A DIP-SLIDE TEST FOR BACTERIURIA IN PROTEIN-CALORIE MALNUTRITION*

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SUMMARY

A simple dip-slide test was used to determine the incidence of bacteriuria in children suffering from protein-calorie malnutrition. Bacteriuria was found to be equally common in patients suffering from kwashiorkor and atrophic malnutrition and in a control group with normal nutritional status. The test is inexpensive and has a definite place in clinical practice.

Children with protein-calorie malnutrition are known to be susceptible to infection, especially bronchopneumonia, intestinal infection and septicaemia.[1-3] Reports as to the incidence of urinary tract infection in protein-calorie malnutrition are few. Campbell,[2] in an autopsy study, found 3 cases with renal abscesses and 3 with pyelonephritis among 40 cases of protein-calorie malnutrition studied. On the other hand, Stirling[4] observed significant renal pathology in 22 out of 31 infants dying of protein-calorie malnutrition, 9 cases being on an infective basis. *In vivo,* Phillips and Wharton,[1] while studying infections in 75 inpatient cases of protein-calorie malnutrition, found 8 cases of urinary tract infection, of which only one had been suspected clinically.

Methods of screening for bacteriuria have drawn much attention recently, with the knowledge that bacteriuria may be asymptomatic,[5,6] and with the increasing realization that although pyuria may be detected by microscopy, it bears an inconstant relationship to bacteriuria.[7] The problem of urinary tract infection in childhood has recently been reviewed by MacGregor.[8] To allow for mass screening of bacteriuria, methods of simplifying specimen collection and transport media have been devised. In 1965, Mackey and Sandys[9] developed a dip inoculum transport medium, which was later improved by Guttman and Naylor.[10] The Uricult† is such a dip-slide with nutrient agar on one side and McConkey's agar on the other side, the area of each medium being 13 cm^2. This method of screening for bacteriuria has been evaluated and found to be successful by several authors.[11-14]

A screening project to assess the frequency of bacteriuria in protein-calorie malnutrition was undertaken using the Uricult dip-slide. Three groups of patients were studied: (*i*) kwashiorkor patients, (*ii*) patients with atrophic malnutrition (taken for the purposes of this study to imply a body-weight less than 80% of the 50th percentile for age, according to the Boston charts[15]), and (*iii*) the control group were those patients whose weight exceeded the 50th percentile for age.

MATERIAL

One hundred and twenty-five children, all outpatients, were studied over a 2-month period. No child with symptoms or signs directly referable to the urinary tract was included in the study.

There were 50 children in the control group, aged from 2 months to 9 years (mean age 30 months); 45 were male and 5 female. The majority of these patients had upper respiratory tract infections, pneumonia or gastro-enteritis.

In the group suffering from atrophic malnutrition there were 50 patients, aged from 10 months to 8 years (mean age 49 months); 47 were male and 3 female. Sixteen of these patients had upper respiratory tract infections, 8 had pneumonia, 8 suffered from 'malnutrition' alone and 5 had gastro-enteritis, while the remainder suffered from a miscellany of conditions.

Of the 25 patients with kwashiorkor, whose ages ranged from 8 months to 5 years (mean age 29 months), 23 were male and 2 female. Twelve of these children suffered from kwashiorkor alone, 6 had pneumonia, 3 had measles and the remaining 4 had upper respiratory tract infections.

The male preponderance in patient selection was expressly designed to facilitate specimen collection.

METHODS

The genitalia and perineum of each patient were cleaned with cetrimide solution, and dried with cottonwool. When the age of the patient permitted, midstream urine specimens were collected in a sterile universal container; if this was not possible, a urine bag was applied.

As soon as the urine was collected, it was poured over the Uricult, excess urine being allowed to drain off; the slide was then returned to its sterile container and incubated at 37°C for 16 - 24 hours. The results were read by reference to the manufacturer's chart (Fig. 1).

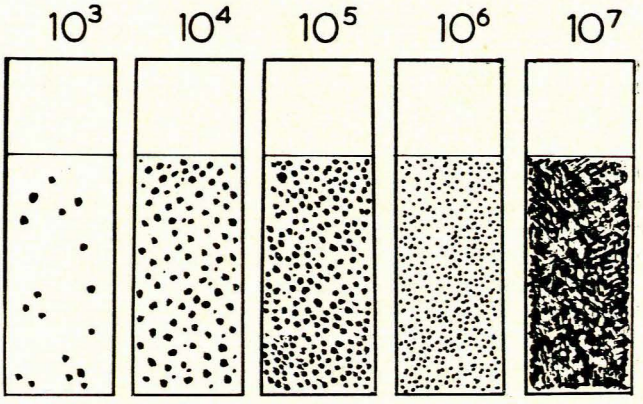

Fig. 1. Chart for comparing bacterial density.

All patients returned the following day, and doubtful (10^4) or positive (10^5 or greater) Uricults were re-evaluated by suprapubic aspiration, which was cultured by the conventional pour plate method. Thus a 10^4 Uricult followed by a sterile suprapubic aspiration was termed a contaminant, while a 10^5 Uricult with a sterile suprapubic aspiration was termed a false positive. Patients with positive Uricults were treated with ampicillin orally, until the results of the confirmatory urine were obtained, at which time therapy was modified as necessary.

*Date received: 10 December 1970.

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No further studies, i.e. pyelography or cystography, or any further attempts at assessing renal function were performed on these patients.

RESULTS

The results of the study are depicted in Table I.

TABLE I. URICULT RESULTS ON 125 CHILDREN STUDIED, CORRELATED TO THE NUMBER CONFIRMED BY SUPRAPUBIC ASPIRATION

	Sterile	10^3	10^4	10^5	10^6	10^7	*Total No. infected*	*No. of cases confirmed*
Control								
Bag urine	15	8	—	2	2	—	4	3
MSU*	22	1	—	—	—	—	0	0
Atrophic protein-calorie malnutrition								
Bag urine	2	4	—	—	—	3	3	2
MSU	37	4	—	—	—	—	0	0
Kwashiorkor								
Bag urine	8	2	3	1	—	—	1	1
MSU	8	3	—	—	—	—	0	0

*MSU = midstream urine specimen.

In the control group of 50 children, 4 had significant Uricults, 2 being 10^5 and 2 being 10^6. Three of the infections were confirmed suprapubically, 2 being due to *E. coli,* one in a 7-month-old male infant with an upper respiratory tract infection, the other in a 6-month-old infant with a similar complaint; the third infection was due to *Proteus mirabilis* in a 2-month-old pyrexial male infant. One false positive was seen in a 1-year-old infant with recurrent diarrhoea; a bag collection had revealed a Uricult growth of 10^6 *E. coli,* while a suprapubic aspiration was sterile.

Among the 50 cases of atrophic malnutrition there were 3 positive Uricults, 2 being due to *E. coli* (10^7), one in a 2-year-old male with gastro-enteritis and the other in a 1-year-old male suffering from malnutrition alone; both were confirmed suprapubically. The third case, a false positive, was in a 1-year-old male with a post-measles bronchopneumonia, whose Uricult revealed a mixed growth of 10^7 *E. coli* and *Strep. faecalis;* suprapubic aspiration was sterile.

Of the 25 cases of kwashiorkor studied, one child had an infected urine with a 10^5 *Proteus mirabilis* Uricult, confirmed suprapubically. Three other children showed 10^4 Uricults, all being bag collections, with sterile suprapubic specimens (i.e. these were due to contaminants).

DISCUSSION

From this limited study, it would appear that urinary tract infection in the milder forms (outpatient) of protein-calorie malnutrition, be it kwashiorkor or atrophic malnutrition, is no more common than among controls. This is in contradistinction to the findings, already mentioned, of Phillips and Wharton,[1] Campbell[2] and Stirling.[4] However, it is most likely that the obvious severity of their cases explains this discrepancy. It is hoped that the present study will be extended to include 50 hospitalized cases of kwashiorkor.

No difficulties were experienced with the Uricults, and of the 125 tests done there were 2 false positives (1·6%), an incidence similar to that reported by others.[11,13] The Uricult is easy to use, and presents many advantages for those in active clinical practice.[11] It is not essential for the dip-slide to be incubated,[11] although there has been some dispute about this point.[13] There are, however, two basic attractions about the Uricult, over and above its simplicity: firstly, it tests for bacteriuria—which, in the majority of cases, is what the physician is seeking; secondly, it is inexpensive, for each Uricult costs about 60c retail, while urine microscopy alone costs R2.85, and the addition of culture and sensitivity raises the cost to R11.30. On the basis that on most occasions when a urine is examined for the presence of infection, the result will be negative, it would be much cheaper both for the patient and for the hospital, to use a dip-slide method, and at least be certain that what one is seeking, namely bacteriuria, is absent.

I should like to thank Dr L. Faivelsohn, Medical Superintendent of Baragwanath Hospital, and Prof. S. Wayburne for permission to publish these findings; Dr R. Cassel and his laboratory staff for their assistance; and Photographic Unit, Department of Medicine, University of the Witwatersrand, for the illustration. I also wish to thank Dr I. Kantero, Orion Laboratories, for the gift of the dip-slides.

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