The skin as the source of *Acinetobacter* and *Moraxella* species occurring in blood cultures

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SUMMARY A study was made of the flora of the skin in hospital inpatients and healthy people to demonstrate the presence of non-fermenting Gram-negative rods of the *Acinetobacter* and *Moraxella* group. These organisms were found to be present on the skin of 34.3% of inpatients and occurred even more commonly in those patients with kidney disease. It was also present on the skin of 20% of a group of healthy members of staff. This rather high rate of skin carriage is thought to account for the not infrequent occurrence of this organism in blood cultures.

In 1975 our laboratory processed approximately 2700 blood cultures. In 31 of the 372 yielding growth, the organism was a non-fermenting Gram-negative rod of the *Moraxella*-*Acinetobacter* group. Only two of these isolates appeared to be associated with clinical evidence of infection, the organisms occurring in all three bottles of these blood cultures whereas the others, probable contaminants, occurred usually in one only and never in all the bottles. After exclusion of any possible contamination of the media used during preparation or processing in the laboratory, 70 patients were studied to establish the source of this probable contamination. Thirty healthy members of the laboratory staff were studied as a normal non-hospitalised control group.

Material and methods

Contact plates (Sterilin Limited) of MacConkey media (Oxoid CM7b) were used to sample the skin of the antecubital fossa before and after disinfection with isopropyl alcohol (Medi Swabs). This site was chosen because it is the usual site from which blood is taken for culture. Eosin methylene blue agar was tested as a selective medium for *Acinetobacter anitratus* in the contact plates as suggested by Taplin and Rebell (1963) but most strains gave scanty growth and it was abandoned in favour of MacConkey media. After overnight incubation at 37°C suspected colonies, namely non-lactose fermenting small coliform colonies, oxidase negative in the case of *Acinetobacter* and oxidase positive in the case of *Moraxella*, were further identified according to the

methods of Cowan and Steel (1977). In addition, ammonium salt sugars, Tween 80 Sierra medium and Nagler plates to demonstrate lecithinase activity were inoculated. Sensitivity tests were performed on lysed blood agar plates using Stokes' method with the Oxford staphylococcus (NCTC 6571) as the control organism.

Results

Isolates of *Acinetobacter* were speciated according to their biochemical reactions (Table 1), many of which were used by Snell (1973). It is difficult to

Table 1 Biochemical reactions of *Acinetobacter* and *Moraxella* species

Test	No. of strains giving a positive reaction in each test		
	<i>A. lwoffii</i>	<i>A. anitratus</i>	<i>Moraxella</i>
No. of strains tested	16	6	8
Oxidase	0	0	8
O/F test—negative	11	0	2
alkali produced	5	0	6
oxidative	0	6	0
Motility at 22°C	0	0	0
Peptone water glucose	0	6†	0
Peptone water lactose 10%	0	6	0
Amm. salt sugar (xylose)	12	6	0
Amm. salt sugar (glucose)	11	6	0
Simmons citrate	6	3	0
Lecithinase production	3	0	0
Tween 80	16	6	2
Urea	7	3	0
Malonate*	0	6	0

O/F = Oxidation-fermentation test.

† Reaction positive after 2-4 days' incubation.

* Not tested by us.

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identify *Moraxella* to species level. The reactions of the genus are given for comparison with *Acinetobacter* species. The O/F test and the reaction in peptone water glucose are the tests which most readily distinguish the two *Acinetobacter* species in routine practice (King and Phillips, 1978). We were not able to confirm the characteristic smell of *A. lwoffii* recorded by these authors in some strains.

The result of this investigation is summarised in Table 2. It was found that patients with kidney disease showed higher carriage rates than other patients (Table 2). Occasional hospitalised patients

Table 2 Skin carriage of non-fermenting rods in hospital patients and healthy staff

Subjects	Total	ACI-MOR group isolated from skin	
		No.	%
Hospitalised patients			
With kidney disease	23	11	47.8
With other conditions	47	13	27.6
Total	70	24	34.3
Healthy staff	30	6	20.0

showed persistent skin carriage over periods of up to nine weeks and longer. Some acquired the organisms during their stay in hospital. A group of five patients in our intensive care unit were also investigated by sampling one hour after cardiac operation for which extensive skin preparation had been carried out. One patient yielded a few colonies of *Acinetobacter* from the antecubital fossa immediately postoperatively. Skin carriage of *Acinetobacter* spp was commoner than carriage of *Moraxella* spp, and the numbers of isolates of *A. lwoffii* were greater than those of *A. anitratus* (Table 3).

Table 3 Frequency of skin carriage of *Acinetobacter* and *Moraxella* in hospital patients and healthy staff

Subjects	Total number	<i>A. lwoffii</i>	<i>A. anitratus</i>	<i>Moraxella</i> species
Patients	70	12	4	8
Controls	30	4	2	0

The figures given for skin carriage in the tables are before skin preparation. After skin preparation the numbers of these organisms were greatly reduced but small numbers (one to three) of colony-forming units persisted in spite of skin preparation in three of 16 patients carrying *Acinetobacter*.

The results of sensitivity tests are summarised in Table 4.

Table 4 Antibiotic sensitivity of *Acinetobacter* and *Moraxella* species

Antibiotic	Number of strains sensitive		
	<i>A. lwoffii</i>	<i>A. anitratus</i>	<i>Moraxella</i> species
No. of strains tested	16	6	8
Penicillin 1 unit/disc	0	0	8
Ampicillin 10 µg/disc	7	4	8
Trimethoprim 2.5 µg/disc	4	0	3
Sulphafurazole 200 µg/disc	11	4	8
Cephaloridine 5 µg/disc	1	0	8
Gentamicin 10 µg/disc	16	6	8

Discussion

The skin was first studied as a potential reservoir of the *Acinetobacter* group by Taplin and Rebell in 1963. At this time they were known as *Mima polymorpha* (*Acinetobacter lwoffii*) and *Herellea* (*Acinetobacter anitratus*). They were found to occur on skin surfaces at rates of 10% and 25% respectively. Dadswell (1976) studied *Acinetobacter* and similar organisms in ear infections. He found that while the majority of his isolates played little or no part in the infective process, presumably being commensals in the skin auditory meatus, a few were associated with acute or chronic ear disease. There have been several cases of reported bacteraemia (CDR Reports, 1978) caused by *Acinetobacter*. Van de Torregrosa and Ortiz (1961) reported cases of meningitis in children due to *Acinetobacter* and *Moraxella*. Our study was directed specifically at deciding the probable significance of isolates from blood cultures. It appears that when these organisms are isolated from blood cultures of patients with no clinical evidence of bacteraemia, it should be remembered that they are common skin commensals and the growth could represent contamination, especially as our studies show that *Acinetobacter* withstood the routine skin disinfection in 18.7% of patients carrying the organism. In none of the patients studied in this series was the organism felt to be playing a pathogenic role in spite of the fact that one had a positive blood culture in addition to the positive skin culture. However, occasional bacteraemic episodes occur in our practice usually in compromised patients.

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