

## Brief Reports

### An Outbreak of Hospital Acquired Diarrhea Due to *Aeromonas sobria*

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Six children admitted in a 18 bedded hematology-oncology unit, developed acute diarrhea in a four week period between March and April 2001. *Aeromonas sobria* was isolated from the stool samples of these children. *Salmonella senftenberg* was the additional pathogen in the stool sample of one patient who developed cola coloured urine and pneumonia in the course of his illness. All the *Aeromonas* strains had a similar biotype and antibiogram. The diarrhea subsided spontaneously in two children whilst three responded to antimicrobial therapy. One patient sought discharge and did not return for a follow up. *Aeromonas sobria* with a similar profile as the isolates from the patients could be isolated from only one of several environmental sites. The outbreak could be contained by appropriate interventional measures.

**Key words :** *Aeromonas*, Diarrhea, Hospital acquired, Outbreak.

*Aeromonas* species are ubiquitous water borne micro-organisms. They have been reported to cause various illnesses in humans such as wound infections, septicemia, peritonitis, pneumonia, etc. They are being increasingly recognized as an important cause of diarrhea worldwide(1). Information regarding nosocomial outbreaks due to this pathogen is scanty. In this communication we describe our experience of managing an outbreak of *Aeromonas* species diarrhea in a pediatric hematology-oncology unit of a tertiary care center in north India.

#### Subjects and Methods

Six children admitted in the hematology oncology unit of Advanced Pediatric Center, PGIMER, Chandigarh developed acute diarrhea in a four-week period in March-April

2001. The clinical profile of these cases is summarized in *Table I*.

#### Patients' isolates

The blood and stool samples of these patients were processed in the medical microbiology laboratory. Stool samples were collected in sterile McCartney bottles and rectal/fecal swabs in Cary Blair transport medium. The samples were processed within two hours of collection. These were inoculated onto MacConkey agar, xylose lysine deoxycholate agar, thiosulphate citrate bile salt agar and enrichment media such as *Salmonella shigella* broth and alkaline peptone water. Blood cultures were taken in the bile and trypticase soy broth. The suspected pathogens were identified by standard bacteriological techniques. Presumptive identification of

**TABLE I**—*Clinical Profile of the Patients.*

	Age	Sex	Diagnosis	Date of admission	Date of diarrhea	Treatment	Outcome
A	4 mo	M	Cyst Liver	27/03/2001	27/03/2001	Cip, Ak IV fluids	Diarrhea subsided
B	1 yr	M	Neuroecto- dermal tumor	10/04/2001	12/04/2001	Cip, Ak, Met IV fluids	Diarrhea subsided
C	3 yr	M	ALL	7/04/2001	13/04/2001	Cip, Ak, Met IV fluids	Diarrhea subsided
D	6 yr	F	ALL	11/04/2001	14/04/2001	Cip, Ak, Met IV fluids	Outcome not known
E	3 yr	M	NHL	20/04/2001	22/04/2001	ORS	Diarrhea subsided spontaneously
F	7 yr	M	Nutritional anemia	21/04/2001	23/04/2001	ORS	Diarrhea subsided spontaneously

IV fluids – Intravenous fluids; Cip–Ciprofloxacin; Ak–Amikacin; Met Metronidazole; ORS–Oral rehydration solution; ALL–Acute lymphatic leukemia; NHL –Non Hodgkins lymphoma.

*Aeromonas* was made on the basis of oxidase positivity, resistance to vibriostatic agent O/129 (oxid 10 & 150 µg/disk, growth on nutrient medium containing no added salt, and negative string test. The isolates were subsequently characterised by a battery of biochemical tests(2). Follow up rectal swabs / stool swabs of these patients were taken again after an interval of one week. Rectal swabs/ stool samples of other children admitted in the same ward were taken simultaneously to determine carriage.

#### *Environmental isolates*

Samples were taken from several sites in the ward. These included water from all the taps(8) and aquaguards(10), intravenous fluids and other drugs being administered to the patients(16), food samples including milk (18), swabs from the sinks(8), refrigerators (6), medicine trolleys and trays(6), utensils(18), nebulisers(6), humidifiers(4) and other equipment(6) being used by the patients.

#### *Antimicrobial susceptibility testing*

The strains were tested for antimicrobial susceptibility by Stoke's disk diffusion method(3) using Mueller Hinton agar and antibiotic disks procured from Hi-Media laboratories, India. The following disks were used: amoxicillin (10 µg), nalidixic acid (30 µg), ciprofloxacin (1 µg), ofloxacin (5 µg), gentamicin (10 µg), amikacin (30 µg), cotrimoxazole (25 µg), chloramphenicol (30 µg), furoxone (30 µg). The plates were incubated at 37°C overnight. The diameter of zone of inhibition of each antimicrobial agent was compared with the control (*Escherichia coli* NCTC 10418) and recorded as resistant, sensitive or intermediate(3).

#### **Results**

Out of the 18 children in the hematology oncology ward during the period of outbreak, six children developed diarrhea. The age of the affected children (5 males & 1 female) ranged from 4.5 months to 7 years. They were

receiving treatment for their underlying diseases. Two children were neutropenic at the time of development of diarrhea. The index case, a four and a half month child, was admitted on 27 March 2001 with symptoms of acute watery diarrhea and fever. Five more children admitted in the same ward developed diarrhea (4 acute watery diarrhea and a solitary case with bloody diarrhea). The mean post admission day for development of diarrhea was 2.7 days. The child who presented with bloody diarrhea later developed cola colored urine and pneumonia.

*Aeromonas* species was the sole enteropathogen isolated in 5 patients. One had mixed infection with *Aeromonas* and *Salmonella* senftenberg. All strains produced acid and gas from glucose, produced indole, decarboxylated lysine and arginine, produced acetoin in Voges Proskauer test, produced acid from L-arabinose, sucrose and mannitol and were resistant to ampicillin (10 µg). The antimicrobial susceptibility pattern of these isolates showed that all the strains were sensitive to amikacin, chloramphenicol, furoxone and resistant to ampicillin, cotrimoxazole, nalidixic acid and ciprofloxacin. The diarrhea was self-limiting in two patients while four patients were treated with ciprofloxacin, amikacin and metronidazole. Five children recovered uneventfully while the outcome of one patient who had developed pneumonia is not known since the child was taken home against medical advice. Rectal/fecal swab cultures of other admitted children not having diarrhea were negative for enteropathogens. *Aeromonas* could not be isolated from follow up rectal swab cultures of children with diarrhea.

On environment sampling, *Aeromonas sobria* could be isolated from one sink that was being used by the patients' attendants for washing utensils. All other cultures were negative for *Aeromonas* species. The strain from the envi-

ronment was similar to the clinical isolates from the patients in biochemical reactions and antimicrobial susceptibility patterns.

### Discussion

*Aeromonas* are ubiquitous bacteria and their prevalence is particularly high in a variety of aquatic environments including drinking water, estuaries, sewage etc. and numerous food products. *Aeromonas* species has been reported as an important cause of acute diarrhea in children and adults(2). The overall incidence of *Aeromonas* species in diarrheal diseases varies from 1 to 27%(4-5). The most commonly implicated species are *A. hydrophila*, *A. sobria*, and *A. caviae*. Though commonly associated with diarrheal disease in healthy adults, they can cause serious infections in immuno-compromised patients(6). Nosocomial infections appear to be uncommon and only one outbreak of hospital-acquired infection has been previously reported(7). A few outbreaks of water or food borne *Aeromonas* species diarrhea have been documented(8,9).

The present outbreak evolved over a period of one month. *Aeromonas* is sporadically isolated in our geographic area. The outbreak was suspected only when clustering of cases was observed from the same ward. It is a well-established fact that infections due to *Aeromonas* are more severe in immunocompromised individuals. In our study, five of the affected children had acute watery diarrhea of moderate to severe degree. Only one child who was co-infected with *Salmonella senftenberg* presented with bloody stools, cola colored urine and later on developed pneumonia. However, both these organisms have the potential to cause invasive disease and hemolytic-uremic syndrome.

All the isolates were *A. sobria* belonging to the same biotype and had similar antimicrobial profile. The single environmental isolate of *Aeromonas sp* had the same biotype and

### Key Message

- Though reported by us for the first time, *Aeromonas* should be considered amongst the causative agents of diarrhea especially in hospital settings and thus prompt measures to identify and contain the source are very important.

antibiogram. *Aeromonas* species are known to reside in a large variety of aquatic environments. Though we could isolate *Aeromonas sobria* from one of the sinks, it is not sure whether the sink acted as a source of infection or was simply contaminated with the organisms. The outbreak evolved over a period of one month, which suggests person-to-person transmission and practically rules out point source outbreak. The following interventional measures were taken: the patients were isolated, barrier nursing was instituted and the sinks were disinfected. The patients' attendants, nurses and doctors were instructed to wash their hands before handling the patients. The caretakers were counselled to wash their hands and clean the utensils properly before feeding the children. These measures controlled the outbreak. The organism has not been isolated in culture specimens since April 2001.

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## Relationship Between BCG Scar Size and Asthma in Children?

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*This case control study was conducted to evaluate any association between the BCG scar size and occurrence of asthma among children between 6-14 years of age. Cases consisted of 90 asthmatic children. Control group included 90 non-asthmatic children from the emergency room service of the same hospital. The BCG scar was measured as the average of the transverse and longitudinal diameters. The results showed that asthmatic subjects have a 3.2 times greater risk exhibiting a scar diameter of < 5mm than non-asthmatic subjects (CI 95% = 1.40 - 7.63; P < 0.01). It was concluded that asthmatic children and adolescents exhibited a greater frequency of an BCG scar diameter of < 5mm than non-asthmatics. Clinical significance of this observation is uncertain.*

**Key words:** BCG, BCG scar, Bronchial asthma, Children.

There is evidence that asthma results from a predominance of a T helper (Th) 2-type response to common airborne allergens (in contrast to Th1 predominant pattern found in normal, non-atopic individuals)(1). These contrasting forms of reaction to allergens appear to be programmed in the immunological memory in early childhood(2) or in utero. Mononuclear cells of cord blood of children who develop asthma and/or other atopic illnesses produce lower amounts of INF- $\gamma$ (3). The extent of Th1/Th2 balance during the neonatal period may be the key determinant of how the genetic predisposition to asthma is

modulated and may be useful in predicting its subsequent development(4). It has been shown that in twelve years old children, clinical asthma is more prevalent in those with low tuberculin skin test reactivity (which is also dependent on Th1 lymphocyte response)(5).

The Bacille Calmette-Guérin (BCG), when administered intradermally, induces, even in newborns, a significant increase in the response of cytokines derived from Th1 lymphocytes(6). Studies have shown that tissue reactions at the site of the BCG vaccination are proportional to the production of INF- $\gamma$  in response to the myco-bacterial