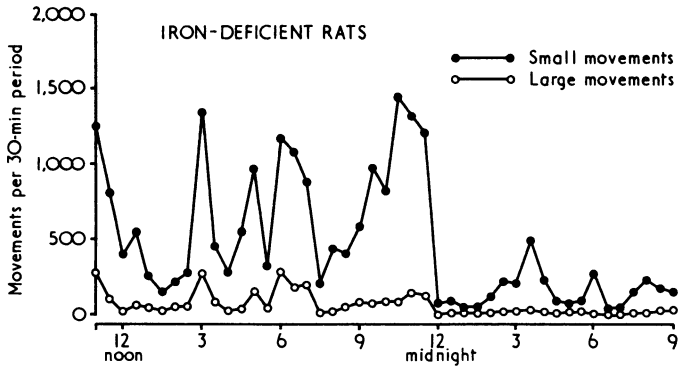

FIG. 3—Diurnal activity pattern in iron-deficient rats.

The normal diurnal pattern of rat activity is shown in Fig. 2. The animals were normally fully awake during the hours of darkness and asleep during daylight. A typical activity pattern in the iron-deficient rats is shown in Fig. 3. There was a noticeable alteration in the diurnal rhythm, with a high proportion of the day's activity taking place during the hours of daylight and a cessation of activity at about midnight. This pattern was repeated in each daily cycle and was seen in both iron-deficient groups. A group of mildly anaemic rats given an iron supplement did not show any reversion to a normal cycle until seven to eight days after therapy was started.

Conclusions

The present pilot study indicates a pronounced change in behaviour in iron-deficient rats consisting partly in a reduction of total activity and partly in an alteration of diurnal rhythm. The cause of this abnormality is unknown but it appears to be rapidly corrected by the administration of iron.

Beutler *et al.* (1960) suggested that symptoms in iron deficiency may be related to depletion of tissue iron enzymes, and these are known to exist in both animal and human subjects (Jacobs, 1969). Patients with iron deficiency anaemia appear to show behaviour changes which often seem to revert to normal after treatment, but it has been difficult to measure this phenomenon, and indeed some have doubted its existence (Elwood *et al.*, 1969). The observation of abnormal behaviour in iron-deficient rats is of interest in this context. The possibility of defining behaviour changes in human iron deficiency awaits the introduction of appropriate techniques.

We should like to thank Mr. Maxwell Jones, of L. K. B. Ltd., for the loan of the activity meter.

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MEDICAL MEMORANDA

Breast Abscess: A Rare Presentation of Typhoid

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Case Report

A 43-year-old nulliparous woman was admitted to hospital via the casualty department with a three-week history of high fever and malaise. One day before admission she developed pain in the right breast. There had been no discharge from the nipple and and there was no previous history of breast disease. She had not had diarrhoea, constipation, or a urinary abnormality, had not been abroad, and had never had a T.A.B. inocu'ation.

On examination she was found to be pyrexial (temperature 104°F; 40°C), and had a tachycardia of 120/min. Above and lateral to the right nipple there was a warm, tender, and hard lobulated mass which measured 5 cm in diameter. The skin was erythematous and adherent to the mass but the mass was not tethered deeply. The nipple was not retracted and there was no discharge. The respiratory, alimentary, nervous, and musculoskeletal systems showed nothing abnormal.

The differential diagnosis rested between a breast abcess and an inflammatory carcinoma with or without a secondary infection. She was submitted to drill biopsy, and at operation a little pus was drained from a firm, indurated mass. Histologically the specimen showed acute inflammation of breast tissue.

Investigations were: haemoglobin 12·1 g/100 ml; W.B.C. 12,900/mm³ (79% neutrophils); E.S.R. 62 mm in 1 hour; wound swab culture, pure growth of *Salmonella typhi;* blood culture, no growth; Widal test, *Salm. typhi* H 1/800, O 1/800, Vi 1/160, untypable Vi strain (Enteric Reference Laboratory), *Brucella abortus* 1/25. Ten days later the titre of the *Salm, typhi* H was 1/400; apart from this there was no change. No pathogens were

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isolated from the stools or urine. Biochemistry, chest *x*-ray picture, and E.C.G. were normal.

Epidemiology.—The patient was infected with *Salm. typhi* with an untypable Vi strain. Her landlady was shown to be a carrier of the disease and two phage types of *Salm. typhi* were isolated from her. She had an untypable Vi strain and also a type A. The landlady's brother had an attack of typhoid some years previously in Sweden, and this was reported at the time to be a *Salm. typhi*, phage type A.

Comment

Until 1923 there had been only 30 cases of breast abscess in typhoid in the world literature, and this led Madelung (1923) to comment on its extreme rarity. Klose and Sebening (1930) subsequently suggested that 0·3% of typhoid patients develop mastitis, but it was not until Pezinski (1937) studied 1,196 cases of typhoid over a period of two years that the relevant statistics became available.

In Pezinski's series, in fact, 0·5% of the patients developed a breast abscess, and among the females the incidence was over 0·9%.

Erbslöh (1954) defined a typhoid breast abscess as one which arose in a case of the generalized disease and emphasized the difficulty in isolating the organism, the constant finding of a W.B.C. below 13,000/mm^3, and that it is a late complication, being predisposed to by physiological breast activity. He also reaffirmed Madelung's finding that the skin over the abscess is not reddened and that in the pus one usually finds a mixed growth and not pure *Salm. typhi.*

In the present case the patient was nulliparous, and apart from a three-week history of fever had no other manifestations of typhoid. The skin over the abscess was reddened, and after the drainage procedure a pure growth of *Salm. typhi* was grown from the wound. The relatively low W.B.C. agreed with the findings of Erbslöh.

In conclusion, in cases of a breast abscess occurring where there are no predisposing factors (breast feeding, pregnancy, etc.) it follows that an underlying general disease should be considered. Clearly, such a diagnosis could easily be missed if the possibility of such a condition was not entertained.

We wish to express our gratitude to Professor H. E. de Wardener and Mr. B. P. Bliss for permission to report this case, Dr. Bubna-Kasteliz for help with the translation, Dr. Hilary J. Andrews and the Department of Bacteriology, Fulham Hospital, and Dr. E. S. Anderson, Enteric Reference Laboratory, Colindale.

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Anorexia Nervosa Associated with Hypothalamic Tumour

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The well-recognized signs and symptoms associated with hypothalamic lesions include both cachexia and obesity. So far as we know, however, true anorexia nervosa has not been described. The present report describes a case presenting clinically as anorexia nervosa, where at necropsy a small neoplasm of the hypothalamus was found.

Case Report

A 25-year-old New Zealand nurse was admitted to the Royal Devon and Exeter Hospital with a history of secondary amenorrhoea, anorexia, and weight loss. Eighteen months earlier she had left New Zealand for a working holiday in Europe knowing that her father had an inoperable bronchial carcinoma. Her periods, previously regular, stopped shortly thereafter but her weight remained steady at about 118 lb (53·5 kg). Six months before admission her father died, after which she developed an aversion to any form of carbohydrate and lost weight. Despite this she remained active and continued to work. During this time she noticed an increased growth of hair on her face and trunk, developed pitting oedema of the feet, and became severely constipated. One month before admission she was admitted to another hospital with a left basal pneumonia, which was successfully treated with antibiotics and physiotherapy. Until this illness she had been in good health apart from an attack of glandular fever three years previously.

Clinically she was bright and cheerful despite her emaciated appearance (68 lb, 30·8 kg) and seemed unaware of the gravity of her illness. Her skin was dry and scaling, with increased growth of fine downy hair on her face and back. She had a sinus bradycardia, a blood pressure of 100/80 mm Hg, and minimal ankle oedema. No abnormal neurological signs were found. Routine investigations showed no abnormality apart from a serum potassium of 3·3 mEq/l. and a borderline serum protein-bound iodine of 3·8 μg/100 ml. Her fasting blood sugar was 64 mg/100 ml. There was evidence of increased adrenocortical activity; an overnight urine specimen contained 940 μg of 11-hydroxycorticoids (normal range 80-320 μg/24 hr), and a morning plasma 11-hydroxycorticoid level was 77·8 μg/100 ml (normal range 6-24 μg/100 ml). The chest *x*-ray picture was normal and a barium-meal examination showed a slowly emptying atonic stomach. A diagnosis of anorexia nervosa was made, thought to have been precipitated by her father's death.

At 3.30 a.m. five days after admission she suddenly became unconscious. She was pale and sweating, incontinent of urine, and had generalized convulsions. Her blood sugar was less than 40 mg/100 ml and she was given glucose intravenously. The convulsions stopped but she remained in coma. Although her blood sugar was maintained at normal levels by intravenous dextrose infusions she never regained consciousness and died two weeks later from a salmonella infection.

Necropsy Findings.—The patient was severely emaciated, with complete absence of subcutaneous fat. The lungs showed severe purulent bronchitis and a confluent bronchopneumonia. Culture of sputum grew *Salmonella typhimurium.* The heart and liver showed brown atrophy. The pituitary was normal on gross examination. Microscopically the cells of the anterior pituitary were mostly of the sparsely granulated type and eosinophils were scant. There were a moderate number of Crooke's hyaline mucoid cells. The adrenals showed cortical lipid depletion. The thyroid, parathyroids, and islets of Langerhans were normal. Except for the brain the viscera appeared normal. The brain contained a small circumscribed nodule measuring 0·5 cm in diameter on the inferior surface of the hypothalamus posterior to the optic chiasma and immediately posterior and to the right of the tuber cinereum (Fig. 1). Microscopical examination showed a well-demarcated but non-encapsulated tumour consisting of a dense fibrillary network of glial fibres among which were many

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