

Features of molluscum contagiosum in the north-east of Scotland and in Fijian village settlements

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INTRODUCTION

Molluscum contagiosum is a benign, human skin tumour of world-wide distribution whose epidemiological features have been briefly summarized by Overfield & Brody (1966). It is caused by a virus which morphologically resembles those of the pox group but which, hitherto, has not been grown in regular serial passage outside the human host. Consequently neutralizing antibodies have only been detected with difficulty and the pathogenesis of the condition is far from clear. Furthermore, the long and variable incubation period, the sporadic occurrence of the disease and its trivial nature and spontaneous cure have precluded a precise definition of its natural transmission between hosts. Histologically, the superficial localization of the tumour and the complete absence of host cellular reaction are as striking features as is the Henderson-Paterson inclusion body, which is the hallmark of the disease. To shed more light on this condition clinico-epidemiological studies are being carried out in two widely separated and racially distinct population groups: hospital out-patients and domiciliary patients in Aberdeen and the north-east of Scotland and Fijian village dwellers in the islands of Fiji in the south-west Pacific. This report presents preliminary findings of these studies.

MATERIALS AND METHODS

The populations studied

The Aberdeen surveys

During 1964 patients with clinically typical molluscum contagiosum were referred from the Dermatology Out-Patient Clinic of Aberdeen Royal Infirmary and by local general practitioners. Histories were recorded according to a standardized series of questions, clinical details were recorded and the central cores of lesions were expressed. Some lesions were further treated by phenol cauterization. The striking age and sex distribution revealed in this survey prompted a further inquiry into the hospital records of all cases of molluscum contagiosum attending the Skin Out-Patient Clinic during the years 1956-63. During an extension of this work in 1966, thirteen further cases were examined by a different observer.

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The Fiji surveys

In 1965 and 1966 two medical students from Aberdeen, during 3-month scholarships in Fiji sponsored by the Nuffield Foundation, undertook, as part of wider studies, small surveys of molluscum contagiosum in selected communities.

(i) In 1965 a survey of pre-school children was carried out in the low-cost housing settlement of Nabua, about $3\frac{1}{2}$ miles from the centre of Suva, the capital, on the island of Viti Levu. One-third of the population, of about 890, was housed in sub-standard dwellings and here it was common practice for the whole family, usually with about five children, to live in a single room. The remaining two-thirds of the population lived in concrete flats with a large bedroom, a small living room, a kitchen and a shower/lavatory unit. Half this part of the settlement was surveyed.

(ii) To provide more data on this age group (0-5 years), results pertaining to molluscum contagiosum were abstracted from a Report on a more comprehensive medico-social study carried out in 1959 at Naviti, an island in the Yasawa group, north-west of Viti Levu. On this island seven village communities, each of up to 200 people, live in buildings of wood and thatch or of wood and corrugated iron, arranged around a central clearing, in which children from all dwellings play together.

(iii) In 1966 a survey was carried out on 90% (672 persons) of the entire population of Wailoku, an Anglican Mission Settlement near Suva. These people were predominantly descendants of Solomon Island indentured labourers who had married with local Fijians.

(iv) Concurrently, the patients who were noted to have molluscum contagiosum in 1965 ((i) above) were re-examined in 1966.

Laboratory confirmation of the clinical diagnosis

Although the lesions of molluscum contagiosum are so typical the following confirmatory laboratory tests were carried out. Electron microscopic examination by the negative staining technique on extracts of lesions from Aberdeen and Fiji showed large numbers of virus particles typical of the pox group (Plate 1A and B). In the absence of a convenient laboratory test for detecting infectivity of the molluscum virus, extracts were examined for biological activity by their capacity to inhibit plaque production by vaccinia virus in mouse embryo cell cultures (Postlethwaite, 1964). Extracts from Fijian lesions were as active in this respect as those from Aberdeen. Finally, a representative lesion from Fiji, transported in 50% buffered glycerol to Aberdeen, was sectioned and stained by phloxine-tartrazine. Histological examination showed the characteristic appearance of molluscum contagiosum (Plate 1C).

RESULTS

The Aberdeen surveys

In spite of their characteristic appearance, the lesions of molluscum contagiosum were often confused by patients with those of verruca vulgaris. Moreover, of 167 doctors' referral letters on patients under 12 years seen at the Skin Out-Patient

Clinic, 90 gave the correct diagnosis, 63 diagnosed warts and 14 were simply descriptive.

In 1964 thirty-nine patients with typical molluscum contagiosum were seen. Their distribution by age and sex is shown in Table 1. Of the 35 aged 7 to 15, 33 gave a history of swimming at public baths within a short period before the development of molluscum lesions. Most were regular attenders. One of the two non-swimmers frequently used communal spray baths. As determined from a control group of children, questioned in 1966 in the same area and corrected for age and sex, the expected number of swimmers was 17.6 ($\chi^2 = 13.2$, $P < 0.01$).

Table 1. *Distribution by age and sex of patients with molluscum contagiosum in Aberdeen*

Age in years	Number of cases							
	1964		1956-63		1966		Totals	
	M	F	M	F	M	F	M	F
1-3	0	2	5	9	0	0	5	11
4-6	0	0	5	6	0	1	5	7
7-9	6	2	31	8	3	0	40	10
10-12	17	3	103	30	5	0	125	33
13-15	3	4	57	22	3	1	63	27
16-18	0	2	8	7	0	0	8	9
> 18	0	0	13	12	0	0	13	12
Totals	26	13	222	94	11	2	259	109

M = male; F = female.

Because of the high incidence of boys aged 10 to 12 years details of age and sex of all previous cases of molluscum contagiosum attending the Skin Out-Patient Department in the years 1956-63 were collected (Table 1). These figures were compared with those of the control sample already mentioned, obtained by asking 1848 schoolchildren aged 7 to 15 how many had attended swimming baths in the previous 6 months. Table 2 shows the age and sex distribution, with the percentage of swimmers, in this control group. No significant difference was found between the age distributions in the two groups ($\chi^2 = 0.96$). A highly significant difference in the sex distribution ($\chi^2 = 32.15$, $P < 0.001$) was found, and clearly the incidence of molluscum contagiosum was much greater in males than females within this age group.

The previous medical histories of the 39 cases studied did not suggest any positive or negative correlation of common childhood illnesses with molluscum contagiosum. Ninety-two per cent had been successfully vaccinated against smallpox in infancy. This figure is not significantly different ($\chi^2 = 2.53$) from the expected figure of 73 % (M.O.H. Report for the City of Aberdeen, 1953).

Less than 25 % of the patients knew of other cases of molluscum contagiosum. In no instance was another member of the same family or household known to be similarly infected. Sixty-six per cent of the patients attended the Skin Out-Patient

Department within 4 months of noticing a molluscum lesion. More than 25% waited 6 months or more. Two out of 39 claimed to have had lesions continuously for at least 1 year. One patient had had molluscum contagiosum previously; more than 3 months had elapsed between his apparent cure and the recurrence. A second case returned with new lesions 6 weeks after an apparently successful treatment. There was no marked seasonal incidence. Of 38 cases in whom it was possible to estimate the month of appearance of lesions, 11 began in Spring (March to May) and 9 in each of the other seasons. All patients were able to identify the site of the first apparent lesion although they were often uncertain about the

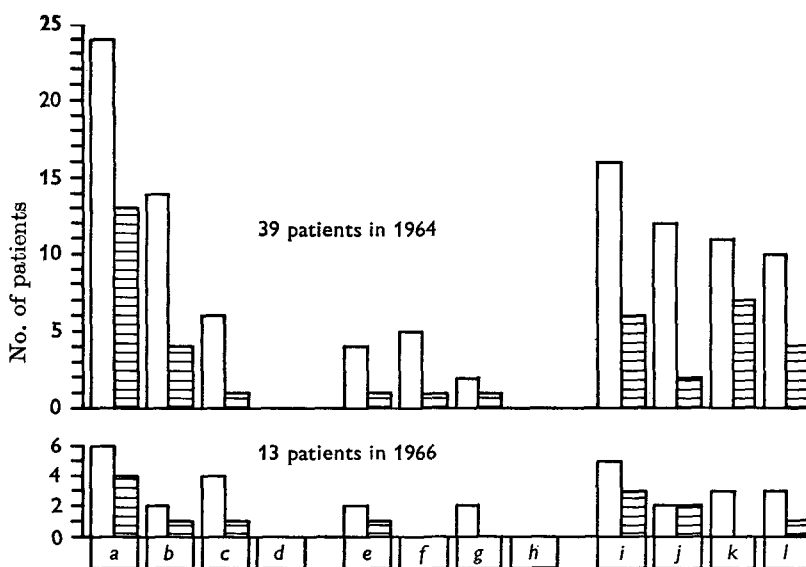


Fig. 1. Anatomical distribution of molluscum lesions seen in Aberdeen patients in 1964 and 1966. □, Lesions noted at examination; ▨, initial lesions. a = axilla; b = shoulder and upper arm; c = fore-arm and elbow; d = hand; e = inguinal region; f = thigh; g = knee-leg; h = foot; i = chest; j = abdomen; k = face and neck; l = buttock and back.

initial lesion in a cluster. Figure 1 shows the anatomical distribution of initial lesions in the 39 cases studied, and also the number of patients presenting with lesions in different sites.

The number of lesions found on first examination ranged from 1 to 73 with a mean of 16. Of 35 cases with multiple lesions 20 showed a unilateral distribution. Most lesions were 1–3 mm. in diameter, and the largest recorded was 7 mm. A history of associated symptoms was specifically sought; 61% had local erythema, 58% pruritis, 55% bleeding, 39% secondary bacterial infection and 29% tenderness or pain.

Treatment was by expression of the central core and, in certain cases, cauterization of the base with phenol. At a 4-week follow-up of 26 patients, treatment was apparently successful in 9 out of 13 treated by expression alone and in 10 out of

13 treated by expression and cauterization. There was clearly no significant difference in cure rates at 4 weeks.

Relevant features of the 13 patients seen during 1966 are presented in Tables 1 and 3 and in Fig. 1. Seen by a different observer, they confirm, in essential details, those features noted in the 1964 survey.

Table 2. *Distribution by age and sex of children in control group, with percentage of swimmers (1966)*

Age in years	Males			Females		
	Sample	Swimmers	(%)	Sample	Swimmers	(%)
7-9	229	79	35	248	78	31
10-12	372	211	57	366	234	64
13-15	318	182	57	315	131	42
Totals	919	472	51	929	443	48

Table 3. *Features of molluscum contagiosum in 13 patients seen in Aberdeen during 1966**

	Children
Swimmers	13
Vaccination history	10 (3 not known)
Season of onset:	
Spring	5
Summer	3
Autumn	2
Winter	3
Unilateral lesions	6
Family doctor's diagnosis:	
Molluscum contagiosum	7
Warts	6
Other	0
Itch/pain/bleeding/infected lesion	7
Contact or family history	1†
Time lesions present before seen at clinic	4.4 months (range 2-10)
Interval between initial and later lesions	Few days to 3 months
Number of lesions present on examination	15.2 (range 5-43)

* Age and sex distributions appear in Table 1 and the anatomical distribution of lesions in Fig. 1.

† A twin brother developed lesions 1 month after onset in index case.

The Fiji surveys

The age and sex incidence of molluscum contagiosum in the Fiji surveys are presented in Table 4. The 1966 figures show that whilst the sex incidence was equal for the population as a whole, 53% of cases occurred between 1 and 5 years. This accounts for the slightly lower overall incidence (4.5%) compared with the 7.2 and 6.2% incidences noted in 1959 and 1965 respectively. During these years only pre-school children were studied, though questioning of mothers during 1965 elicited no history of molluscum contagiosum in older members of the family.

Table 4. *Distribution by age and sex of patients with molluscum contagiosum in Fiji*

Number of cases according to source of material

Age in Years	(a) 1959 report, Naviti Island, 0-5 years			(b) 1965 survey, Nabua, 0-5 years			(c) 1966 follow-up of 1965 survey, Nabua, New lesions			(d) 1966 survey, Wailoku, Whole population			(e) Totals (less (c))		
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
	1	0	0	0	1	2	3	0	1	1	0	1	1	1	3	4
2	3	6	9	0	1	1	0	1	1	1	3	4	4	10	14
3	0	3	3	2	0	2	1	0	1	3	2	5	5	5	10
4	0	2	2	0	0	0	0	0	0	1	2	3	1	4	5
5	0	0	0	2	0	2	0	0	0	2	1	3	4	1	5
6	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0
7	.	.	.	.	.	.	.	.	.	2	0	2	2	0	2
8	.	.	.	.	.	.	.	.	.	0	1	1	0	1	1
9	.	.	.	.	.	.	.	.	.	2	0	2	2	0	2
10	.	.	.	.	.	.	.	.	.	1	0	1	1	0	1
11	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0
12	.	.	.	.	.	.	.	.	.	1	1	2	1	1	2
13	.	.	.	.	.	.	.	.	.	1	2	3	1	2	3
14	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0
15	.	.	.	.	.	.	.	.	.	0	1	1	0	1	1
> 15*	.	.	.	.	.	.	.	.	.	1	1	2	1	1	2
Totals	3	11	14	5	3	8	1	2	3	15	15	30	23	29	52
Total examined	96	84	180	69	60	129	.	.	.	326	346	672	491	490	981
% with M.C.	3.0	13	7.2	7.3	5.0	6.2	.	.	.	4.6	4.3	4.5	4.7	5.9	5.4

Note. In 1965, two other cases of molluscum contagiosum were seen, in the Yasawa group of islands: a male aged 3 and a female aged 1 year. * One female of 30 and a male of 32 years.

M = male; F = female; T = total.

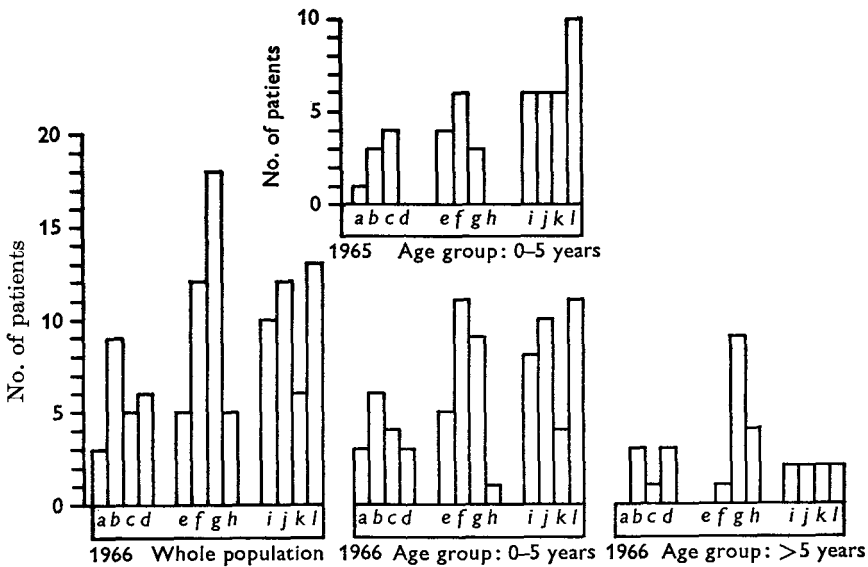


Fig. 2. Anatomical distribution of molluscum lesions in Fijian patients, as noted on examination. Letters a to l denote anatomical regions as in Fig. 1.

The anatomical distribution of lesions in the Fijian patients, as they presented on examination, is shown in Fig. 2, which also presents the data of the 1966 survey separately for the pre-school and older patients. The suggestion that fewer skin areas were affected in older patients was confirmed by direct scoring. For this purpose skin areas corresponding to those indicated in Fig. 2 were scored if they presented molluscum lesions, left and right limb areas being scored separately

Table 5. *The recurrence of molluscum lesions in the eight Fijian patients from Nabua as affected by surgical removal of lesions one year previously*

Patient		Number of lesions in 1965	Treatment in 1965	Number and site of new lesions in 1966
Sex	Age			
M	1	9	Nil	Nil
M	5	10	Nil	Nil
F	1	7	Nil	1 left elbow 1 right thigh 1 right buttock
F	2	7	Nil	1 right buttock 1 right great toe
F	1	27	3 lesions excised from chest and back	Nil
M	3	9	2 lesions excised from back and buttocks	Nil
M	5	22	2 lesions excised from neck and left elbow	Nil
M	3	10	2 lesions excised from abdomen	2 left buttock 1 right buttock 1 right thigh 1 right knee

M = male; F = female.

whilst central skin regions (face and neck, chest, abdomen and back) were considered as single units. Genital lesions were included with existing inguinal lesions or were scored as inguinal in location if the latter site was not involved. On this basis, affected skin areas averaged 4.8 (range 1–11) for the age group 0–5 years and 2.1 (range 1–4) for the older age group. The corresponding figure for the younger children in the 1965 survey was 5.1.

In 1966 (30 cases) and 1965 (10 cases) the numbers of lesions ranged, respectively, from 1 to 71 (mean 15.2) and 7 to 27 (mean 15.9). Thirteen cases out of 30 in 1966 showed a unilateral distribution of lesions, including 3 cases with only 1, whilst in 1965 all lesions were distributed bilaterally.

The 8 cases from Nabua had a total of 101 lesions when examined in 1965. From 4 of these cases a total of 9 lesions was surgically excised, an operation which caused moderate bleeding. One year later none of the lesions was present, pale scars level with the skin surface being noted at the site of the previously recorded

lesions. Three children had new lesions in different sites. Table 5 shows no positive correlation between the occurrence of these lesions and the previous expectant or surgical treatment. The spontaneous resolution of molluscum lesions was very noticeable in Fijians. In both the 1965 and 1966 surveys, follow-up visits 5-7

Table 6. Household incidence of molluscum contagiosum in the Fiji surveys

	Source of data						Totals
	1959 report. Naviti Island. 0-5 years		1965 survey. Nabua. 0-5 years		1966 survey. Wailoku. Whole popu- lation		
Number of house- holds examined	165		118		113		396
Number of house- holds with one case only	8*		4*		18		30
Number of house- holds with more than one case	3*		2*		5		10
Total number of households with molluscum contagiosum	11*		6*		23		40
Households with more than one case							
Household							
no.	Sex	Age	Sex	Age	Sex	Age	
1	F	3	M	5	F	3	
	F	2	M	3	F	2	
2	F	2	F	1	} twins	M	13
	M	2	M	1		F	2
3	F	2	.	.	M	12	
	M	2	.	.	F	8	
4	.	.	.	.	M	7	
	.	.	.	.	F	12	
5	.	.	.	.	F	15	
	.	.	.	.	F	13	
	.	.	.	.	F	5	
	.	.	.	.	M	3	

* Data restricted to households having affected children aged 0-5 years.

Note. In practically every household other skin conditions were found in several members, for example, taenia versicolor, scabies, lice.

weeks after the initial examinations showed that most lesions had already disappeared. The history was that 'they had just dropped off'. It was difficult to obtain accurate histories from Fijian patients or their relatives but in the 1965 survey lesions were stated to have been present for periods from 1 to 12 months, with a mean of 4 months, and at the time of examination some were known to be resolving.

In all three surveys in Fiji there was evidence of spread of molluscum contagiosum within households. In 25% of households with the condition more than one member of the family was affected (Table 6).

DISCUSSION

The information from these two populations, distinct as to geographical location, climate, race and demography, complement one another in providing certain comparative factual data and a few speculative pointers relating to the natural history of molluscum contagiosum. In Scotland accurate history taking was limited by the selection of the population studied according to the condition under scrutiny. In Fiji, whilst histories were unreliable, entire populations were examined and the widely prevalent disease was studied in its natural setting.

The epidemiological pattern of molluscum contagiosum was different in these two groups. In Scotland peak incidence between 10 and 12 years contrasted with a peak at 2–3 years in Fiji. In Aberdeen males predominated, but the sexes were equally affected in Fiji. In Aberdeen the relationship between molluscum contagiosum and attendance of patients at public baths was striking, confirming the earlier findings of Walker (1910). The apparent anomaly that similar proportions of boys and girls swim, whilst more boys present with molluscum contagiosum, may be explained by the greater frequency with which boys indulge in this exercise. These findings fit well with the notion that the main factor which determines disease prevalence is opportunity for contagious exposure to the virus rather than any postulated inherent sex susceptibility. This opportunity occurs early in Fiji where the communal way of life, the relative lack of personal hygiene (see footnote, Table 6) and the scanty clothing, especially in the very young, contribute to early and repeated encounters with the virus. In the cooler, urban environment of Aberdeen, on the other hand, infection only becomes at all common in older children, under conditions which encourage, directly or indirectly, close bodily contact. Though chlorinated water in the swimming pool itself may well be viricidal, the opportunity for such infective contact during showering is great. Under normal conditions the virus must be of low intrinsic infectivity since spread within households and schools was very rare in Aberdeen, though 25% of affected households in Fiji harboured more than one case. Also pointing to the importance of transmission by direct contact was the frequency with which lesions were encountered both unilaterally, suggesting auto-inoculation by scratching, and on opposing surfaces, as in the intergluteal cleft and on adjacent aspects of the axilla and upper arm. However, whilst these studies provide no direct evidence, the possibility is not excluded that within the human host molluscum virus may also spread during a phase of viraemia.

The central distribution of lesions in the Aberdeen survey was striking and was especially marked in the axilla. This is not in accord with the peripheral distribution generally described (Low, 1946; Ingram & Brain, 1957; Warren, 1965). However, in Fiji peripheral lesions were fairly common, being particularly prevalent on the lower limbs. Palms and soles were not affected except for one girl of 4 years, who had a single lesion at the junction of palm and wrist. Reasons for such discrepant distributions are not obvious, though the wearing of shoes and socks may be relevant. It is also possible that a critical skin temperature may be of importance in determining sites of virus growth.

In the absence of antibody studies the question of immunity in this condition must be speculative. However, three features seem worthy of note. First, no case was seen, either in Fiji or Aberdeen, under 1 year of age and only an occasional case presented over the age of 30. Although a prolonged incubation period may be of some importance, the possibility of antibody-mediated maternally-transmitted immunity should not be ignored. Secondly, after the first year of life, the age incidences in Fiji and Aberdeen are strongly reminiscent of the well-documented comparative age distributions of poliomyelitis infection, as determined both clinically and serologically, in Cairo and the United States before the days of mass immuno-prophylaxis against this condition (Paul, Melnick, Bennett & Goldblum, 1952; Paul, Melnick & Riordan, 1952). Thirdly, in Fiji, the suggestion of waning susceptibility with age, and the possibility that this may be immunologically mediated, receive tenuous support from the decreasing degree of skin involvement with age. The numbers of skin areas affected in the 1966 Fiji survey, in the age groups 0 to 5, 6 to 32 and greater than 32 years were, respectively, 4.8, 2.1 and nil. On the other hand, molluscum lesions undoubtedly recurred, either after natural resolution of earlier ones or after surgical excision of some. Since this latter procedure caused bleeding, the suggestion that trauma brings about natural resolution by releasing antigen to the blood with consequent antibody formation seems less likely.

The difficulties encountered by practitioners in Aberdeen in identifying lesions of molluscum contagiosum may be a reflection of the relatively rare occurrence and benign nature of this condition. However those practitioners who do recognize it may well treat it themselves, and the incidence of molluscum contagiosum amongst hospital skin out-patients may not be a very reliable measure of its true incidence. In the years 1956-63 in Aberdeen, the incidence was 12/1000 skin out-patients. Low's figures in Edinburgh were 2/1000 in 1934-39 and 1.4/1000 in 1940-44. These findings contrast with the 4.5% noted in an entire population of 672 persons in a village settlement in Fiji. Even this last figure represents only part of the truth since, as indicated, lesions disappear from the Fijian skin with remarkable rapidity. A more prolonged study is required, with repeated observations at short intervals, to plot the true natural history of this condition. Fiji would seem an ideal location to do this. Furthermore, an extension of these studies to include the racially and socially distinct Indian communities in Fiji would be of comparative interest.

SUMMARY

Between 1964 and 1966 comparative studies were carried out in Aberdeen, Scotland, and in village settlements in Fiji on the clinico-epidemiological features of molluscum contagiosum. In Aberdeen there was a positive correlation between this disease and attendance of patients at public swimming baths. The preponderance of male patients in Aberdeen was attributed to their more frequent indulgence in swimming. Household spread of the condition was rare in Aberdeen but common in Fiji. Lesions frequently occurred unilaterally or were situated on opposing skin surfaces. They were mainly central in distribution in Aberdeen,

the axilla being a site of predilection. In Fijians, peripheral lesions were fairly common though palms and soles were not affected. Peak age incidence in Aberdeen was 10–12 years, contrasting with a peak at 2–3 years in Fiji. Opportunity for contagious exposure appeared to be the main factor determining transmission of molluscum contagiosum between hosts, this opportunity occurring frequently and early in life in Fiji but only under special circumstances and later in childhood in Aberdeen. However, the age distributions in the two populations suggested the possible operation of immunological as well as environmental factors in determining the overall pattern of disease in the community.

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EXPLANATION OF PLATE

A and B. Electron micrographs of extracts from molluscum lesions from patients in (A) Aberdeen and (B) Fiji.

C. Section of molluscum contagiosum lesion from Fijian patient stained by phloxine-tartrazine. $\times 150$.