Maternal Rectal and Vaginal Flora Associated with Infant Colonization and Its Relationship to Diarrhea

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OBJECTIVES :

1. To correlate studies (1, 2) performed at Phra Mongkutklao (Royal Thai Army) Hospital examining epidemic neonatal diarrhea with neonate enteric bacterial flora and pre-delivery maternal rectal flora.

2. To assess enteric bacteria colonization in the pre-delivery maternal environment with the 3 day neonate status.

3. To provide a significant information base for investigating future epidemics of neonatal diarrhea.

BACKGROUND : Young Asiatic Indian children, under 5 years of age, had enteric pathogen carrier rates of up to 13% with no signs or symptoms of bacterial intestinal diseases (3). Rates of 27% were reported in healthy Mexican University students (4). Neonatal diarrhea is a common tropical disease (5). The maternal-neonate contact during the trauma of delivery could be a source of neonate colonization (6).

During 1975, a study of epidemic neonatal diarrhea with sepsis at Phra Mongkutklao Hospital demonstrated serotypes of enteropathogenic *E. coli* (EPC) in symptomatic infants in 20% of the nursing staff. Subsequent nursing and patient management changes led to a marked decrease in cases (2). A random follow-up study in 1977 on 103 mothers upon admission to the delivery room found a 48% rectal colonization of medically significant bacteria of which 64% were serotypes of generally recognized enteropathogenic *Escherichia coli* (1).

METHODS : The study was performed from 21 February to 25 April 1978 at the nursery and delivery room of Phra Mongkutklao Hospital. Three hundred ninety-one maternal-neonate pairs were studied. A pair is defined as one mother and her newborn; a case is one individual of a pair. Rectal and vaginal cultures were performed on mothers upon admission to the delivery room. History was acquired at time of specimen collection. Standard enteric bacterial isolation, identification, and serotyping was performed (7, 8, 9). Rectal culture of

infants were performed at 24 and 72 hrs. after birth and when associated with diarrhea. Follow-up infant diarrhea history after the 3rd day of discharge was attempted through the hospital post-natal clinic. Infant specimens were not acquired after 72 hrs. post delivery.

RESULTS : Twenty six (6.65%) of 391 maternal-neonate pairs had identical enteric isolates. Ninety six per cent of the paired isolates were *E. coli* of serotypes 018a 018c:K 77, 055:K 59, 0111:K 58, and 086a (Table 1). Maternal ages of these 26 cases were 17-33 years and parities 1-6. Twenty of the mothers resided outside of Bangkok (Table 2).

Infants and mothers were followed after 72 hrs. at the post-natal clinic. Treatment of diarrhea was administered as appropriate to symptoms without cultures being taken. Fifteen infants had diarrhea after 72 hrs. but prior to discharge. Mothers of this study, upon discharge, were also given survey questionnaires to respond to should their infants become ill during the first week after discharge. Twenty five mothers indicated that the infants did develop diarrhea. Sixty one (16%) of the 391 mothers also had a recent (within 3 days), prior history of diarrhea, and 37 of the 62(60%) were found positive for enteric isolates (Table 3). Sixty nine percent of the maternal only isolates (Table 4) were of *E. coli* serotypes 018a 018c:K 77, 0111:K 58, and 055:K 59. Ninety two percent of the matched pair isolates were also of these serotypes (Table 1). Seventy-three percent of infant isolates which were not associated with maternal isolates were of these serotypes (Table 5). The *E. coli* serotypes 018a 018c:K 77, 0111:K 58, and 055:K 59 were the predominate organisms isolated from mothers infants and mother-infant matched cases. Twenty six of 61(42%) symptomatic of which 37(70%) were positive for *E. coli* of these 3 serotypes (Table 3).

Isolates from infants at 24 hrs., 72 hrs. and found at both 24 and 72 hrs. are summarized in Table 6. Of *E. coli* serotypes, 018a 018c:K 77, 0111:K 58, 055:K 59 and 086a; 50%, 50%, 67%, 67% and 100%, respectively were isolated at 24 hrs. Twelve mother-infant pairs had significant isolates which were not the same organisms (Table 7).

Maternal isolates and age; parity, and home province history are summarized in Table 8.

Table 1. Maternal-neonate enteric bacteria matched isolates of 391 paired cases

	Maternal Source			Total	%	%
	Rectal	Vaginal	R+V	Paired Isolates	Paired Isolates	Paired Cases
E. coli 018a 018c:K 77	5	5	2	12	46	3.07
0111:K 58	5	1		6	23	1.53
055:K 59	3	2	1	6	23	1.53
086a			1	1	4	0.26
Enteropathogenic *E. coli* total :				25	96	6.39
Salmonella group E1 spp.			1	1	4	0.26
Matched isolate total :				26		6.65

Table 2. Maternal history of matched neonate-maternal isolates (26 cases)

Matched Isolates	# Cases	Age/# Cases	Parity/ # Cases	Home Province Bangkok	Other
E. coli 018a 018c:K 77	12	18/1,19/1,20/1, 21/2,22/2,25/2, 24/1,27/2	1/3,2/6 3/2,1-unk	1	11
055:K 59	6	17/1,18/1,20/1, 27/1,28/1,33/1	1/3,3/2 6/1	2	4
0111:K 58	6	18/1,20/1,25/1, 27/2	1/2,2/4	2	4
086a	1	29/1	1/1	1	0
E. coli total :	25				
Salmonella group E1 spp.	1	24/1	3/1	0	1
Isolate total :	26				

Table 3. Sixty-one symptomatic maternal diarrhea cases of 391 mother-neonate paired cases (no symptomatic infants)

Group I	Maternal-neonate isolate match.	
E. coli :	018a, 018c:K 77	2 cases
	055:K 59	1 case
Group II	Maternal isolate only, infant negative.	
E. coli :	055:K 59	3 cases
	0111:K 58	2 cases
	018a 018c:K 77	1 case
	0127a	1 case
Group III	Infant isolate only, mother negative.	
E. coli :	028:K 73	1 case
	0111:K 58	2 cases
	0111:K 58, 086a	1 case
	020a 020b:K 84	1 case
	018a 018c:K 77	10 cases
	018a 018c:K 77, Shig. boydii 15	1 case
	0125:K 70	1 case
	055:K 59	5 cases
	086a	2 cases
	018a, Shig. A-D 01	1 case
Salmonella gr. E1 spp.		2 cases
		37 cases
Group IV	Mother and infant negative for bacterial isolates	
	Symptomatic only	24 total cases

Table 4. *E. coli* maternal isolates not matched with neonates (391 total cases)

	Isolate Source			Total	%*E. coli*	%
	Rectal	Vaginal	R+V	Isolates	Isolates	Cases
E. coli 018a 018c:K 77	15	9		24	32.00	6.14
0111:K 58	13	3	1	17	22.67	4.35
055:K 59	6	3	2	11	14.67	2.81
0127a	5			5	6.67	1.28
0125:K 70	1	3		4	5.33	1.02
086a	1	2		3	4.00	0.76
020a 020b:K 84	1	2		3	4.00	0.76
044:K 77		1		1	1.33	0.26
0128:K 67		2		2	2.67	0.51
025	1			1	1.33	0.26
026:K 60	1			1	1.33	0.26
0127a:K 63			1	1	1.33	0.26
020a 020c:K 61	1			1	1.33	0.26
044:K 74	1			1	1.33	0.26
total *E. coli*				75		19.18
total *E. coli* cases				72		18.41

Cases with two species EPEC

E. coli 0127a	Rectal	1 case
044:K 77	Vaginal	
055:K 59	Rectal	1 case
0111:K 58	Vaginal	
0111:K 58	Rectal	1 case
018a 018c:K 77	Vaginal	

Table 5. Neonate *E. coli* isolates not matched with mothers of 391 paired cases (All infants diarrhea asymptomatic)

	Total Isolates	%*E. coli* Isolates	% Cases
018a 018c:K 77	28	38.36	7.16
055:K 59	13	17.81	3.32
0111:K 58	12	16.44	3.07
086a	4	5.48	1.02
0125:K 70	3	4.11	0.77
020a 020b:K 84	3	4.11	0.77
0127a	2	2.74	0.51
0126:K 71	2	2.74	0.51
0119:K 69	1	1.37	0.26
018a 018c:K 67	1	1.37	0.26
028:K 73	1	1.37	0.26
044:K 74	1	1.37	0.26
026:K 60	1	1.37	0.26
0128:K 67	1	1.37	0.26

(3 cases had two species of EPEC)

Table 6. Maternal-neonate enteric bacterial matched isolates of 391 paired cases

		24 hrs. Isolates	72 hrs. Isolates	24+72 hrs. Isolates	Total Paired Isolates
E. coli	018a 018c:K 77	6	4	2	12
	0111:K 58	4	2		6
	055:K 59	4	2		6
	086a	1			1
E. coli totals		15	8	2	25
Salmonella group E1 spp.			1		
	total	15	9	2	26

Table 7. Isolates of 12 mother-infant pairs, un-match, of 391 mother-infant paired cases

	Mother	Infant
E. coli	0112a 0112c:K 66	Salm. gr. E1 spp.
	020a 020c:K 61	Salm. gr. E4 spp.
	086a	Salm. gr. E1 spp.
	018a 018c:K 77	Salm. gr. E1 spp.
	0111:K 58	Salm. gr. E4 spp.
	0127a, 0111:K 58	Sh. boydii 15 and *E. coli* 018a 018c:K 77
	0127a:K 63	*E. coli* 0111:K 53 and *E. coli* 018a 018c:K 77
	0111:K 58	Salm. gr. E1 spp. + *E. coli* 055:K 59 and *E. coli* 020a 020b:K 84
E. coli	018a 018c:K 77, Salm. gr. E1 spp.	*E. coli* 0111:K 58
	Sh. boydii 2	Salm. gr. E4 spp. + *E. coli* 018a 018c:K 77
	V. parahaemolyticus	Salm. gr. E spp. + *E. coli* 018a 018c:K 77
	V. parahaemolyticus	*E. coli* 055:K 59

Table 8. Maternal enteric bacterial isolates (391 pairs)

	# Cases	Age/# Cases	Parity/ # Cases	Home Province Bangkok	Out
E. coli 018a 018c:K 77	24	16/1,20/4,21/2,22/2, 23/2,25/3,26/2,27/2, 28/1,29/1,30/1,32/2, 35/1	1/15,2/4 3/5	5	19
0111;K 58	17	18/2,19/2,20/1,21/3, 22/1,23/1,24/1,25/2, 26/1/28/1,30/1,35/1	1/9,2/6 4/2	4 1-unk	12
055:K 59	11	17/1,18/2,23/2,26/1, 28/2,30/1,31/1,32/1	1/6,2/3 3/1,4/1	4	7
0127a	5	21/1,24/1,27/2,35/1	1/3,2/1 4/1	2	3
0125:K 70	4	20/1,23/1,25/1,28/1	1/1,2/1 3/1	2	2
020a 020b:K 84	3	23/1,30/1,32/1	2/1,3/1 1-unk	0	3
086a	3	21/1,22/1,27/1	1/1,2/1 3/1	1	2
044:K 74	2	21/1,37/1	2/1,4/1	0	2
0128:K 67	2	20/1,29/1	1/2	0	2
0127a:K 63	1	23/1	2/1	0	1
026:K 60	1	19/1	1/1	0	1
020a 020b:K 61	1	16/1	1/1	0	1
025	1	26/1	UNK	0	1
Salm. gr. E1 spp.	2	22/1,23/1	2/2	1	1
S.paratyphi A	1	20/1	2/1	0	1
S. somniform I	1	21/1	1/1	0	1
Shigella A-D 02	1	22/1	1/1	0	1
E. coli total :	75				
Isolate total :	80				

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