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PATHOGENIC STAPHYLOCOCCI IN THE ENVIRONMENT OF THE NEWBORN INFANT

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Improved hygiene and the development of potent antibacterial agents have been responsible over recent years for a considerable reduction in the amount of neonatal infection, particularly infection of the alimentary and respiratory tracts. Staphylococcal infection of the newborn, especially in hospital, is, however, still a problem, and the marked tendency of the staphylococcus to acquire resistance to antibiotics has retarded its control and increased its relative importance.

The objects of the present investigation are to report and compare the carriage rates and antibiotic resistance of staphylococci in three maternity hospital units of different types; to compare these hospital results with corresponding data obtained from domiciliary confinements; to correlate staphylococcal carriage with clinical infection; and to study the mode of spread of the organism between mothers, babies, and hospital staff.

Materials and Methods

The hospital units concerned are (a) a maternity unit adapted from an old building, somewhat crowded and part of a general hospital (hospital W); (b) a newer and more spacious unit, also part of a general hospital, with better facilities for isolating infected patients (hospital E); and (c) a small self-contained maternity hospital with adequate accommodation situated in the country (hospital M). The period of the investigation was from March to July, 1952.

Altogether 608 vaginal swabs and 701 nasal swabs taken on admission from 770 mothers in these three hospital maternity units and 44 nasal and 44 vaginal swabs from mothers confined at home were examined for the presence of pathogenic staphylococci, and their sensitivity to four antibiotics and to sulphonamide was determined. Specimens taken from the offspring of these mothers included 683 conjunctival and 639 umbilical swabs, from a total of 774 babies. Eye swabs (E₄) were taken four days after delivery of the infant, since it has been shown that the carrier rate reaches its maximum about this time (Torrey and Reese, 1945). Umbilical swabs (U₈) were taken as soon as the cord had separated—that is, about the eighth day after birth. From the medical, nursing, and domestic staff attending these cases during the period of the survey, 245 nasal swabs were examined.

In order to ascertain whether mothers acquired pathogenic staphylococci while in hospital, 293 nasal and 297

vaginal swabs taken approximately eight days after admission were examined in addition to those taken on admission.

Swabs were plated out on nutrient agar within 24 hours and the plates incubated at 37° C. for 18 to 24 hours. The resulting growths were tested for coagulase production and if positive were tested by the disk technique of Gould and Bowie (1952), modified as described by Forfar *et al.* (1953), for sensitivity to chlortetracycline ("aureomycin"), chloramphenicol, penicillin, streptomycin, and "soluthiazole" (a soluble derivative of sulphathiazole). Four different possible results were recognized—3 (highly sensitive); 2 (moderately sensitive); 1 (slightly sensitive); 0 (resistant). The approximate relationships between these conventions and (1) the coefficient of resistance, and (2) the minimum inhibitory concentration, are given in the paper by Forfar *et al.* (1953). We used the drug-resistance pattern as a means of identifying or labelling an organism. Because of the margin of error in all sensitivity-testing techniques, however, the following methods were used in labelling organisms according to their reactions to the five drugs concerned:

(1) For the purpose of overall "resistance patterns" as given in Tables II-VI the organisms were labelled as either "sensitive" or "resistant." Thus grades 3 and 2 were grouped together as "sensitive" and grades 1 and 0 as "resistant."

(2) In comparing one individual organism with another, as is done in Table VIII, a difference of more than one grade of sensitivity was required in order to distinguish two strains as different. Thus a strain giving grades 3, 2, 3, 0, 3 for the respective drugs was considered to have the same sensitivity pattern as one giving grades 3, 2, 3, 0, 2, since only one degree of difference was present in respect of the last drug. A strain giving the pattern 3, 2, 3, 0, 1 would, however, be regarded as definitely different from the first-mentioned strain. This differentiation is made on the assumption that only in a very small proportion of strains could mutation occur in the short period during which specimens were taken from a mother and/or baby.

(3) Where comparison with the results of previous workers is involved, resistance rates include only those organisms giving complete *in vitro* resistance—that is grade 0.

While this method of labelling lacks the precision of serological and phage-typing methods, it does enable recognition of different strains to be achieved with a high degree of probability, although two strains giving the same pattern may not necessarily be identical. The disk-diffusion technique has, too, the advantage that it enables a large number of tests to be quickly performed, so that the numbers large enough to give statistically significant results may be readily obtained.

Where two percentages are compared, the difference between them is said to be significant when the observed difference is more than two and a half times the standard error of the difference.

Results

Carriage rates for coagulase-positive staphylococci are given in Table I for the three hospital units and for the domiciliary cases investigated. It will be seen that the carriage rate for the first-day vaginal swabs for the combined hospitals (3.5%) rose by the eighth day of stay in hospital to 10.8%. This is a statistically significant increase, but there is no corresponding rise in the maternal nasal carriage rate, nor is there any significant difference between the nasal carriage rates of mothers at home and in hospital.

The vaginal carriage rate of the mothers at the time of delivery is so low that vaginal contamination cannot be a significant source of infection of the infant.

Both the E₄ and U₈ staphylococcal carriage rates for babies born at home are significantly less than those for hospital-born babies. This is despite the fact that the carriage rate for the domiciliary nursing staff is the same high figure (55 to 56%) as that for the hospital W staff (where in fact the domiciliary nurses are accommodated) and shows that the domiciliary nursing staff did not pass on their staphylococci to any extent to babies born at home.

The highest carriage rate shown in Table I is the hospital staff nasal carrier rate (51% for the combined hospitals), but the U₈ rate approaches nearly to this level.

In Table II, for the combined hospitals, the antibiotic-resistance patterns of staphylococci from various sites on mother, baby, and nursing staff are shown. It will be noted that in parallel with the lower carriage rate for the mothers there is a lower incidence of drug resistance among the staphylococci carried by them. Among the staphylococci isolated from the babies and from the nursing staff penicillin resistance is of a high order. A fairly close resemblance is seen between the antibiotic-resistance patterns of staphylococci from the babies and staff, but there is an obvious difference between these staphylococci on the one hand and those of the mothers on the other.

Table III sets out the consolidated totals of coagulase-positive staphylococci isolated from mothers, from routine carriage swabs from babies (E₄, U₈), from clinical infections of babies, and from nursing staff subgrouped according to

TABLE I.—Carriage Rates for Coagulase-positive Staphylococci

Specimens		Hospital			Total	Domiciliary
		W	E	M		
1st-day swabs from mothers:						
Nasal ..	C.R. %	30.4	25.6	31.7	28.7	22.8
	N.S.	303	278	120	701	44
Vaginal ..	C.R. %	2.8	4.0	3.3	3.5	0
	N.S.	214	273	121	608	44
8th-day swabs from mothers:						
Nasal ..	C.R. %	37.0	27.3	22.2	30.7	
	N.S.	127	121	45	293	
Vaginal ..	C.R. %	7.8	14.9	8.3	10.8	
	N.S.	128	121	48	297	
Eye swabs from 4-day-old babies	C.R. %	32.8	44.5	16.0	35.3	5.0
	N.S.	262	281	100	643	40
Umbilical swabs from 8-day-old babies	C.R. %	53.5	25.0	52.7	40.1	8.6
	N.S.	226	283	95	604	35
Staff nasal swabs	C.R. %	56.3	51.5	40.4	51.3	55.6
	N.S.	96	93	47	236	9

C.R. = Carriage rate. N.S. = No. of swabs taken.

TABLE II.—Antibiotic-resistance Patterns in Combined Hospitals: W, E, and M

Specimens	% Coagulase-pos. Staph. Resistant to					Total Coag.-pos. Staph.
	Sulphonamide	Chlortetracycline	Chloramphenicol	Penicillin	Streptomycin	
1st-day swabs from mothers:						
Nasal ..	4.1	1.4	2.7	19.4	0	22.2
Vaginal ..	14.3	4.8	4.8	28.6	9.5	21
8th-day swabs from mothers:						
Nasal ..	8.7	1.1	1.1	29.3	2.2	92
Vaginal ..	11.4	2.9	2.9	51.5	5.7	35
Eye swabs from 4-day-old babies	19.2	3.4	11.7	76.2	12.5	239
Umbilical swabs from 8-day-old babies	27.4	3.8	5.3	80.3	9.9	263
Staff nasal swabs	19.3	2.4	7.3	74.2	4.0	124
Clinical infection swabs from babies	17.0	10.6	8.5	85.0	8.5	47

TABLE III.—Comparison of Resistance Patterns of Staphylococci from Mothers, Babies, and Staff in the Combined Hospitals W, E, and M

	Coagulase-pos. Staph. Resistant to					Total Coag.-pos. Staph.	Total Swabs
	Sulphonamide	Chlortetracycline	Chloramphenicol	Penicillin	Streptomycin		
Mothers ..	24	6	9	94	6	370	1,899
Babies (carriage) ..	118	18	42	393	56	502	1,247
Babies (clinical infections) ..	8	5	4	40	4	47	87
Staff ..	24	3	9	92	5	124	236

TABLE IV.— χ^2 Analysis of 'Strains Resistant and Sensitive to Drugs in Left-hand Column, Data Shown in Table III

χ^2	Mothers, Babies (Carr.), Babies (C.I.), Staff	Babies (Carr.), Babies (C.I.), Staff	Mothers, Babies (Carr.)	Mothers, Babies (C.I.)	Mothers, Staff	Babies (Carr.), Babies (C.I.)	Babies (Carr.), Staff	Babies (C.I.), Staff
Sulphonamide P=	42.8 <0.001	1.80 0.42	44.5 <0.001	6.59 0.01	8.9 0.005	1.04 0.30	0.93 0.35	0.13 0.73
Chlortetracycline P=	12.0 0.009	6.58 0.04	2.97 0.09	13.8 <0.001	0.33 0.62	5.30 0.02	0.40 0.53	5.16 0.02
Chloramphenicol P=	14.1 0.005	0.17 0.92	13.8 <0.001	4.76 0.03	6.13 0.01	0.004 0.97	0.16 0.90	0.07 0.80
Penicillin P=	276.7 <0.001	2.47 0.29	242.2 <0.001	68.8 <0.001	94.0 <0.001	0.43 0.15	0.92 0.35	2.28 0.13
Streptomycin P=	33.5 <0.001	5.85 0.06	20.2 <0.001	8.8 0.005	2.9 0.10	0.31 0.60	5.71 0.02	1.32 0.25
$\Sigma\chi^2$	379.1	16.87	323.67	102.75	112.2	7.084	8.12	8.96

their antibiotic resistance. In Table IV the χ^2 test has been applied to these figures, and in each case antibiotic resistance has been the character tested. The test has been applied to the group comprising mothers, babies (carriage), babies (clinical infections), and staff; to this group with the mothers omitted; and to the six possible pairings within the group. It will be seen that with the group comprising mothers, babies (carriage), babies (clinical infections), and staff high χ^2 values are obtained, and there is, therefore, a very low probability of similarity between the members of the group; whereas, when the mothers are left out, relatively low χ^2 values are obtained, hence there is a very much higher probability that the organisms from the group comprising babies (carriage), babies (clinical infections), and staff are similar. This is shown even more clearly when the summed χ^2 from mothers, babies (carriage), babies (clinical infections), and staff is compared with the summed χ^2 from babies (carriage), babies (clinical infections), and staff.

In other words, there is a very close similarity between those staphylococci carried on the baby, those isolated from clinical infections of the baby, and those carried by the staff, but no relationship between the mothers' staphylococci on the one hand, and those from the babies (carriage and clinical infections) and staff on the other. It is thus highly probable that there is a free interchange of staphylococci between the nursing staff and babies, and between one baby and another, but mothers seem not to be a significant source of infection to the infant.

This is further confirmed when the χ^2 test is applied to individual pairs—that is, mothers/babies (carriage), mothers/babies (clinical infections), mothers/staff, staff/babies (carriage), staff/babies (clinical infections), and babies (carriage)/babies (clinical infections). Again the high χ^2 values (and therefore low probability of similarity) obtained in comparing the mothers' organisms with those from the babies and nursing staff contrast with the low χ^2 values (and therefore high probability of similarity) obtained on comparing staff and babies (carriage and clinical infections), and babies (carriage) and babies (clinical infections).

Table V shows no significant difference in drug-resistance patterns between hospitals W, E, and M, but shows that domiciliary staphylococci gave a lower penicillin-resistance rate of 23% as compared with 65 to 76% for the hospitals.

TABLE V.—Comparison of Resistance Patterns in Hospitals W, E, and M, and in the Home (Pooling Hospital Results from Mothers' 8th-day Swabs, Babies' Swabs, and Staff Swabs; and All Domiciliary Swabs)

Hosp-ital	% Coagulase-pos. Staph. Resistant to					Total Coag.-pos. Staph.
	Sulphonamide	Chlortetracycline	Chloramphenicol	Penicillin	Streptomycin	
W ..	19.3	3.3	7.9	74.7	8.2	367
E ..	17.7	8.1	8.1	65.7	9.9	323
M ..	30.8	6.4	1.8	76.4	6.4	110
Total Home	20.2 23.5	3.6 0	7.1 0	71.3 23.5	8.6 11.8	800 17

Although this is not statistically significant, owing to the small numbers of *Staphylococcus pyogenes* isolated from domiciliary cases in the series, the difference is highly suggestive and reflects the well-known fact that staphylococcal penicillin-resistance rates are much lower among the general population than in hospitals.

Table VI compares the resistance patterns of babies' staphylococci (from E₄ and U₈ swabs) in the three units. Apart from a somewhat higher incidence of sulphonamide

TABLE VI.—Comparison of Resistance Patterns in Hospitals W, E, and M of Babies' Staphylococci (E₄ plus U₈)

Hosp-ital	% Coagulase-pos. Staph. Resistant to					Total Coag.-pos. Staph.
	Sulphonamide	Chlortetracycline	Chloramphenicol	Penicillin	Streptomycin	
W ..	20.7	4.0	9.7	77.6	11.0	227
E ..	22.1	2.0	9.3	77.6	12.8	204
M ..	38.3	8.8	1.5	86.8	7.4	68

resistance in hospital M than in hospitals W and E, no significant difference is seen between the figures for the three hospitals.

Table VII shows the incidence of septic eye and skin infections in the various hospitals and the combined incidence for the hospitals. There is no significant difference between the total infection rates in the three units, but among these infections eye infections occurred significantly more often in hospital M (92% of infections occurred in the eye) than in hospital W (52% of infections), while, correspondingly, skin sepsis was significantly lower in hospital M (8% of infections) than in hospital W (48% of infections). The proportion of clinical infections in which *Staph. pyogenes* was isolated was lower in hospital M (35%) than in hospital W (59%) or hospital E (50%).

The ratio *Staph. pyogenes* sepsis rate/*Staph. pyogenes* carriage rate was 1/4.6 for hospital W, 1/5.5 for hospital E, and 1/5.8 for hospital M, when E₄ and U₈ swabs and sepsis of the skin and conjunctivae are included. Although hospitals W and E showed similar ratios for eye-sepsis rate/eye-carriage rate and for skin-sepsis rate/umbilical-carriage rate, hospital M showed a relatively high ratio for the former and a relatively low ratio for the latter. Thus the rate of infection and the rate of carriage do not always run parallel to each other.

Table VIII shows the comparison in sensitivity patterns between staphylococci isolated from each member of 125 mother/baby pairs. In 34% of these pairs the two strains concerned had the same patterns of sensitivity to the five drugs used in the tests; that is to say, they could have been the same organism, though it does not necessarily follow that they were; in the remaining 66% the two strains had different sensitivity patterns and were therefore not the same. One can conclude from this that the majority of babies acquire staphylococci from a source other than their mothers. In view of the very much higher carriage rate on

TABLE VII.—Incidence and Bacteriology of Clinically Recognizable Infections in Babies

Hospital	Total Admissions to Baby Nurseries During Period of Investigation	Clinical Infections, with Percentage of Total Admissions			Bacteriological Investigation of Clinical Infections. Percentages are of Number of Swabs Taken			
		Conjunctivitis	Skin Sepsis	Total	Coag.-pos. Staph. Isolated	Coag.-neg. Staph. or Other Organisms Isolated	No Organisms Isolated	No Swab Taken
W ..	326	26 (8.0%)	24 (7.4%)	50 (15.4%)	26 (59%)	11 (25%)	7 (16%)	6
E ..	349	32 (9.2%)	13 (3.7%)	43* (12.3%)	14 (50%)	7 (25%)	7 (25%)	15
M ..	141	22 (15.6%)	2 (1.4%)	24 (17.0%)	6 (35%)	6 (35%)	5 (29%)	7
Total ..	816	80 (9.8%)	39 (4.8%)	117 (14.3%)	46 (52%)	24 (27%)	19 (21%)	28

* Two patients had both conjunctivitis and skin sepsis.

TABLE VIII.—Comparison, by Sensitivity Patterns, of Coagulase-positive Staphylococci from Mother and Child, and of Strains From Two Sites in the Same Infant

	Hospital	Where 2 Strains Had Same Sensitivity Pattern, i.e., Could be Same	Where 2 Strains Had Different Sensitivity Patterns, i.e., Strains Not Same
Mother/baby pairs where a coag.-pos. staph. was isolated from at least one swab from mother and baby	W	25	36
	E	16	29
	M	2	17
	Total	43 (34%)	82 (66%)
Normal babies in whom a coag.-pos. staph. was isolated from both eye and umbilicus	W	15	16
	E	19	15
	M	7	5
	Total	41 (54%)	36 (46%)
Babies in whom a coag.-pos. staph. was isolated both from a septic lesion and from another clinically unaffected site	W	10	10
	E	6	4
	M	1	4
	Total	17 (49%)	18 (51%)

baby than on mother, however, it may be that to an appreciable extent the mother acquires her staphylococci from her infant.

Table VIII also shows that, where organisms were isolated from two sites on the same baby, on only half of the occasions could these have been the same organism. This was equally true whether one of the sites was clinically infected or not. One should therefore not assume that a staphylococcus isolated, for example, from the skin is the same as that causing infection elsewhere in the body. Specimens for examination for drug sensitivity should be taken from each available locus and reported on separately.

Discussion

The coagulase-positive staphylococcal carriage rates for mothers' nasal swabs of 28.7% (first day) and 30.7% (eighth day) obtained in this series compare with the rates of 21% given by Torrey and Reese (1945), 28% by Parker and Kennedy (1949), 42.6% by Rountree and Barbour (1950), and 36% by Ludlam (1953). No significant increase occurred either in the carriage rate or the penicillin-resistance rate of staphylococci isolated from the nose between the first and eighth days of the mothers' stay in hospital. There was, however, a significant rise in the vaginal carriage rate during this period. The carriage rate in infants in hospital rose from presumably nil at birth to 35.3% by the fourth day of life (eye swabs), and to 40.1% by the eighth day (umbilical swabs). These are low figures compared with others previously published, yet a comparison with the figures for babies born at home (5% and 8.6% respectively for the fourth- and eighth-day specimens) demonstrates the great importance of the hospital environment in increasing the staphylococcal carriage rate of the newborn.

The low figures for carriage in babies born at home occurred in spite of the fact that they were attended by nurses from hospital W, who had the same high incidence of staphylococcal carriage as other hospital nurses. This shows that the limited contact occurring between domi-

ciliary nursing staff and the babies was relatively ineffective in spreading staphylococcal infection to these infants.

Other authors have given much higher figures for infant carriage of *Staph. pyogenes* after the fourth day of life—for example, 89% (Torrey and Reese, 1945), 100% (Cunliffe, 1949), 88.9% (Rountree and Barbour, 1950), and 75% (Barber *et al.*, 1953). We also gave a higher figure (60%) in a previous publication (Forfar *et al.*, 1953) for umbilical swabs from hospital W in 1951, and it may be that improved medical care and hygiene have contributed to this fall in staphylococcal carriage in infants. This decrease is not due to a reduction in numbers of staphylococci carried by the hospital staff, since their staphylococcal carriage rate has remained practically unchanged. Thus the present average figure of 51.3 for the combined hospitals compares with 64% given by Miles *et al.* (1944), 52% by Williams (1946), 58–68% by Barber *et al.* (1949), 54.5% by Rountree and Barbour (1950), 21–50% by Ludlam (1953), and 53% by Forfar *et al.* (1953).

On the other hand, the combined hospital rates for eye and skin sepsis in the present series (9.8% and 4.8% respectively) are high compared with some recently published figures—for example, 4.2% and 2.3% respectively given by Forfar *et al.* (1953), 9.2% and 3.6% by Barber *et al.* (1949), and 0.61% and 1.58% by Frazer (1948). It must be emphasized that the infections recorded in the present investigation were in the main trivial, and serious infection was entirely absent. The results were therefore similar in this respect to those of Barber *et al.* (1953), who reported high sepsis rates accompanied by an absence of serious infection. The apparent increase in the sepsis rates recorded in this series therefore reflects the increased care with which early mild infections were recognized and treated. We feel that early recognition and early and adequate treatment of all minor staphylococcal infection is an important factor in preventing more serious infection.

The incidence of complete penicillin resistance among hospital strains of *Staph. pyogenes* in the present series was 57.6%* for staff nasal swabs and 64.7%* for babies' fourth- and eighth-day swabs. The figure for nurses compares with 70 to 80% given by Barber *et al.* (1949), 64% by Rountree and Barbour (1950), 56% by Rountree and Barbour (1951), 75 to 85% by Ludlam (1953), and 30.7% by Forfar *et al.* (1953) for hospital W in 1951. The figure for babies compares with 90% given by Barber *et al.* (1953), and 64.4% by Forfar *et al.* (1953).

More than 90% of pathogenic staphylococci were still sensitive to chlortetracycline and chloramphenicol during the period of the present investigation, and almost as great a proportion were sensitive to streptomycin. The mean sulphonamide resistance percentage for all swabs was 16.8%, although in the case of hospital M babies the rate was as high as 38.3%.

Duncan and Walker (1942), Allison and Hobbs (1947), Parker and Kennedy (1949), Barber *et al.* (1949), and other authors, using serological and phage-typing methods, have shown that infection is usually conveyed in hospital maternity units from baby to baby, from staff to baby, or from blankets, dust, etc., to baby. This is borne out by the present investigation, since drug-resistance patterns

*Grade 0 only.

showed a considerable degree of uniformity among staphylococci from babies and staff, but no such uniformity between babies and staff on the one hand and mothers on the other.

The results for mother/baby pairs given in Table VIII are in keeping with the view that few infants are infected from their mothers. The actual proportion infected from this source must be much less even than the 34% of cases in which the two strains infecting mother and child could be the same. Some of these will have been different strains with the same sensitivity patterns, and even if they were identical there remains the likelihood that the mothers were infected from their babies and not vice versa.

The three maternity units W, E, and M were chosen because of the considerable differences between them—the crowded older buildings of hospital W contrasting with the more modern and spacious unit at hospital E and the separate maternity hospital M situated in the country. One would therefore have expected that staphylococcal carriage rates would have been higher in hospital W than in E or M, and that hospital W babies would have acquired more staphylococci from the nursing staff than in hospital E or M. In fact, however, staphylococcal carriage rates were at a similarly high level for the babies of all three units, and the resistance rates against the various drugs were similar for the staphylococci isolated from each of the three hospitals, with the exception of sulphonamide resistance, which occurred significantly more often in hospital M than in hospitals W and E (38.3% as against 20.7% and 22.1% respectively). Another point of similarity between the results from the three units was in respect of the ratio *Staph. pyogenes* sepsis rate/*Staph. pyogenes* carriage rate. Although hospital M showed differences where eye and skin sepsis/carriage ratios were examined individually, the overall ratio of 1/5.8 for hospital M compared with 1/5.5 for hospital E, and 1/4.6 for hospital W. There is thus no evidence in this investigation to show that the nature of the hospital buildings or their proximity or otherwise to other hospital departments had any effect on the spread of staphylococcal infection in the units concerned.

Summary

Over 51% of the members of the nursing, medical, and domestic staff in three Edinburgh maternity units were found to be carrying *Staph. pyogenes* in their anterior nares. Of these staphylococci, 58% were completely resistant to penicillin and nearly 20% were resistant to sulphonamide. Less than 10% were resistant to chloramphenicol, chlortetracycline, and streptomycin.

The staphylococcal carriage rates of the mothers admitted to, and babies delivered in, these units was determined. The mothers' vaginal carriage rate was 3.5% and their nasal carriage rate was 28.7%. Of these, only the vaginal carriage rate rose during an eight-day period.

The babies' eye carriage rate on the fourth day after delivery was 35.3% and the umbilical carriage rate on the eighth day was 40.1%. The corresponding carriage rates for babies born at home were 5% and 8.6%.

As between three different maternity units of different type there was little difference in the mothers, babies, and staff carriage rates.

There was a much higher incidence of penicillin-resistant strains among nurses and babies than among mothers, and among week-old babies born in hospital than among those born at home. Individual hospitals showed little difference in antibiotic-resistance rates.

A relatively high frequency of mild skin and conjunctival sepsis contrasted with a complete absence of serious infection in this series.

The great majority of infants acquired their staphylococci from sources other than their mothers, chiefly from the nursing staff and from other babies. Despite the fact that there was a high carriage rate among the nurses attending babies born at home the carriage rate on these babies remained low.

Where infants carried staphylococci on two different sites (eye and umbilicus), in approximately half the cases the staphylococci had different drug-sensitivity patterns.

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MANAGEMENT AND TREATMENT OF PATIENTS WITH COAL-WORKERS' PNEUMOCONIOSIS

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Coal-workers' pneumoconiosis is an important industrial disease. In 1947 it was estimated that there were about 16,000 certified cases in South Wales and at least an equal number uncertified (Hugh-Jones and Fletcher, 1951). Since then an increasing awareness of the condition and more frequent radiological examinations have led to more cases being revealed in other parts of Great Britain. The number of new cases certified each year in South Wales rose steadily from 44 in 1931 to 5,224 in 1945, but declined to 1,079 in 1953. In the rest of Great Britain the number has been rising steadily, passing the figure for South Wales in 1951, to reach 2,987 by 1953 (Ministry of Fuel and Power, 1954). It is therefore likely that an increasing number of practitioners who have not met the condition before may be asked for advice about it by patients who are or have been miners. Although there is no specific therapy, the reassurance derived from a better understanding of the condition can be a real help, and in the more disabled case treatment of symptoms and complications is both possible and often quite effective.

Questions about re-employment and compensation are likely to arise. This article therefore includes an