3. *Haemoglobinuria*.—This apparently had all the clinical features of haemoglobinuria of exertion (Whitby and Britton, 1946). Its aetiology is obscure. Regarding the part played by exertion in these cases, all that can be said is that the patients were ambulant the previous day, but not to any great extent. Blood urea remained unraised and urine did not at any time before the onset of haemoglobinuria show evidence of nephritis or necrosing nephrosis due to toxic action of lead, or of haemoglobinuric nephrosis following haemoglobinuria. The possibility that it was caused by an acute haemolytic crisis due to lead cannot be ruled out. It appears that the blood was almost completely cleared of its oxyhaemoglobin content when a sample was taken for examination, whereas the urine collected at the same time was that which had accumulated in the bladder for at least four hours. Subsequent samples of urine had been markedly and progressively clear. The amount of blood destroyed by haemolysis seems to have been small, as shown by the red-cell counts before and after the haemolysis. The first sample of haemoglobinuric urine had been passed from seven to nine hours before the collection of venous blood. Haemolysis had no doubt taken place earlier than this. During this period the haemoglobin in the blood could have been easily cleared by the kidneys. Hence the apparent similarity to haemoglobinuria of exertion.

4. *Erythrocytosis*.—This accompanied the symptoms of acute Parkinsonism very closely. In all probability it was of the same nature as polycythaemia described in encephalitis lethargica and Huntington's chorea by Moehlig and Bates (1933).

5. *Pallor*.—This was not a feature of any of the cases recorded by Cassells and Dodds. Its presence in my two cases was a pointer to its causation by lead.

Summary

Acute Parkinsonism, haemoglobinuria, abdominal pain simulating appendicitis, erythrocytosis, and pallor are recorded in two petrol-tank cleaners. These symptoms were in addition to the usual effects of exposure to petrol vapour and lead tetraethyl.

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Mr. Lawrence B. Hall, sanitary engineer of the U.S. Public Health Service, has gone to Iran to help in that country's fight against malaria. He will continue work in malaria control initiated by another Public Health Service officer, Dr. Justin M. Andrews, and will supervise training of Iranian personnel in carrying out a D.D.T. spraying scheme recommended by Dr. Andrews after a survey a few months ago. Mr. Hall's headquarters will be in Tehran. The Iranian Embassy in Washington requested the services of Mr. Hall under terms of the Smith-Mundt Act, an educational exchange programme through which the U.S.A. gives technical and other services on a reciprocal basis with other nations. Mr. Hall did malaria-control work along the Burma Road in 1941, and also later when he was attached to the China-Burma-India Command of the U.S. Army.

STAPHYLOCOCCI IN THE NEWBORN THEIR COAGULASE PRODUCTION AND RESISTANCE TO PENICILLIN AND STREPTOMYCIN

BY

G. MARTYN, M.R.C.S., L.R.C.P., D.P.H.

(From the Departments of Child Health and Bacteriology,
University of Manchester)

This investigation was undertaken to determine the incidence of staphylococci in the nasopharynx and the faeces of normal infants during the first seven days of life. Potentially pathogenic strains were differentiated by the coagulase method and their sensitivity to penicillin and streptomycin was tested. The results refer to infants born in hospital and may not perhaps be applicable to newborn infants generally. They are, however, a contribution to the study of the oecology of the staphylococcus both with regard to the newborn and in relation to possible effects of antibiotics on staphylococci in the whole community.

Although numerous studies and reviews of the respiratory and faecal flora of normal infants are available there is little information about the incidence of staphylococci during the first week of life.

Torrey and Reese (1945) found carrier rates of haemolytic *Staph. aureus* of 6.6% during the first day, 50% for the second day, 62% for the third day, and 88.8% during the fourth to eighth days. Kneeland (1930) found in 30 normal infants during the first two weeks of life an incidence of 93% of *Staph. albus* and 32% *Staph. aureus*. Todd (1922) cultured dried powdered stools on human blood agar from infants and obtained *Staph. albus* in 53%; *Staph. aureus* was not found. Crowley, Downie, Fulton, and Wilson (1941) found in 57 normal breast-fed infants, 3–23 days of age, that about 50% had *Staph. albus* in the stools; *Staph. aureus* was present only once.

Technique

The infants studied were born in the obstetrical department of St. Mary's Hospital, Manchester, and were in five nurseries each containing a maximum of 12 cots. They were all healthy, full-term, breast-fed, and in contact with their mothers only at feeding-times. None had been treated with penicillin, and so far as could be ascertained none of the mothers had received any. No persons in contact with the children wore masks. Visitors were not allowed in the nurseries. There was no special air-conditioning in the nurseries. The survey was made from August to November, 1948.

Specimens were taken from the nasopharynx by means of per-nasal swabs—i.e., fine cotton-wool swabs on thin flexible iron wire passed via the external nares to the back of the nose. Rectal swabs were taken, using adult-type throat swabs, with special precautions against contamination from the skin surrounding the anus.

The nasal swabs were plated on horse-blood agar within one to two hours of collection and incubated aerobically at 37° C. The rectal swabs were plated on horse-blood agar and MacConkey's bile-salt medium and inoculated into 10% NaCl in Robertson's meat medium as recommended by Maitland and Martyn (1949) for the selective isolation of staphylococci. The culture from the salt-meat medium after incubation aerobically for twenty-four hours at 37° C. was subcultured to horse-blood-agar plates, also incubated for twenty-four hours. It was not necessary to use the selective medium for nasal swabs, as the staphylococci were not mixed with many other bacteria.

When the colonies were uniform in colour on one plate one colony only was subcultured. If there was more than

one variety a colony of each was picked. As the main object was to determine the incidence of coagulase-positive strains, if an aureus colony turned out to be coagulase-negative the plate, which had been kept, was re-examined and other colonies picked—a procedure which sometimes led to the isolation of a coagulase-positive strain. Such a plate was then recorded as having two varieties of staphylococci. All strains isolated were tested for the production of coagulase, 0.5 ml. of a 1 in 10 dilution of citrated human plasma being used and 5 drops (approximately 0.125 ml.) of an overnight broth culture being added. The culture was incubated at 37° C., and examined after two hours and after standing at room temperature overnight. All coagulase-positive strains are referred to as *Staph. pyogenes*, and the great majority of them had aureus colonies. The coagulase-negative strains are designated *Staph. saprophyticus*; they usually had white or nearly white colonies, and no attempt was made to differentiate strains which morphologically might have been classed as micrococci.

Results of Culture

Cultures were made from 130 infants, and the results are summarized in Table I. From the nasopharynx, apart

TABLE I.—Incidence of Staphylococci Isolated from Nasopharynx and Faeces of 130 Healthy Infants Aged 0-7 Days

	All Sources	Nasopharynx (total)	Faeces (total)	Nasopharynx and Faeces	Nasopharynx Only	Faeces Only
<i>Staphylococcus</i> ..	130 (100%)	127	130	127	0	3
<i>Staph. pyogenes</i> ..	99 (76%)	81 (62%)	65 (50%)	47 (36%)	34 (26%)	18 (14%)
<i>Staph. saprophyticus</i> *	112 (86%)	70 (54%)	102 (78%)	60 (46%)	10 (8%)	42 (32%)

* Micrococci were not differentiated (see text).

from three infants a few hours old whose swabs yielded no growth, staphylococcus was always present, and usually it was the only organism. As a rule it appeared as a pure aureus or albus strain, but sometimes there was more than one variety. *Streptococcus viridans* was noted in a few cases. Other bacteria were few, and were not identified.

The isolation of staphylococci from the faeces of all infants was the result of using a selective medium which has been shown by Maitland and Martyn to detect small numbers. Direct plating of the same rectal swabs on blood agar seldom revealed staphylococci. The high incidence of 50% for *Staph. pyogenes* in the faeces of normal infants is noteworthy.

Penicillin and Streptomycin Sensitivity of Coagulase-positive Strains Isolated

Barber and Rozwadowska-Dowzenko (1948) have stated that the incidence of penicillin-resistant staphylococci cultured from infections has been increasing during the past few years. The coagulase-positive staphylococci isolated from normal healthy infants were therefore tested for sensitivity to penicillin to see if the relatively high incidence of penicillin-resistant strains was peculiar to infections. The opportunity was taken to test the strains as well for sensitivity to streptomycin.

Methods.—Penicillin sensitivity was tested by soaking strips of sterile filter-paper (about 7 by 1 cm.) in normal saline containing 40 units of crystalline penicillin per ml. A strip was then laid on a nutrient-agar plate after it had been inoculated in streaks with eighteen-hour broth cultures of the staphylococci to be tested. The Oxford staphylococcus was inoculated on every plate as a control. Resistant strains detected by this method were tested for the production of penicillinase by mixing equal volumes of an

overnight broth culture and normal saline containing 5 units of penicillin per ml. Each mixture was then tested by the cylinder-plate method for the presence of penicillin by the technique described by Hayes (1945). Streptomycin sensitivity was similarly tested with strips soaked in a concentration of 1,000 units per ml. of streptomycin.

TABLE II.—Penicillin and Streptomycin Sensitivity of Strains of *Staph. Pyogenes* Isolated from Nasopharynx and Faeces of Healthy Infants Aged 0-7 Days

Source:	Nasopharynx	Faeces
Total No. of <i>Staph. pyogenes</i> isolated ..	81	65
No. of penicillin-resistant strains ..	45 (55.5%)	38 (58.5%)
No. of streptomycin-resistant strains ..	3 (3.7%)	1 (1.5%)

Results.—In Table II are shown the numbers of strains isolated from the nasopharynx and faeces which were resistant to penicillin and streptomycin. The incidence of 55.5% of strains resistant to penicillin in the nasopharynx and of 58.5% in the faeces approximated very closely to the incidence recorded by Barber and Rozwadowska-Dowzenko of 59% in infections. All the 83 penicillin-resistant strains produced penicillinase, but three strains failed to show it by the standard test against 5 units of penicillin per ml. It was shown for these three strains, however, by using 1 unit of penicillin per ml. The incidence of streptomycin-resistant strains was low. Only four such strains were encountered, and they were all sensitive to penicillin.

Uniformity of Strains from Individual Cases

To test the possibility that what appeared to be a pure culture of *Staph. pyogenes* might be a mixture of penicillin-sensitive and penicillin-resistant strains 20 colonies were picked from each of five plates and tested separately. Three plates were from faeces and two from the nasopharynx. All the colonies from each plate were similar: the strains were penicillin-resistant.

Further evidence regarding uniformity of strains was obtained by testing for sensitivity to penicillin and streptomycin pairs of strains, one from the nasopharynx and one from the faeces of individual infants. There were 47 such pairs—37 were similar, 8 were different in their sensitivity to penicillin, and 2 others differed in sensitivity to streptomycin, in each instance one strain being sensitive and the other resistant according to the method of testing.

The fact that in about three-quarters of the infants harbouring *Staph. pyogenes* in both nasopharynx and bowel the strains were similar in their behaviour to antibiotics may be regarded as suggestive evidence of their common origin and in favour of their uniformity. Against this should be put the observation that in about one-quarter of the infants the strains from bowel and nasopharynx were different in sensitivity to antibiotics. To obtain complete evidence regarding the degree of uniformity in the staphylococcal flora of very young infants bacteriophage typing of a number of strains from each source should be undertaken. So far as penicillin resistance is concerned the evidence obtained in this investigation suggests that examination of one colony from each source did not introduce a large error owing to lack of uniformity in the flora.

Comment

The staphylococci found in young infants are derived from the environment, and the incidence and variety of staphylococci found may therefore be expected to vary somewhat in different groups.

In the present investigation in a maternity hospital the relative importance of the mothers, of attendants, and of the air of the wards as a source of staphylococci is

not known. The incidence of 62% of *Staph. pyogenes* in the nasopharynx and its relative predominance is not unexpected in view of the findings of others (Kneeland, 1930; Torrey and Reese, 1945). The high incidence of 50% in the faeces is much greater than has been recorded heretofore (Todd, 1922; Crowley, Downie, Fulton, and Wilson, 1941), owing largely, it is believed, to the selective medium employed. It is a relevant point in considering the staphylococcus as a possible aetiological agent in enteritis.

The high incidence of penicillin-resistant strains in both nasopharynx and bowel probably reflects the strains circulating in a hospital environment. It is of interest that a similar incidence was found by Barber and Rozwadowska-Dowzenko (1948) from strains from infections, also in hospital. The figures obtained from this series of infants, taken in conjunction with time and place, may be regarded as a contribution to the further study of penicillin resistance of staphylococci in the community.

Summary

An investigation into the incidence of staphylococci in the nasopharynx and faeces of 130 normal healthy breast-fed infants aged 0-7 days born in the Maternity Department of St. Mary's Hospital, Manchester, is recorded.

From the nasopharynx *Staph. pyogenes* was isolated in 62% of the infants and from the faeces in 50%.

Of the *Staph. pyogenes* strains isolated from the nasopharynx 55.5%, and from the faeces 58.5%, were penicillin-resistant. All the resistant strains produced penicillinase.

Only four strains of *Staph. pyogenes* isolated were resistant to streptomycin.

In the cases that were specially tested there was homogeneity in the staphylococcal flora of the nasopharynx and bowel in individual infants so far as sensitivity to penicillin was concerned. In three-quarters of the infants who harboured *Staph. pyogenes* in both nasopharynx and bowel the strains from the two sources corresponded in their susceptibility to both penicillin and streptomycin.

The high incidence of *Staph. pyogenes* in the faeces was due largely to the use of a selective medium, and the high incidence of penicillin-resistant strains probably reflects the strain circulating in the hospital.

I wish to thank Professor W. F. Gaisford for his interest and advice and Professor H. B. Maitland for helpful criticism.

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The Ministry of Health has issued a circular describing the procedure to be followed in caring for persons of unsound mind arriving at seaports and airports. If a British subject of unsound mind is not met by a relative or friend who will take charge of him, the medical officer there should call in the appropriate duly authorized officer of the local health authority, who is responsible for removing a person of unsound mind. An alien of unsound mind is prohibited by the Aliens Order, 1920, from being given leave to land, but Article 14 of the Order enables the Secretary of State to exempt any person from that prohibition. An immigration officer who considers that an alien is of unsound mind should seek the advice of the Medical Inspector of Aliens. If the latter is satisfied that the alien is of unsound mind, he gives the appropriate certificate on Form Port 12 to the immigration officer. If, nevertheless, the alien is allowed to land, the immigration officer is responsible for his disposal, and he may then deal with him in the same way as for a British subject.

Medical Memorandum

Unusual Physical Signs in Strangulated Inguinal Hernia

The following case of strangulated inguinal hernia is recorded because it illustrates three physical signs which should receive wider recognition.

CASE REPORT

A normal healthy man aged 33 was admitted to hospital complaining of a swelling in the right groin and vague abdominal pain. The swelling in the groin had been present for about six weeks and had not given rise to any symptoms until three days before admission, when it became painful and enlarged rapidly, extending into the scrotum. He complained of some generalized abdominal pain of colicky nature, a little nausea, and constipation for two days. It was also reported that blood-stained fluid had been aspirated from a hydrocele on the right side some hours previous to admission.

On examination a large fusiform swelling was seen in the right groin, extending downwards and continuous with a very large swelling in the right half of the scrotum. It was impossible to get above the swelling in the groin, yet the swelling of the scrotum was clearly cystic and translucent, although not brightly so. There was a good cough impulse over the swelling in the groin. Auscultation of the abdomen revealed some increase of peristaltic sounds, and the heart sounds could be clearly heard throughout the whole abdomen.

At operation a loop of ileum was found to be strangulated at a constriction about half-way down an hourglass-shaped hernial sac. About 6 in. (15 cm.) of bowel was involved, and the distal sac, which was very large, was filled with dark blood-stained fluid. Considerable ascites was present in the abdominal cavity, with moderate intestinal distension.

The strangulated bowel was thickened, waterlogged, and dark purple in colour, and the mesentery was thrombotic and oedematous. After the usual measures to restore the circulation it was decided to resect the bowel, and a piece about 2 ft. 6 in. (76 cm.) was removed and an end-to-end anastomosis performed. The large congenital sac was removed and the hernia repaired. The patient made an uninterrupted recovery and at a follow-up three months later had no complaints.

COMMENTARY

The Cough Impulse.—In a case of suspected strangulated hernia the presence of a cough impulse should not necessarily rule out the diagnosis. As in this case, the site of strangulation may be some way distal to the external abdominal ring, leaving the proximal part of the contents unstrangulated.

Blood-stained Hydrocele.—The collection of blood-stained fluid from a hydrocele is usually considered to be associated with some disease or trauma of the testis. The above case demonstrated that it may be associated with intestinal obstruction. Such a finding was of even greater interest in another case I had some years ago. A man presented with a recently developed hydrocele of a hernial sac with blood-stained fluid. On lying the patient down it was found that the sac could be slowly emptied into the peritoneal cavity—i.e., the processus vaginalis was patent. At operation an internal strangulation due to a fibrous band was found. At no time had he ever noticed any descent into the hernia—the congenital sac being always there, but making itself manifest only when blood-stained fluid formed within the abdomen.

Heart Sounds Heard Clearly in the Abdomen.—This fact, I believe, signifies a combination of intestinal distension and fluid. I have heard the sounds on other occasions, and these findings have always been confirmed at operation or strongly supported by other signs.

In the case recorded the fluid in the abdomen was no doubt present because the strangulation was of that type which starts with slow venous occlusion, as shown by the thickened waterlogged loop of strangulated bowel in contrast to the thin friable type of wall found in more rapid strangulation in which the arteries are quickly occluded. Although in the former type of obstruction I believe the bowel is often more viable than its appearance would suggest, it is this type of strangulation which leads to late obstruction from interstitial fibrosis and constriction if the bowel is dropped back.

If the patient's condition warrants it, an immediate resection would always seem justified.

C. PATRICK SAMES, M.S., F.R.C.S.,
Assistant Director, Surgical Unit, St. Mary's Hospital.