encouraging. The difficulty in assessing the value of penicillin therapy is common to all conditions which tend to natural cure. It is especially difficult when different doses have been used and treatment has begun at different stages of the disease. In the case of *L. canicola* infections a further factor must be taken into account. McIntyre and Stuart (1949) have shown that in dogs there is an invasive or septicaemic stage followed by a later stage where there is renal involvement. Dogs in the first stage all recovered after penicillin treatment, but there was a 50% mortality if the kidneys were involved. The ineffectiveness of penicillin in the renal stage of the infection is further suggested by McIntyre and Montgomery (1952) and Brunner and Meyer (1949), who have shown that the organism can be recovered from the renal tubules 14 months to two years after treatment.

The very rapid response to penicillin in high dosage in our two cases strongly suggests a therapeutic effect. It is to be noted that both were treated early and were probably mainly in the septicaemic stage, although Case 2 showed some albuminuria. The severe reaction shown by Case 2 was of Herxheimer type, and is further evidence of a lethal effect on the organisms. It is perhaps significant that the only other recorded case of rapid improvement after treatment with penicillin (Case 4 in Table II) also received large doses early in the disease.

Stagg and Leibovitz (1951) believe that chlortetracycline ("aureomycin") is an effective therapeutic agent in *L. canicola* infection. The evidence for this is inconclusive, since in their case 18 hours of treatment with penicillin in high dosage had preceded chlortetracycline. In experimental *L. canicola* infection in hamsters, Heilman (1945) found that the protective effect of penicillin was greater than that of streptomycin.

Since no other satisfactory treatment is known, it seems desirable to treat recognized examples of this disease with large doses of penicillin as early as possible after infection.

Summary

Two cases of human infection with *Leptospira canicola* are described.

L. canicola infection should be considered in the differential diagnosis of unexplained pyrexia or lymphocytic meningitis.

Evidence is produced to show that the incubation period of the disease is about seven days and that the early administration of penicillin in high dosage is an effective form of therapy.

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POLYAGGLUTINABILITY OF HUMAN RED BLOOD CELLS

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Amongst the abnormal agglutinations, polyagglutination is a rare phenomenon and few cases have been reported. It is a transitory agglutinability of red cells developed *in vivo* and characterized by the agglutination of cells by a proportion of normal sera independent of their group agglutinins. It is not connected with auto-agglutination.

In ABO blood grouping the so-called Landsteiner's law states that if an agglutinin is present in the red cells of a blood the corresponding agglutinin must be absent from the plasma, and if the agglutinin is absent the corresponding agglutinin must be present. The first part of this law is a logical outcome of the situation, for if both agglutinin and agglutinin were present the cells would be agglutinated (Wright, 1952), but in cases of polyagglutination this law cannot and does not stand. This factor is known to appear in some diseased states, though it has been recorded in some healthy individuals as well, but in both cases it is found to be transitory. Whether there is any influence of this polyagglutinability on the diseased process is not yet known. It is very difficult to understand what initiates this agglutinability of these cells and why the process of agglutination is inhibited *in vivo* but initiated *in vitro*.

It has been described that *in vitro* the infection in a sample of blood may change the cells in such a way that they are agglutinated by all sera (Hübener-Thomsen-Friedenreich phenomenon). Friedenreich has shown that filtrates of certain bacteria contain an enzyme which acts on human red cells, changing a latent antigen to an active one, which is known as Friedenreich's T-antigen (Race and Sanger, 1954).

Case Report

A married Hindu woman aged 30 was admitted to Chittaranjan Seva Sadan Hospital on December 28, 1953. She had had four children, but no history of miscarriage or abnormal labour. Her first baby died a few years after birth; the other three are all living and in good health. Her menstrual history was normal. The last menstrual period was September 25, 1953. She had never had any transfusion. On admission to hospital she complained of pain in the lower abdomen for 22 days, bleeding per vaginam for 22 days, and fever for two days.

On examination the patient was very anaemic. There was no jaundice. Her temperature was 102.6° F. (39.2° C.) (the high fever continued until death), pulse 140, respirations 20, blood pressure 110/80 mm. Hg. A blood count showed Hb, 36%; red cells, 2,160,000; white cells, 13,400 (polymorphs 80%, lymphocytes 12%, monocytes 8%). The urine was acid in reaction and showed no abnormality.

Pelvic abscess was diagnosed and posterior colpotomy was performed. A substance like anchovy sauce was found. Microscopical examination of this showed inflammatory cells but no malignant cells. As transfusion was advised, the serum and the washed cells (suspended in normal saline) were tested, but in spite of repeated efforts we could not determine the group. The patient was Rh-positive with

C and D and negative with E antigen. The Kahn test was negative. The patient's cells were tested against α and β sera (Table I). The cells were agglutinated by both the sera, indicating Group AB, but when the serum of the patient was also matched against known cells A cells were agglutinated but there was no reaction with B cells (Table I), indicating Group B.

TABLE I

α Serum and patient's cells	..	+++ (agglutination)
β " " "	..	+++ "
A cells " " serum	..	+++ "
B " " " "	..	--- (no agglutination)

As the need for blood transfusion was urgent, and as no definite group could be determined, we tried to cross-match with 10 Group O bloods, 4 Group AB bloods, 10 Group B bloods, and 12 Group A bloods. The results are shown in Table II. All these tests were done repeatedly and in dilutions of 1:4, 1:8, 1:16, 1:32, but without any change of results either at room or at refrigerator (4 to 6° C.) temperature.

TABLE II

	Group O		Group AB		Group B		Group A	
	Serum	Cell	Serum	Cell	Serum	Cell	Serum	Cell
Patient's cells	+++	---	+++	+++	+++	---	+++	+++
" serum	---	---	---	---	---	---	---	---

+, Agglutination. —, No agglutination.

The above grouping and cross-matchings were also done by the test-tube method at 37° C., but the results were the same as with the slide method. The serum and clotted blood of the patient were left in the refrigerator for more than one month at 4 to 6° C. and all the tests were repeated, but no change was detected. On all occasions her own serum did not agglutinate with her own red cells. The possibility of contamination can be excluded, as we performed all the tests immediately after the blood was withdrawn. The patient died on January 18, 1954.

Discussion

The first case of polyagglutinability was reported by Levine and Katzin (1938). They found that the red cells (Group O) of patients suffering from pneumococcus type I infection treated with sulphonamide and serum agglutinated with 15% normal sera independent of group. This peculiarity disappeared four months after recovery. Gaffney and Sachs (1943) reported two cases, of which one occurred in a patient with congenital syphilis and the other in a healthy adult. In both cases they found polyagglutination and concluded that both bloods were of Group O subjects.

Levine and Katzin's patient was also of Group O. In the first case of Gaffney and Sachs the titre of polyagglutinability went on increasing from 47 to 100%, in their second case it increased to 73%, and in both cases the cells and serum of patients agglutinated with both α and β serum and A and B cells respectively, but the cells failed to agglutinate at 37° C., thereby giving the correct grouping of the patient—that is, O. In neither case was there autoagglutination either at refrigerator or at room temperature. In all three cases this polyagglutinability was transitory and disappeared within four to six months.

In our case cells agglutinated with α and β serum and serum agglutinated with A cells but failed to agglutinate B cells and never agglutinated their own. We are thus inclined to describe the phenomenon here as polyagglutinability instead of panagglutinability.

Gaffney and Sachs found that the sera which agglutinated the cells of the patients at room temperature (20 to 25° C.) did not agglutinate at 37° C. This question does not arise in our country, because our room temperature is always around 37° C. In our case repetition of the tests in different dilutions and at our room temperature (34 to 37° C.) and at

refrigerator temperature (4 to 6° C.) did not show any alteration in any way. This type of agglutination gives a false idea about the grouping of patients.

The cross-match report (Table II) gives a peculiar result, and no definite conclusion could be reached; in order to come to a conclusion we made a back calculation to suggest that the patient was possibly of Group B.

Observations of different authors at different times suggest that panagglutination is due to bacterial contamination. Schiff *et al.* (quoted by Gaffney and Sachs, 1943) produced panagglutinability of cells artificially by bacterial contamination, in which the red blood cells did not agglutinate with their own serum and thus the difference was only one of degree.

Though the existence of a relationship of cold agglutination with polyagglutination was suggested by different authors, our case did not show any such relationship, as we got the same result in different temperatures, including that of the room.

The actual pathogenesis of polyagglutination is far from certain, but we have already mentioned that the T-antigen is responsible for some such abnormal agglutination as is described by Friedenreich and supported by Henningsen, Holländer, Van Loghem, Van der Hart, and Heier (Race and Sanger, 1954). In our case the patient was dangerously ill and ultimately died of the disease; it seems possible that bacteria were in some way responsible.

It is evident from the above that previous authors got agglutination at room temperature but not at 37° C., but we found the same result at room temperature, at the refrigerator temperature, and at 37° C. incubation. As our patient was seriously ill, it seems that the degree of bacteraemia or septicaemia might play some part in the phenomenon by transforming the latent T-antigen of cells into an active one. Further experimental work is necessary before any conclusion can be reached.

Summary

Polyagglutinability observed in a case of pelvic abscess with septicaemia is described and the relevant available literature reviewed.

The similarity between polyagglutinability and panagglutinability is observed and discussed.

The fact that such a case brings out the problem of correct grouping has been stressed.

T-antigen seems to have an aetiological bearing in such cases.

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An unusual case is described in the latest (1954) annual report of the Medical and Dental Defence Union of Scotland Ltd. "A National Service candidate, aged 18, was referred by the examining board to an ear, nose, and throat specialist for an opinion. The latter, on examining the candidate when referred to him, undertook to wash out the candidate's antrum, a procedure to which the candidate's father objected, as having been done on a minor (or infant) without the parent's consent. While the claim was not pressed, the consultant was advised that he had been in error in his zeal, as he was entitled to do nothing more than furnish a report to the medical examiners who had referred the candidate."