

The skin flora of the hemiplegic hand

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SUMMARY

More organisms were found on the paralysed hands of hemiplegic patients than on their unaffected ones. However, both showed considerably higher bacterial counts than did geriatric patients without paralysis. An infection rate for *Cl. welchi* of 15% was found in the paralysed hands.

INTRODUCTION

It has been commonly observed in the management of hemiplegic patients that a characteristic unpleasant odour may emanate from the palm of the paralysed hand. This can be recognized readily within the ward complex. In an attempt to discover its cause, the types and numbers of organisms present on affected hands were investigated.

No formal studies on the skin flora of hemiplegic patients can be found. However, a more varied flora was found on the arms of sedentary inmates of a home for old people than on mobile ones (R. R. Marples, personal communication). Somerville (1969) reported an increased recovery of enterobacteria from the skin of geriatric patients. Ayliffe & Lowbury (1969) in hospital patients showed occasional heavy skin contamination of the thighs, buttocks and groins with *Cl. welchi* but rarely on other sites, especially in those incontinent of faeces. Drewett, Payne, Tuke & Verdon (1972) in a survey of unselected hospital patients sampled the lower limb at various levels and reported 44% cultures positive for *Cl. welchi* in at least one site. Proximity to the anus and increasing age were factors predisposing to such an infection.

MATERIAL AND METHODS

A simple method of sampling the hemiplegic hand was devised using a swab moistened with broth. The palm was rubbed firmly with five strokes from its lateral to its medial aspect. Swabs were cultured aerobically and anaerobically on blood agar for 48 hr. Colonies resembling *Cl. welchi* were confirmed by subcultures on Nagler plates containing neomycin, half of whose surface had been spread with specific antitoxin before inoculation.

In the first part of the study 80 hemiplegic patients in the geriatric wards of

Table 1. *The various organisms present on the hands of different groups of patients*

	<i>Staph. epidermidis</i> and micrococci	Diphtheroids	<i>Staph. aureus</i>	Enterobacteria	<i>Cl. welchi</i>
Control group (40 patients)	30 (75%)	32 (80%)	12 (30%)	26 (65%)	1 (2.5%)
Paralysed hands in hemiplegic patients (80 patients)	76 (95%)	52 (65%)	14 (17%)	71 (89%)	12 (15%)
Non-paralysed hands in hemiplegic patients	34 (42%)	28 (35%)	11 (14%)	21 (26%)	0

four hospitals in Cumbria were examined. Both paralysed and unaffected hands were examined.

Of the patients investigated, 36 had the characteristic odour, more noticeable when their hands remained unwashed for 24 hr. The paralysed patients could be graded clinically according to their degree of paralysis as follows:

Grade V normal power, Grade IV ability to move the limb against gravity and resistance, Grade III ability to move the hand against gravity but not resistance, Grade II ability to move the hand if gravity is neutralized, Grade I flicker of movement only, Grade 0 no movement whatsoever.

Most of the patients demonstrating the distinctive odour were in categories 0, I and II. As a control group, 40 other geriatric patients in the same wards, but without paralysis, were similarly tested. The sexes were equally divided as were hands between right and left.

The second stage of the study consisted of an attempt to enumerate the organisms present on both hands of hemiplegic patients and in a control group of unparalysed patients in the same wards. The detergent scrub method was employed as described by Williamson & Kligman (1965). Colony counts were carried out by the pour plate method. All the patients examined in both stages of the investigation had unwashed hands for the previous 24 hr.

RESULTS

Bacterial flora of the hands

Table 1 shows the incidence of each of five different groups of organisms on the hands of different groups of patients. With the exception of *Staphylococcus aureus* all the organisms are found more frequently on the paralysed hands of hemiplegic patients. The flora of the non-paralysed hands of hemiplegic patients is very similar to that of the hands of the control group. Table 2 shows the relation between the presence of *Cl. welchi* on the hands and the severity of the paralysis.

Table 2. Relation between the presence of *Cl. welchi* and the severity of the paralysis

Clinical grade	No. of patients	No. positive for <i>Cl. welchi</i>
0	11	4 (26%)
I	22	3 (14%)
II	32	4 (12%)
III	12	1 (8%)
IV	2	0
V	1	0

Total colony counts

Paralysed patients. In a series of 12 patients the mean skin count for the paralysed hand was 1.32 million organisms/cm.², with a range from 0.26 to 1.6 million. The corresponding figure for the unaffected hand was 0.54 million organisms/cm.², with a range from 0.26 to 0.8 million.

Non-paralysed controls. In a series of 10 such patients the mean skin count was 5000 organisms/cm.², with a range from 2600 to 11,000.

These results indicate that there is an unexpectedly high incidence of *Cl. welchi* infection in the paralysed hands of hemiplegic patients; this is not paralleled either in their unaffected hands or in other patients in the geriatric wards who have not had strokes. The incidence of *Cl. welchi* is apparently related to the severity of the disability, particularly when spasticity resulted in flexion of the small joints of the hands. Many more organisms are carried on the hands of hemiplegic patients than on those of old people with other diseases and the paralysed hand appears to be more affected in this way than the mobile one.

DISCUSSION

In the geriatric wards under study on average 140 hemiplegic patients are admitted every year. The 80 examined in this survey may be considered therefore as a significant proportion.

The possibility that faecal incontinence influenced the results of this survey has to be considered. However, only 4 of the 80 hemiplegic patients examined were thus afflicted and only one of these was positive for *Cl. welchi* on the hand. Out of 40 control patients one also was incontinent of faeces, the only member of this group to carry the organism. Not one of the patients tested was demented or grossly abnormal in behaviour. That *Cl. welchi* plays any part in the characteristic odour of paralysed hands is uncertain. Out of 36 patients with this manifestation, 29 were not carrying this organism on their palms. Of 12 patients with *Cl. welchi* present only 7 showed the phenomenon.

It is well known that the humidity of the skin is a very important factor in controlling the number of organisms present. This is shown by the increase in numbers of skin organisms when occlusive dressings are used. Paralysis and other major diseases of the central nervous system encourage excessive sweating and this is no doubt the basis of our quantitative findings. The arithmetical mean

count of aerobic organisms on the palms of normal people is given as $9.8 \times 10^2/\text{cm}^2$ by Somerville & Murphy (1973).

The work by Lowbury & Lilly (1958) on *Cl. welchi* infection in burns indicates that the source of the infection with this organism is the patients' own faecal flora. No doubt this holds for our series also. This is supported by the difficulty encountered in isolating the organism from the geriatric wards by the use of settle plates and the slit-sampler. The paralysed hand is immovable and therefore cannot be infected from the bowel directly. It is hospital practice to clasp the palm of the paralysed hand with the unaffected one in order to exercise the limb. However, as it was not possible to demonstrate the presence of *Cl. welchi* on any non-paralysed hands this route of infection is unlikely. Our ability to culture this organism on so many paralysed hands may be considered to be a consequence of the disordered physiology of the skin of the part. The more severe the paralysis the more likely was the infection to be present.

The malodour is possibly related to the extremely large number of organisms present on the affected hands.

If operations are contemplated on patients with hemiplegia, the paralysed hand, in addition to the bowel, should be considered as a potential source of *Cl. welchi* infection.

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