Further work is necessary to define the indications for splenectomy, but we think it premature to conclude that it is never indicated in this condition.

Increasing hepatomegaly after splenectomy in myelofibrosis has been described, but has not necessarily been associated with either jaundice or rapid clinical deterioration—for example, Case J. G. of Nathan and Berlin (1959). We have observed this change after splenectomy in other myeloproliferative disorders in the absence of haematological deterioration. During the three months following operation in Case 2 reported here, the liver enlarged considerably and an obstructive-type jaundice was present for the last month of life. Necropsy was not allowed, and the pathology of this jaundice is unknown. It remains to be seen whether the possibility of subsequent liver damage should contraindicate splenectomy in this condition.

A brief consideration of the theoretical implications of our findings is appropriate. The relationship between the spleen and the bone-marrow remains obscure, and the relative roles of red-cell hypersequestration and marrow inhibition by the spleen are still debated (Doan, 1949; Dameshek, 1955). It is difficult to interpret the results obtained in these two patients wholly in terms of splenic hypersequestration of red cells. The increased red-cell production after splenectomy implies splenic inhibition of erythropoiesis. This finding lends support to the view that the spleen may not only be an important site of red-cell destruction, but may on occasion simultaneously limit effective red-cell production.

Summary

In two cases of myelofibrosis splenectomy was followed by considerable haematological improvement.

Evidence was obtained that erythropoiesis was increased after splenectomy in each case. The significance of this finding is discussed.

The indications for and against splenectomy in myelofibrosis are still uncertain, but it is premature to conclude that the operation is never indicated in this condition.

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EFFECT OF AN ANTIBACTERIAL NASAL CREAM ON NASAL COLONIZATION AND INFECTION IN THE NEWBORN

BY

R. F. JENNISON, M.D., M.R.C.P.

Consultant Pathologist

AND

G. M. KOMROWER, F.R.C.P.

Consultant Paediatrician

St. Mary's Hospitals, United Manchester Hospitals.
Manchester

The increasing incidence of staphylococcal infections in maternity hospitals has become a matter of some concern. Although most of the infections which occur in babies in hospitals are superficial and mild, severe infections—for example, pneumonia and pemphigus—may arise, and some may also develop after the baby has left hospital—for example, osteomyelitis. Similarly, severe staphylococcal infections are not common in parturient women while in hospital but may develop later—for example, breast abscess.

If the number of staphylococci in the environment could be lowered an appreciable reduction in the number of lesions due to these organisms might be found. A high proportion of babies' noses become colonized with staphylococci during the first few days of life (Cunliffe, 1949; Parker and Kennedy, 1949; Cook *et al.*, 1958; Gillespie *et al.*, 1958). Not only may this colonization lead to infections in hospital but a large proportion of babies may leave hospital carrying pathogenic staphylococci, which may give rise to serious sepsis in the baby or in the mother during the weeks after discharge. These staphylococci are often retained for many months (Ludlam, 1953; Hurst, 1957).

It has been shown that the use of an antibiotic nasal cream by the hospital staff reduces the incidence of staphylococcal cross-infection in a ward (Gould and Allan, 1954; Rountree *et al.*, 1956), but the routine use of a nasal cream by hospital staff presents considerable administrative difficulties. It was decided, therefore, to carry out a trial of the application of an antibacterial nasal cream ("naseptin") to the anterior nares of babies from birth and to study the effect on nasal colonization and on the incidence of infection.

Methods

The wards in which the investigation was carried out are large and old-fashioned, holding 14 to 16 beds; there are very few side-rooms, and the facility for isolation of mother and child is limited. The nurseries hold up to 15 cots, and the babies remain therein, apart from feeding-times and a period of five hours each day which they spend with their mothers. Masks are not worn by the paediatric nursing and medical staff nor by the mothers. The cord is tied with sterile ligatures, and

sterile collodion is applied to the cut stump, which is treated twice daily with 1% chlorhexidine in 90% spirit. The babies are bathed on the fourth day, and thereafter on alternate days until discharge from hospital, care being taken to keep the cord dry.

Groups of babies had cream containing 0.1% chlorhexidine hydrochloride and 0.5% neomycin sulphate (naseptin) applied to the anterior nares once daily by means of a glass rod of 5 mm. diameter. Swabs were taken within 24 hours of birth and on the fourth and eighth days, in order to show the effect on the rate of colonization. Swabs were taken 24 hours after the last application of cream. Swabs were also taken from a comparable group of babies without the application of cream. In a further group the mothers also used the antibacterial cream.

All the swabs were plated on to agar plates containing 0.01% phenolphthalein diphosphate and phosphatase-positive colonies subcultured for further investigation. (The term staphylococci in this paper refers to coagulase-positive *Staph. aureus*.) Broth or agar containing 10% NaCl was not used. The incorporation of 0.1% lubrol in the agar was not found to increase the number of staphylococci isolated, and was discontinued after a trial period.

Swabs were also taken from all lesions which developed in the babies while in hospital, and the infections referred to later are only those from which staphylococci were isolated.

The incidence of infections in mothers and babies after leaving hospital was determined either by health visitors or by a postal questionnaire at two months.

Most of the staphylococci isolated from carriers were sent for phage-typing in order to determine more accurately the relationship between the staphylococci isolated from various sites and individuals.

Results

Initially there were 132 babies in the control group and 113 in the group in which nasal cream was used.

Fig. 1.—Effect of nasal cream on the carriage rate of babies and mothers.

TABLE I.—Infections in Babies in Hospital and During First Two Months after Leaving Hospital Related to Application of Nasal Cream

	No. of Babies	Infections in Hospital		No. of Babies	Infections After Discharge		Total %
		No.	%		No.	%	
No cream	113	13	11.6	98	23	23.5	35.1
Cream	108	8	7.4	105	13	12.4	19.8

Staphylococci were found in 2.5% of babies in the first 24 hours after birth, but thereafter colonization was rapid in the control group, so that one half showed staphylococci on the fourth day and 88 babies (67%) were positive on the eighth day. When the nasal cream was used only 21 (18%) of the babies' noses had been colonized by the eighth day (Fig. 1).

During their stay in hospital the proportion of mothers who carried staphylococci did not rise, being 29% on admission, 27.5% on the fourth day, and 29% on discharge; but the use of the nasal cream by the mothers steadily reduced the carrier rate to 16.5% on the fourth day and 3.2% on discharge (Fig. 1). In a group of babies whose mothers also used the nasal cream there was no further effect on the colonization of the babies' noses.

In the control group 13 (11.6%) out of 113 babies developed staphylococcal lesions while in hospital, as compared with 8 (7.4%) out of 108 in the treated babies. Of the 98 babies in the control group who were followed up after discharge from hospital, 23 (23.5%) reported an infection, whereas in the treated group only 13 (12.4%) out of 105 developed lesions (Table I). As

Fig. 2.—Distribution of skin and conjunctival infections in babies while in hospital and during the first two months at home.

is shown in Fig. 2, the greater difference was in the number of conjunctival infections; these are high compared with other reports, as we have included all babies with discharge from the inner canthus but without actual conjunctivitis. Most of these infections cleared in 24 hours. If the incidence of infection is related to actual carriage of staphylococci in the nose this difference is emphasized (Table II).

Of the 389 staphylococci that were phage-typed, 231 belonged to group I and 87 to group III. The two most common types in group I were 52A and 29/52 or 29/52/80; together these two comprised 60% of the group I staphylococci. In group III, types 7/47/53/54+ and 77 together made up 56% of the group.

During the period of the trial these four types comprised 52% of the staphylococci obtained on the eighth day from various sites in babies, but only 27% in the case of the mothers. These four types formed 43% of the staphylococci isolated from members of the staff.

TABLE II.—*Infections in Babies in Hospital and During First Two Months after Leaving Hospital Related to Nasal Carriage of Staphylococci*

	No. of Babies	Infections in Hospital		No. of Babies	Infections After Discharge		Total %
		No.	%		No.	%	
Carriers ..	107	14	13.1	92	22	23.9	37.0
Non-carriers ..	109	6	5.5	102	12	11.7	17.2

Discussion

The association between nasal carriage of staphylococci and septic lesions has been known for some years—for example, industrial wounds (Williams and Miles, 1949), recurrent furunculosis (Valentine and Hall-Smith, 1952), and recurrent styes (Roodyn, 1954). Little has been done to control staphylococcal cross-infection routinely by preventing and clearing nasal colonization, although there have been a number of reports of the effect of nasal clearance as an emergency method during epidemics—the local application of an antibiotic nasal cream being the most common method employed. Gould and Allan (1954) and Rountree *et al.* (1956) have shown that a considerable reduction in staphylococcal cross-infection can be obtained by the nasal treatment of hospital staff. Gould and Cruickshank (1957) showed that by reducing nasal carriage in individuals recurrent lesions due to staphylococci were greatly reduced. Gillespie and Adler (1957) reported that the use of a nasal cream by staff and patients in a children's hospital was effective in controlling an epidemic of infections due to *Staph. pyogenes* type 80. Klein and Rogers (1959) and Wilkinson (1959), using a nasal cream, and Baker and Christie (1959), using nasal antibiotic drops, have reported similar success in maternity hospitals.

Since we began our investigation Weinstein (1959) has shown that nasal colonization often precedes the infection of wounds, and Williams *et al.* (1959) have demonstrated that the incidence of wound sepsis in a surgical ward was only 2% in non-carriers, whereas it was 7.1% in carriers. In about half of these infections the same staphylococcus was found in the nose and the wound. But Williams *et al.* also showed that 35% of the carriers of the more virulent staphylococci, as determined by phage-typing, developed wound sepsis, and all these wound infections were due to staphylococci of the same type as those in the nose; similar results were obtained in patients who developed sepsis at other sites. They suggest that the incidence of infection might be reduced if nasal colonization could be prevented, although Weinstein had little success with this method.

The problem with the newborn is slightly different, as they are almost always born free of staphylococci, and the aim must be to prevent their becoming colonized with hospital staphylococci, some of which are potentially more dangerous and often more resistant to antibiotics. Although a number of babies who are discharged from hospital free from staphylococci will acquire them later, there is a much greater chance that these staphylococci will be of a less virulent and less resistant type and therefore less likely to cause severe sepsis.

In the trial reported here, 67% of the untreated babies became nasal carriers by the eighth day. This proportion is a little lower than that reported by Cunliffe (1949), Parker and Kennedy (1949), Cook *et al.* (1958), and Gillespie *et al.* (1958), but the use of the antibacterial nasal cream was effective in reducing the carriage rate to less than one-third—namely, 18%. There was also a considerable reduction in the number of conjunctival infections due to staphylococci in the treated group. The decrease in infections was also apparent during the two months after discharge from hospital (Fig. 2). Although most eye infections are themselves of little consequence they represent a form of colonization and allow transfer of hospital staphylococci to the home. When the incidence of infections is related to actual nasal carriage (Table II), the difference in infection rates is more obvious, being more than twice as high in carriers than in non-carriers. This ratio is very similar to that found in the newborn by Manfield *et al.* (1960) and in surgical patients by Williams *et al.* (1959).

Further evidence to show the importance of nasal carriage can be obtained from the phage-types in this series. Four types—52A, 29/52 or 29/52/80, 7/47/53/54+, and 77—formed 52% of the staphylococci isolated from carrier sites on the babies. During 1959, 133 staphylococci from various lesions were typed, and 54% were found to belong to these four types.

Although the carrier rate amongst the mothers remained stationary at 29%, the type of staphylococci changed, as was noted by Barber *et al.* (1953). Within 24 hours of delivery 18% of the maternal staphylococci belonged to the most common types present in the hospital during the relevant period, but by the eighth day the figure had risen to 27%. This change is not so marked as that found by Barber *et al.*—an increase of from 6% to 35% in type 52A—but their patients were swabbed on admission, whereas ours were swabbed after delivery and had been in contact with hospital staff for a variable period of time.

For many years it has been thought that the staphylococcus causing breast abscesses most often comes from the baby's and not the mother's nose (Colbeck, 1949; Cook *et al.*, 1958; Knight and Nolan, 1959), although the evidence for this statement is not always unequivocal. However, Wilkinson (1959) has shown that in 40 cases of breast abscess a staphylococcus of the same phage-type was present in 27 of the corresponding babies' noses. Unfortunately, the six patients with a breast abscess in our series were seen at other hospitals and no pus was obtained; but an abscess occurred in five mothers of babies in the control group, and four of these babies were carriers of staphylococci on discharge.

There have been a number of reports on methods for the prevention of colonization of babies' noses. Baldwin *et al.* (1957) found that hexachlorophane baths provided the best method of reducing nasal colonization. Cook *et al.* (1958) compared results with chlorhexidine hand-cream, sterilized bedding, individual gowns, and triple dye painted on the umbilicus. The last method was the most effective, but reduced nasal carriage only from 100% to 69%. Gillespie *et al.* (1958), while using hexachlorophane dusting powder, noted that nasal colonization was reduced by one-half to 40%. Manfield *et al.* (1960) compared triple dye alone, triple dye combined with ultra-violet irradiation of the nursery, and triple dye combined with daily hexachlorophane baths. The first two methods reduced colonization to 65% and the third to 55%.

It is apparent that the application of an antibacterial cream to the anterior nares is the best method of reducing colonization in newborn infants. Gould (1955), using an antibiotic cream, reduced the carriage rate in adults to 25%, but the use of an antibiotic likely to produce resistant strains is a disadvantage. Baker and Christie (1959) used neomycin drops in infants with good clearance, and this antibiotic has the advantage of not adversely affecting the general sensitivity patterns although resistance to neomycin itself has been described (Quie *et al.*, 1960). We have used a combination of neomycin and chlorhexidine, with a reduction in nasal carriage rate to 18% in babies and 3.5% in mothers and a marked reduction in the infection rate. No harmful effects were noted during the trial, and *in vitro* observations have not shown any resistance to neomycin when it is combined in this manner with chlorhexidine (K. G. Green, personal communication, 1960).

The recent work of Gillespie *et al.* (1958), Simpson *et al.* (1960), and Corner *et al.* (1960), using hexachlorophane dusting powder, suggests that a combination of both methods might be of further benefit, and such a trial is now in progress.

Summary

A trial of combined neomycin/chlorhexidine nasal cream ("naseptin") was carried out in an attempt to reduce nasal colonization by staphylococci in newborn infants and mothers in a maternity hospital.

There was a definite reduction of nasal colonization in both groups.

The incidence of infections both in hospital and in the two-months period after discharge was appreciably reduced, more particularly in the group who were not nasal carriers of staphylococci.

The majority of the staphylococci that were phage-typed belonged to group I.

It is suggested that daily use of nasal cream combined with regular powdering with an antiseptic dusting powder might produce a further fall in colonization and infection in the newborn period.

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SECRETION OF ABH ANTIGENS IN PEPTIC ULCERATION AND GASTRIC CARCINOMA*

BY

EDWIN NEWMAN, B.S.

GEORGE S. NAIFEH, B.S.

JAMES E. AUER, B.S.

AND

JOSEPH A. BUCKWALTER, M.D.

*From the Department of Surgery, College of Medicine,
State University of Iowa*

Various hypotheses have been proposed to explain the association of the ABO blood groups with disease processes. Best-established are the association with peptic ulceration characterized by an increased group O frequency and that for gastric carcinoma characterized by an increased group A frequency (Buckwalter *et al.*, 1958). Perhaps the most plausible explanation for the associations with peptic ulceration and gastric carcinoma is that the mucopolysaccharide ABH blood-group substances which are secreted into the gastrointestinal tract protect the mucous membrane against ulcerogenic and carcinogenic agents (Aird *et al.*, 1954). This is a report of a study of secretion of mucopolysaccharide blood-group substance in peptic ulcer and gastric carcinoma patients.

Materials and Methods

Since 1956 peptic ulcer and gastric carcinoma patients admitted to the University of Iowa and Iowa City Veterans Administration hospitals have provided clinical material for this study. The diagnoses have been established on morphological grounds in all patients with gastric carcinoma and in two-thirds of those with peptic ulcer; and in the remainder on the basis of a typical history with positive upper gastro-intestinal x-ray studies. Blood and saliva samples and relevant history have been obtained for each patient. A qualitative determination of the ABH substance in saliva has been done, employing the isohaemagglutination test, using anti-H substance prepared from seeds of *Ulex europaeus*, and A and B antisera. Controls have been provided by a random sample of hospital personnel and patients with diagnoses other than those being studied. The differences between the secretor and non-secretor percentages of the patients and the controls have been examined for statistical significance by the chi-square (χ^2) method.

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