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# A Pilot Search for Environmental Factors Influencing Diarrheal Disease in Young Children in Panama

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Diarrheal disorders have long been reported in the developing countries as the leading cause of death in children during the first few years of life<sup>(1)</sup>. Panama is no exception as its statistical data on the problem reveal these disorders to be the major cause of death in infants and children and the sixth highest cause of death for the total population<sup>(2)</sup>.

The criteria used in Panama for the general diagnosis of this disorder, often referred to as simply diarrhea, is the passage of five or more stools within twenty-four hours or presence of mucus or blood in loose stools<sup>(3)</sup>.

Global research has resulted in the compilation of much information on this complex problem as influenced by the nation's internal and external environment. The complexity of the etiological and epidemiological factors, however, has hindered progress toward its control.

The first bacteriological evaluation of human diarrhea in Panama, undertaken in 1964, was a study of young children visiting the hospital outpatient clinic<sup>(4)</sup>. Results of the investigation showed only 7.9 per cent of the children with diarrhea and 1.4 per cent of the controls to have either *Escherichia coli*, *Salmonella*, or *Shigella*, the three main pathogenic organisms thought to cause diarrhea. Studies were then broadened to include environmental conditions thought to influence the presence of bacteria in diarrheal disease. Quality of housing was evaluated as a single factor<sup>(5)</sup>; findings were inconclusive except that the rates of diarrhea in the best type of housing differed from the other five substandard types. Later water and hygiene facilities were evaluated<sup>(6,7)</sup>; no direct relationship to diarrhea was found.

Upon review of other bacterial studies of diarrhea, one study of normal children found that

approximately one tenth had either enterovirus or some type of pathogenic bacteria in the stool with the prevalence varying with age, sex, area, season, and locality<sup>(8)</sup>. Pierce's examination of the feces of patients with diarrhea, revealed no regular occurrence of common pathogenic bacteria<sup>(9)</sup>. Other studies found little differences in the intestinal bacterial flora of well children and children with diarrhea<sup>(10, 11)</sup>. One, however, found quantitative rather than qualitative differences in the intestinal bacteria of the controls and the group with diarrhea<sup>(12)</sup>. More specifically, one group related that when infants were given food contaminated with bacteria normally found in the intestine, massive contamination and overgrowth of these organisms resulted<sup>(13)</sup>. This change could be a major factor in acute diarrheal disease because of the capacity of the large numbers of bacteria to upset the balance of the intestinal tract flora.

Diarrhea has been studied in relation to other causative agents besides bacteria. It was found to be associated with viruses and respiratory infection<sup>(14, 15, 16)</sup> but not significantly associated with the presence of intestinal helminths and protozoa<sup>(17)</sup>. Diarrhea has also been associated with antibiotic therapy. Some antibiotics have been shown to upset the balance of the intestinal flora by suppressing some organisms and permitting overgrowth of others, thereby either causing or increasing the severity and duration of diarrhea<sup>(18, 19)</sup>.

Studies have implicated some foods and animals as possible carriers of bacteria capable of causing diarrhea. Dried milk in the factory was found to contain both *Staphylococcus*<sup>(20)</sup> and *Salmonella*<sup>(21)</sup>. Lizards were shown to harbor *Salmonella* organisms<sup>(22)</sup>.

The INCAP groups working in Guatemala since the 1950's have done the most complete and continuous investigation of the epidemiology and etiology of diarrhea with respect to environment and nutrition. One group concluded that the social environment appeared to exert its greatest effect, not through the type of housing, but through the population density in living compounds and habits of the people in relation to care of water, wastes, and food consumed<sup>(23)</sup>. As to specific

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