the main symptoms which cannot be absent in a case of schizophrenia provided the others, or some of the others, are present.

In view of this multiform symptomatology, numerous efforts have been made to establish one of the symptoms as the fundamental disturbance of schizophrenia. Although in each of these theories a certain core of truth is contained, none of them covers the facts with a satisfactory completeness.

General Qualities

There are, however, a few general and structural qualities of the schizophrenic picture which are of diagnostic value. The relative *clearness of consciousness* has been mentioned before. It can be present in states of severe motor excitement, in full-blown hallucinosis, and in deep stupor. The hallucinating schizophrenic who seems completely absorbed in his delusional world, but at the same time notes every detail in his real environment, is the classic example of this psychological picture which has been named "double orientation." It is perhaps not by pure chance that states of disturbance of consciousness like continuous sleep, hypoglycaemic coma, or epileptic fits seem to have some therapeutic effect on schizophrenia.

The *tendency to "splitting"*—that is, a non-systematic psychic disconnexion, from which the name of the illness was taken—is another structural character evident in most cases. Fragmentation may separate ideas from accompanying emotions, mimic expression from proper affect, and speaking from thinking, but also a complex of delusional ideas may be separated from the rest of the personality and emerge only on certain occasions.

It has been said that many schizophrenic symptoms have a quality of peculiar *psychological remoteness from normality*. They are so far from normal understanding that they cannot be described in ordinary language. One cannot imagine what is going on in the patient as one can, to some extent, in all other psychoses. Thus, the reaction of the non-schizophrenic to the schizophrenic can be used as a diagnostic test. At the same time—and this is diagnostically much more significant—the patient himself finds his absurdities not at all strange, but quite natural, rational, and understandable.

As a final general character the *detachment from reality* (Bleuler's "Autismus") has to be mentioned. It often appears as an active withdrawal of the patient from anything that may disturb his delusional world. In later stages of the illness, if favoured by supporting circumstances, it produces a grotesque mental isolation of the patients. In the beginning a detached superiority of the patient to everything that really matters to him may provide the keystone of the diagnosis.

B. Albrigo (*Rif. med.*, 1938, **54**, 1297) records two personal cases of aberrant vaccinia. The first was that of a woman, aged 25, vaccinated in infancy only and the subject of eczema of the vulva, who developed extensive vaccinia of the external genitals, perineum, and anal region. Infection in this case was probably due to her having scratched the eczematous lesions after attending to her recently vaccinated child. Subsequent vaccination on the arm had a negative result. The second case was that of a man, aged 38, who had been vaccinated in infancy and again at 18 years of age and was the subject of peri-anal eczema. The vaccinial nature of the peri-anal lesions in his case was shown by the production of a typical vaccinial keratitis after inoculation of the cornea of a rabbit.

INCIDENCE OF PATHOGENIC STAPHYLOCOCCI IN THE NOSE

BY

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It has been suggested that a factor in the chronicity of some cases of furunculosis and osteomyelitis is the transference of pathogenic staphylococci by the patient's fingers from the nose to the skin or wound. Dolman (1935) found that staphylococci were present in the nose of nine patients with nasal sinusitis and also in the apparently healthy nose of several patients with staphylococcal infections elsewhere. Valentine (1936) obtained cultures of *Staphylococcus aureus* from the healthy nose of fourteen of eighteen cases of chronic furunculosis. In six out of seven of these strains the toxin production (α-haemolysin and Panton-Valentine leucocidin) was comparable to that of the strain isolated from the lesion elsewhere. Apart from the possibility of reinfection of a superficial lesion it is conceivable that pathogenic staphylococci in the nose may sometimes gain access to the blood stream and give rise to an acute osteomyelitis or a perinephric abscess. Thus it is of interest to gain an idea of the incidence of pathogenic staphylococci in the nose of individuals who are free from staphylococcal infection.

Individuals Studied and Methods Employed

During February and March, 1938, nasal swabs were taken from 101 undergraduates aged 18 to 22, thirty-three children in hospital aged 7 months to 16 years, and thirty-one adults in hospital aged 19 to 75 years. None of these had or had recently had a staphylococcal or nasopharyngeal infection.

The nostrils were swabbed through the anterior nares with sterile cotton-wool swabs mounted on a probe. Since the work of Thomson and Hewlett (1895) it has been agreed that, in a healthy nose, cultures from the walls of the nasal cavities proper yield relatively few organisms, while the vestibule, the vibrissae, and crusts of dried secretion yield a plentiful and varied growth (Küster, 1929; Cruickshank and Cruickshank, 1931). From the point of view of a possible source of infection of the patient's fingers it is the vestibule which might be important, so that it is no disadvantage in this investigation that the majority of the organisms obtained on the swabs came from that source.

A swab from each nostril was smeared directly on half an agar plate. The plates were incubated at 37° C. for twenty-four hours. Films were made of suspicious colonies, and when staphylococci were found two or three representative colonies were subcultured into a broth tube. When both *aureus* and *albus* were present colonies of each were examined. The broth cultures were incubated at 37° C. in an atmosphere of 30 per cent. carbon dioxide for forty-eight hours. After centrifugation the supernatant fluid was tested for α-haemolysin by diluting 0.1 c.cm. with 0.4 c.cm. saline, adding 0.5 c.cm. of a 2 per cent. suspension of thrice-washed rabbit red cells and incubating at 37° C. for an hour. A control tube containing 1 unit of antitoxin was set up for each fluid. In a few cases where haemolysis occurred in the control tube, proof that the α-haemolysin was responsible was obtained by showing that the antitoxin neutralized

a greater dilution of the fluid. A loopful of the sedimented cocci was inoculated into a sterile stoppered tube containing 0.5 c.cm. of a 1 in 5 dilution of human oxalated plasma in saline. The presence or absence of coagulation was noted after three hours' incubation at 37° C. and confirmed after the tubes had stood on the bench overnight. One per cent. mannite peptone water tubes were also inoculated, and were read for acid production after twenty-four hours, and after seven days' incubation.

Strains of Staphylococci

In all, 167 strains of staphylococci were studied, and the results are given in Table I.

TABLE I.—*Properties of Staphylococci Isolated from the Nose*

Strain	No	Haemolysin		Coagulase		Mannite	
		+	−	+	−	+	−
Aureus	59	55	4	51	8	55	4
Albus	108	23	85	23	85	29	79
Haemolysin + ..	78			74	4	74	4
− ..	89			0	89	10	79
Coagulase + ..	74					71	3
„ − ..	93					13	80

There is a high degree of association between *aureus* pigmentation, haemolysin production, coagulase production, and mannite production, which is in accord with the results of others. Four haemolytic strains produced no coagulation though tested on two samples of human plasma and on rabbit plasma on which other strains gave positive results. There is, therefore, not complete correlation of haemolysin production and coagulase activity as recorded by Cowan (1938), but agreement of the order found by Hallman (1937), Saski and Fegjin (1937), Cruickshank (1937), and Fisher (1936). Flaum (1938) records even more divergent results. The discrepancies are possibly due to differences in the plasma used or in the method of toxin production. It is, however, generally agreed that haemolysin-positive coagulase-positive strains are pathogenic. The four haemolysin-positive coagulase-negative strains in this series have been classed as pathogenic. They all occurred in the undergraduate group, and the figures are not greatly affected by their inclusion.

The figures in Table I and Cowan's results suggest that a very high proportion of *aureus* strains are pathogenic and a high but lower proportion of *albus* strains non-pathogenic. The percentage of *aureus* strains in a series can therefore be used, in default of other information, as a rough estimate of the percentage of pathogens.

Incidence of Staphylococci in the Nose of Healthy Persons

The numbers of persons in the various groups found to be carrying staphylococci in the nose are recorded in Table II, with the percentages and their standard errors. As mentioned above, swabs were taken from both the right and the left nostril. In most cases the growth from the two nostrils was similar. In fifteen cases the growth from one side was heavier or contained more *aureus* and less *albus* colonies than the other; but such differences were slight, and the results are given as positive or negative for each individual.

TABLE II.—*The Number of Persons with Staphylococci in the Nose*

Group	No.	Staphylococci Present		Haemolytic Staphylococci	
		No.	% ± S.E.	No.	% ± S.E.
Children in hospital (7 months to 16 years) ..	33	24	72.7 ± 9.1	19	57.5 ± 8.6
Adults in hospital (19 to 75 years)	31	27	87.1 ± 6.5	13	41.9 ± 8.9
Undergraduates (18 to 22 years)	101	91	90.9 ± 3.0	33	34.4 ± 4.7
Total	165	142	86.1 ± 2.9	67	40.6 ± 3.8

The results are similar to those obtained by Hallman (1937). The figures in Table III have been extracted from her paper and the standard errors calculated.

TABLE III.—*The Number of Persons with Staphylococci in the Nose (Hallman, 1937)*

Group	No.	Staphylococci Present		Coagulase + Staphylococci	
		No.	% ± S.E.	No.	% ± S.E.
Children in hospital (2 months to 12 years) ..	272	201	73.9 ± 3.1	159	58.4 ± 3.0
Children in hospital (13 to 19 years)	38	30	70.9 ± 8.3	23	60.5 ± 7.9
Adults in hospital (over 19 years)	49	37	75.5 ± 7.1	22	44.9 ± 7.1
Students	109	87	79.8 ± 4.3	40	36.7 ± 4.7
Total	468	355	76.3 ± 2.3	244	52.1 ± 2.3

The different percentages of carriers of pathogenic staphylococci recorded in the totals are due to the large number of children in Hallman's series. The difference between the carrier rates in Hallman's students and younger children is 21.7 per cent., which is more than thrice its standard error 5.6, and there is a difference of 23.1 per cent. between the undergraduates and children in my series, which is more than twice its standard error 9.8. Thus the differences in carrier rates of these groups are more than are likely to have arisen from sampling errors. Too much stress cannot be laid on the striking similarity of the carrier rates in comparable groups of the two series, since there are differences in the percentage of persons carrying non-pathogenic staphylococci, and neither author found the coagulase and haemolysin tests completely parallel. In both series the carrier rate of non-pathogenic staphylococci is higher as the carrier rate of pathogenic strains is lower. It is safe to conclude that in two samples of healthy and active young adults one of every three was found to be carrying pathogenic staphylococci in the nose. In adults in hospital the carrier rate was higher, but the numbers involved are not sufficient to make the difference certain. In children in hospital three out of five were carriers.

The statement of a carrier rate does not give a measure of the chance that an individual will be a carrier if observed over a period of time. Dudley (1932), during a year's observation of diphtheria carriers in a school, found that, with an average carrier rate of 6.6 per cent., 40 per cent. of the boys were carriers at one time or another. Davis (1921) concluded that cultures taken at short intervals from the throat of normal persons sooner or later revealed the presence of haemolytic streptococci in practically all of them. Hart (1937) noted during nine months' study of the nasal and pharyngeal flora of an operating theatre staff that there were many intermittent carriers of *Staph. aureus* and few persistent ones. The

figures he obtained for the carrier rate (Table IV) are of interest because they show a greater variation among the same community over a period of time than was shown between the various groups of the series recorded above.

TABLE IV.—*Carrier Rates in an Operating Theatre Staff (Hart, 1937)*

Group	Date	No.	Staphylococcus Aureus Present	
			No.	% ± S.E.
Operating theatre staff	Jan. 20	57	35	61.4 ± 6.5
	Jan. 29	44	44	100
	Feb. 7	53	14	26.4 ± 6.1
	Sep. 30	56	9	16.1 ± 4.9
General population	Jan. 23	54	39	70.4 ± 6.2

Bloomfield (1921) found *Staph. aureus* present in the throat only as a transient parasite except when there was a definite local infection. Eight laboratory workers examined by him carried *Staph. albus* constantly in the nose over a period of three months, while *Staph. aureus* was only occasionally present. Personal observations on patients in hospital showed that haemolytic staphylococci were not always isolated from later swabs of the nose of a patient whose first swab had been positive a few weeks before.

These observations and analogies make it evident that there is considerable variation from one community to another and in the same community from time to time in the percentage of persons carrying pathogenic staphylococci in the nose, that in healthy and active undergraduates the carrier rate may be one in three, and that the great majority of healthy individuals are carriers from time to time.

Incidence of Staphylococci in the Nose of Patients with Staphylococcal Infections

Owing to the limitations of available clinical material the incidence of pathogenic staphylococci in the nose of patients with staphylococcal infections has been studied only on small numbers of individuals. The methods used have been the same as for healthy persons, and the figures are given in Table V.

TABLE V.—*The Number of Patients with Staphylococci in the Nose*

Author	Group	No.	Staphylococci Present	Haemolytic Staphylococci	
			No.	No.	% ±S.E.
McFarlan	Osteomyelitis (over 19 years)	10	10	7	70.0±14.5
	Boils and carbuncles (over 19 years)	19	18	13	68.4 ± 10.7
	Total	29	28	20	68.9 ± 8.6
				Coagulase + Staphylococci	
Hallman	Osteomyelitis (19 years or under)	22	20	11	50.0±10.7
	Osteomyelitis (over 19 years)	29	22	13	44.8 ± 9.2
	Total	51	42	24	47.1 ± 7.1

The figures in my series suggest that there is a higher incidence than in persons with no staphylococcal infections, and the difference (27.0% ± 12.4) is more than would often arise from errors of sampling. Yet Hallman's figures do not show a similar difference, and it would be premature to conclude that the incidence is in fact higher. In nine undergraduates who had had a series of boils a year or more before investigation and were then free, there were seven who had haemolytic staphylococci in the nose. This shows that the local condition does not necessarily recur when pathogenic staphylococci are present in the nose. The growths of staphylococci obtained from the nose of some patients with staphylococcal infections were pure *aureus* and more profuse than usual, but similar growths were obtained occasionally from healthy persons.

It is certainly possible that pathogenic staphylococci may be transferred by the patient's fingers from the nose to a lesion elsewhere. The figures recorded here show that pathogenic staphylococci are so often present in an apparently healthy nose that it is reasonable to take all possible precautions to prevent reinfection from that source. Yet the frequency with which pathogenic staphylococci occur in the nose of healthy persons makes it possible that their presence in the nose of patients with staphylococcal infections in other parts of the body is merely a reflection of the carrier rate of the community in which they are living. If the serological types of staphylococci prove to be as stable and numerous as Griffith's streptococcal types it may be possible to obtain evidence in favour of the occurrence of reinfection from the nose by finding that the nasal strain is serologically identical with that isolated from the lesion elsewhere. At present the isolation of pathogenic staphylococci from the nose of a patient with a chronic staphylococcal infection cannot be considered as proof that reinfection is occurring.

Summary

1. Pathogenic staphylococci were isolated from the healthy nose of 34 per cent. of healthy undergraduates, 42 per cent. of adults in hospital, and 58 per cent. of children in hospital. Similar figures for the incidence in individuals with no staphylococcal infection have been obtained by Hallman in a larger series.

2. It is suggested that the great majority of healthy individuals are carriers from time to time.

3. Pathogenic staphylococci were isolated from the healthy nose of 69 per cent. of patients with staphylococcal infections elsewhere.

4. The isolation of pathogenic staphylococci from the healthy nose of a patient with a chronic staphylococcal infection is not in itself proof that reinfection from the nose is responsible for the chronicity of the infection, though the possibility of such reinfection cannot be denied.

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