later it seemed advisable to transfuse the patient again, but by then it appeared impossible to cross-match him successfully. For this reason his blood was sent to one of us (R. K. W.). After identification of the various antibodies contained in the patient's serum he was transfused successfully several times.

Five months after admission he suffered the first of a series of three massive intestinal haemorrhages. From the first two he rallied, after transfusion, but during the third he died; this was about six and a half months after admission. Permission for a post-mortem examination could not be obtained.

During his stay in hospital the white cell count had varied from a leukaemoid level down to 2,000 per c.mm. At no time were "lupus erythematosus inclusion bodies" found in the polymorphonuclear leucocytes.

Summary of Serological Findings

The patient belonged to group B, N, cDe/cde or cDe/cDe (Table II). Anti-M was the first antibody to be identified

TABLE II.—*The Blood Groups of the Patient's Red Cells and the Antibodies in His Serum*

Patient's Groups	Antibodies in Serum
B N, presumably S— cDe/cde or cDe/cDe Presumably Fy(a—)	Anti-A Anti-M and anti-S Anti-C and anti-E Anti-Fy ^a

in his serum; it was clearly shown by tests in saline at 15° C. Thereafter tests were confined to N blood samples. Titrations in saline at 37° C. demonstrated the presence of anti-C. Because a sample of N S cde/cde blood was agglutinated the presence in the serum of anti-S was suspected; it was subsequently proved by tests on O, cde/cde, N cells with and without the antigen S. The presence of anti-A could easily be demonstrated by an immediate reaction with A cells on a tile.

A strongly positive reaction with cDe/cDE cells suggested the presence of anti-E. This was proved by tests on saline suspensions of cells lacking A, M, S, and C antigens, but some with and some without the antigen E. Those with E were agglutinated, those without were not.

The shortage of available cells lacking the antigens A, M, S, C, and E made absorption necessary for the next stage. The serum was absorbed with blood A, B, MN S, P+, CDe/CDc, Lu(a—), K—, Le(a—), Fy(a—), and, as this did not of course remove the anti-E, further tests were confined to blood samples lacking E. Indirect antiglobulin tests then disclosed the presence of anti-Fy^a. This example of anti-Fy^a, unlike others so far described, is capable of giving weak reactions with Fy(a+) cells suspended in saline.

The following antibodies were not present in the serum: anti-B, -O, -H, -N, -P, -D, -d, -c, -e, -Lu^a, -K, -k, -Le^b.

Once again it was rather disappointing that no "new" antibody could be found in the serum of a person obviously so apt to become immunized.

Comment

The possibility of a relationship between unusual ability to produce blood-group antibodies and certain diseases has been discussed in a previous paper (Collins *et al.*, 1950). No conclusions were reached, and the conjectures will not be repeated here.

The serum described in this paper, which is from a person suffering from an undiagnosed collagen disease, is the third most abundant in blood-group antibodies to be reported. The other two sera were from patients suffering from lupus erythematosus diffusum and from osteosclerosis with extramedullary haematopoiesis respectively. Recovery was straightforward.

Summary

A patient who suffered from an undiagnosed collagen disease and who had received many transfusions was found to have the following blood-group antibodies in his serum: anti-A, -M, -S, -C, -E, and anti-Fy^a.

We wish to thank Dr. J. Kriz, chief of the Laboratory Service, Veterans Administration Hospital, Richmond, Va., for his kind co-operation in obtaining the clinical data of this case. We also wish to thank Mrs. M. Waller for the initial serological work-up. We are grateful to Dr. B. H. Kirman, of the Fountain Hospital, Tooting, for his help in setting up the large panel of donors of test cells without which such an investigation as that here described is not possible.

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Medical Memoranda

Double-barrelled Enteric Intussusception Causing Volvulus

A number of unusual cases of intussusception were reported in the *British Medical Journal* of March 4, 1950 (page 525). Details of the following case may therefore be of interest.

Case Report

The patient, a girl aged 15, was admitted to hospital on February 25, 1950. In November, 1949, after an attack of influenza, she had suffered from aching central abdominal pain for one hour, which was considerably relieved by vomiting twice. Fourteen days later she had severe "gripping" central abdominal pain for two hours, also relieved by vomiting. On two further occasions, at six-weeks intervals, she had similar but more severe attacks lasting four to five hours and six to seven hours respectively. Fourteen weeks after the first sign of trouble and two and a half days before admission the sequence started again, but this time did not cease. She was referred to hospital, where she had been seen once as an out-patient with "intestinal colic." The possibility of mesenteric adenitis, Meckel's diverticulum, or recurrent intussusception was then suggested, but was difficult to prove.

On examination the girl was not unduly distressed or dry. Her pulse was 108, and respiration and temperature were normal. The abdomen was not rigid, but there was some tenderness and guarding in the subumbilical region and right iliac fossa. This area was filled with a diffuse soft swelling, in the centre of which was a firmer sausage-shaped mass 5-6 in. (12.5-15 cm.) long, running obliquely upwards to the right.

A provisional diagnosis of small-bowel obstruction probably due to intussusception was made, but it was felt that there was something unusual about it and that this was probably not the whole story.

A right subumbilical paramedian incision was made, revealing the presence of sero-sanguineous exudate. A number of coils of dilated small gut were found "bunched" together in the pelvic brim region, which on further exploration proved to be a volvulus of ileum in a clockwise direction. On untwisting this the centre of the affected gut proved to be an entero-enteric intussusception, which seemed much more bulky and solid than would be expected, and which had a very tight neck, with foul purulent fluid exuding from beneath it when any endeavour was made to open it up. Attempted reduction by milking was unsuccessful. The

mass was therefore resected and end-to-end anastomosis carried out, and the abdomen was closed without drainage.

The excised specimen was opened along the intussusciptions and the thick dark-red congested intussusceptum was seen. This had a very narrow apex, which when slit up with scissors presented, rather unexpectedly, the apex of another intussusceptum, dark blue-black in colour. On incising this the entering layer was found to be yellow and necrotic. The neck of the outer intussusception just covered that of the inner, and both were very tight. The cause of the original invagination was found to be a polyp of moderate dimensions.

It seemed that the polyp had caused an intussusception, to the limits of the mesenteric attachment, and the ensheathing layer had contracted both at the neck and at the apex; this spasm and constriction formed the apex and was the cause of the second intussusception. The total mass was very bulky and solid, and the weight of this in an active gut combined to provoke the volvulus.

I wish to thank Mr. J. E. Stanley Lee for permission to publish this report.

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Meningitis Due to *Leptospira Canicola*

Since *Leptospira canicola* was first isolated in 1931 by Klarenbeek and Schüffner (1933) from the urine of a dog, and the first cases of human infection were recorded by Dhont *et al.* (1934), more than 150 cases have been reported (Alston, 1949). The first case in this country was recorded by Baber and Stuart (1946), and a number of cases have been reported since, several being of meningitic type and one only being fatal (Weetch *et al.*, 1949).

An article by Campbell *et al.* (1950) reporting six cases of canicola fever in Bristol, and the review of the subject in the same number of the *British Medical Journal*, have drawn attention to the subject. Signs of meningeal irritation are a not uncommon manifestation of the disease (Harvier *et al.*, 1946). The following case, which presented clinically as meningitis, is of interest, as infection with *L. canicola* was proved retrospectively in both the patient and her bull-terrier.

Case Report

A married woman aged 32 was admitted to hospital on August 29, 1949, complaining of headache, fever, and vomiting for six days. The headache had begun on August 23, and had grown steadily worse. She had been feverish and had vomited several times. There was no significant previous history.

The patient was acutely ill on admission, but was fully alert and co-operative. Her temperature was 100° F. (37.8° C.) and the tongue was coated. There was considerable stiffness of the neck and back; the abdominal reflexes were absent, but other reflexes were normal; there was no paralysis. No jaundice or conjunctival injection was noted at any time. A trace of albumin and a few epithelial cells were present in the urine, but no red cells or casts. Lumbar puncture produced a slightly turbid fluid, not under increased pressure. In view of the turbidity, treatment with sulphamerazine was begun while bacteriological results were awaited. The report on the cerebrospinal fluid was as follows: leucocytes, 585 per c.mm. (73% lymphocytes, 27% polymorphs); protein, 35 mg. per 100 ml.; sugar, 78 mg. per 100 ml.; chlorides, 760 mg. per 100 ml.; no organisms or acid-fast bacilli seen; sterile on culture.

The patient was admitted at a time when the incidence of poliomyelitis was high, and the clinical picture and cerebrospinal fluid findings would have fitted such a diagnosis, except that the cell count was considered to be rather high. The possibility of a choriomeningitis was considered, and blood samples were taken for agglutination tests, being repeated at intervals.

A second lumbar puncture on September 1 showed a fall of leucocytes to 310 per c.mm., with 86% lymphocytes. The Wassermann reaction of the fluid was negative. By this time the patient's condition had improved, and the meningeal signs were abating, though she was still pyrexial and had some headache. The total white cell count in the blood was 8,400, of which 53% were polymorphs.

Convalescence was uneventful apart from a transient rise of temperature on September 10 associated with a small thrombosis in the left calf. This prolonged her period of rest in bed. By September 30 there were no abnormal signs in the central nervous system, the neck stiffness having disappeared and the abdominal reflexes having returned. The cerebrospinal fluid on September 26 showed 13 leucocytes per c.mm., mainly lymphocytes; protein, 15 mg. per 100 ml.; sugar, 51 mg. per 100 ml.; and chlorides, 780 mg. per 100 ml.

Serological results were still not available when the patient was discharged on October 6, a tentative diagnosis of abortive poliomyelitis having been made. On October 11 Dr. J. C. Broom reported a positive leptospiral antibody titre, and another specimen of blood was taken. Further inquiries from the patient then revealed that her bull-terrier had suffered a rather vague illness with anorexia and abnormal passivity a few days after the patient's admission to hospital. The animal when examined (in the convalescent stage) by a veterinary surgeon showed clinical evidence of having had a leptospiral infection, and the dog's serum showed a positive antibody titre for *L. canicola*.

Antibody Titres Against *Leptospira*

	<i>L. icterohaemorrhagiae</i>	<i>L. canicola</i>
Patient { 23/9/49 (32nd day)	Positive 1/1,000	Positive 1/3,000
19/10/49 (57th day)	Negative 1/3,000	Negative 1/10,000
Dog { 12/11/49	Positive 1/100	Positive 1/3,000
	Negative 1/300	Negative 1/10,000
	Positive 1/30	Positive 1/1,000
	Negative 1/100	Negative 1/3,000

In the first specimen of the patient's serum the titres against *L. canicola* and *L. icterohaemorrhagiae* were almost equal. This, I understand from Dr. Broom, is not an uncommon finding. By the time of the second test, however, the titres had characteristically diverged, to reveal *L. canicola* as the infecting organism. The titre of 1/1,000 against *L. canicola* which was found in the dog was a sufficiently high positive result to indicate a recent infection, and steps are being taken to ensure that the animal shall not remain a source of infection.

My thanks are due to Dr. D. MacIntyre for permission to publish this case, and to Dr. J. C. Broom and Dr. M. S. Ross for their help with pathological data.

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