Journal of the Arkansas Academy of Science

Volume 45 Article 39

1991

Bacteremia Associated with Mortality in an Arkansas Alligator

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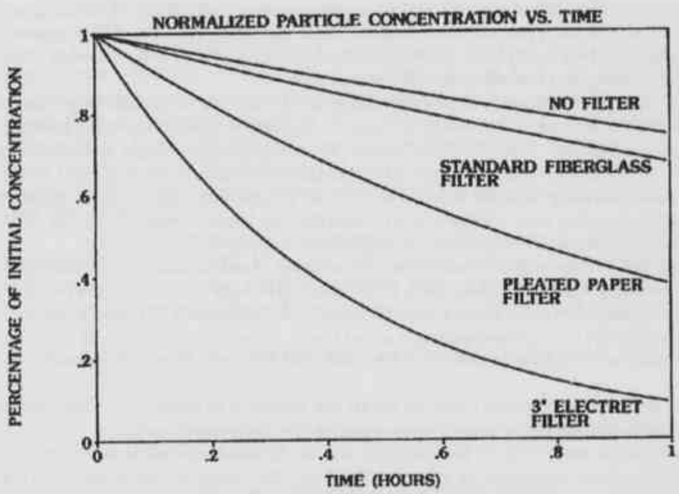

Figure 1. Best fit exponential decay of particulate concentrations with time in the test residence for each of the filters tested. The fit for the 15 cm electret filter is not shown as it fell nearly on top of that for the 7.5 cm electret filter.

The relative merits of each filter type are as follows:

(1) Pleated Paper Filter - This type demonstrated appreciable particulate removal ability in the submicrometer size range with moderate energy consumption.
(2) Electret Filters – The electret filters yielded the best small particle collection ability of those tested. The 7.5 cm electret gave 92% of the CADR of the 15 cm electret with only 36% of the energy consumption. The 15 cm electret loaded the blower, reducing the air flow rate resulting in a lower CADR than would otherwise have been expected.
(3) Standard Fiberglass Filter – The merits of this type include compatibility with existing HVAC systems and low cost. Small particle collection ability is minimal. Energy consumption is low.

The CADR numbers should be interpreted with caution. They are specific to the test aerosol and to the test chamber and air handling system. The CADR numbers for different filters can only be compared when all other factors in the determination of the numbers are the same. High CADR numbers are given by high filtration efficiencies. However, a maximum CADR exists which depends on the volumetric air flow rate and the mixing factor for the house. Therefore, continuing to increase the filtration efficiency will add little in terms of improved air quality but will increase energy consumption. Additional work in this study will be aimed at determining optimum filtration efficiency when both air quality and energy consumption are considered.

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THE VASCULAR FLORA OF PERRY COUNTY, ARKANSAS; A PROGRESS REPORT

Located in western, central Arkansas in the Ouachita Mountain Division, Perry County lies in the center of the Fourche Mountain Subdivision immediately below the Arkansas River Valley Subdivision of the Interior Highlands. The vascular flora of this county is poorly known; Perry County ranks at 56 of the 75 Arkansas counties for the number of known taxa (Smith, 1988. An atlas and annotated list of the vascular plants of Arkansas. Kinko's, 653 West Dickson Street, Fayetteville, AR. 72701). Community types represented in the County range from hydric sites (cypress swamps; ponds, streams and river banks) to bottomland hardwood forests, to pine forests, to upland hardwood forests, cedar glades and bluffs; included are disturbed sites ranging from hydric to xeric.

Numerous collection trips concentrated over the last year during the spring, summer and fall growing seasons have been made to sites representative of these community types. Currently 134 county records of vascular species have been identified. Voucher specimens are deposited in the herbaria of UCA and UARK. This current list is published with the Arkansas Native Plant Society as an Occasional Paper and may be obtained from Dr. James H. Peck, Biology Dept., University of Arkansas at Little Rock, 2801 S. University Ave., Little Rock, AR 72204.

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BACTEREMIA ASSOCIATED WITH MORTALITY IN AN ARKANSAS ALLIGATOR

Death from gram-negative septicemia has been reported several times in reptiles. In alligators this has been associated with populations that had been stressed due to changes in the natural or captive environment (Shotts *et al.*, 1972; Gordon *et al.*,1979). It is believed that the bacteria gain entrance to the blood stream of infected reptiles by natural or surgical wounds (Cooper, 1981). We report a case of death in an adult alligator associated with a septicemia or bacteremia in which the most prominent organism isolated was *Aeromonas hydrophila*. The alligator had been obtained from the wild but had been living isolated away from a natural or translocated population of alligators. The only significant pathology found on postmortem examination was minute hemorrhagic lesions in the gastrointestinal tract, which could have provided the bacteria entrance to the circulatory system.

A large, male alligator was captured on an embankment of a small, impounded lake on a geological elevation of the Mississippi delta known as Crowley's Ridge in East-Central Arkansas (St. Francis Co.) on March 10, 1985. The animal was known to have resided in the area for many years on this uplifted region, which is approximately 30 miles from the nearest known alligator population on the St. Francis River. The original territory and time of the alligator's arrival on Crowley's ridge are unknown. The alligator was 305-cm long (snout to tip of tail) and weighed 114-kg. The animal was recently deceased when captured and was immediately transported to the Arkansas State Livestock and Poultry Commission Laboratories in Little Rock for postmortem examination and collection of laboratory samples. The alligator had been seen alive the previous day and its heart muscle was still active when examined, therefore the time elapsed from death to postmortem examination was estimated to be less than12 hours. Aseptic culture specimens (3 samples each) were taken as follows: Aerobic and

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anaerobic blood cultures from the cardiac chambers, aerobic and anaerobic cultures from liver tissue, aerobic and anaerobic cultures from swabs of the lung and trachea, and stool cultures. Standard clinical microbiology techniques were employed and the gram-negative isolates were identified with the API diagnostic panel (API products, Plainview, New York). Where possible, numbers of organisms isolated on agar plates were estimated on a scale of rare to 4+ (Bartlett *et al.*, 1978). Stool samples were also taken for ova and parasite examination by direct, concentrate, and trichrome staining techniques.

Prior to its death the alligator had been closely observed for a week. It was noted to be sluggish in its movements and it had noticeable bleeding from its nares. The only gross pathology seen on postmortem examination, in an otherwise healthy animal, were numerous small hemorrhagic lesions occurring intermittently throughout the gastrointestinal tract from the stomach to the small and large intestines. The intestinal lesions were small with a slight inflammatory response, and were not purulent. The lesions appeared to be confined to the mucosa and submucosa as there was no serosanguinous fluid in the peritoneal cavity. The bleeding from these lesions was apparently responsible for the nasal bleeding since the lungs and the bronchi were clear. In previous cases of gram-negative septicemia in crocodilians a nasal discharge has been associated with purulent pneumonia rather than with intestinal hemorrhaging (Shotts *et al.*, 1972). No tissue sections were taken for histopathology. There was little digestive residuum in the stomach and no evidence that the animal had recently fed.

The bacteriology results were as follows: Blood cultures (aerobic and anaerobic) – *Aeromonas hydrophila*, *Citrobacter freundii*, and *Clostridium bifermentans;* stool cultures – *A. hydrophila* (4+) and *Hafnia alvei* (2+); liver tissue (aerobic) – *A. hydrophila* (4+), *C. freundii* (3+), and *Enterococcus* (1+); liver tissue (anaerobic) – *Clostridium* spp., *Bacteroides* spp., and other nonidentifiable gram-negative rods; Lung swabs (aerobic) – *A. hydrophila* (3+) and a rare nonfermentative, nonidentifiable gram-negative rod; lung swabs (anaerobic) – *A. hydrophila* (2+), *Proprionibacterium acnes* (rare), *B. ureolyticus* (rare), *B. eggerthii* (rare); tracheal swabs (aerobic) – *Serratia plymuthica* (1+) and *Streptomyces* spp; tracheal swabs (anaerobic) – No growth. No evidence of animal parasites was found in the stool samples.

Gross examination of the intestinal tract and microscopic examination of intestinal scrappings failed to reveal the presence of helminths. Two placobdelled leeches were found in the oral cavity but no other ectoparasites were seen. Wright-stained blood smears were negative for erythrozoan parasites.

Conclusions from the laboratory examinations, necropsy, and field observations were that; 1) the alligator was an isolated individual from the wild which had no recent contact with other crocodilians, 2) it was not exposed to handling, physical trauma, or relatively high environmental temperatures, 3) it was a relatively healthy specimen presenting only with enteritis accompanied by minute hemorrhaging, and 4) it had either a bacteremia or septicemia with *A. hydrophila* being the predominant organism.

Aeromonas hydrophila is a motile, nonsporulating gram-negative bacillus ubiquitous in nature, especially in aquatic environments. It is so easily and frequently isolated from crocodilians and other reptiles that it has been considered to be either normal flora or a common transient (Gordon *et al.*, 1979; Flandry *et al.*, 1989). It has even been isolated from the tissues of healthy alligators (Gordon *et al.*, 1979). Under certain conditions *A. hydrophila* is believed capable of producing disease, presumably because of excessive environmental stress, physical handling, trauma, and immunosuppression (Cooper, 1981). The frequency and quantity of *A. hydrophila* isolated from all of the cultures (with the exception of the trachea) in the present case, strongly suggests this organism as the cause of a septicemia in the alligator. Probable cause of death can be hypothesized as associated septic shock. The lack of severe accompanying pathology is not inconsistent with cases of presumed septic shock in reptiles (Cooper, 1981).

The variety of organisms isolated suggests that the time lapse before the cultures were taken could have allowed the multiplication of *A. hydrophila* and the other identified microbial agents. It is possible that these agents could have gained entrance to the circulation after death. However, similar polymicrobic septicemias are seen with humans, especially in patients that are immunocompromised.

Although *A. hydrophila* can be isolated from the gastrointestinal tract in asymptomatic animals, its predominance in the stool samples in the present case suggests that this organism may have also produced the initial enteritis. Enteritis is not an uncommon finding with infections of *A. hydrophila* in both reptiles and humans (Marcus, 1981; Zwadyk, 1988), but it is difficult to be certain as to whether the initial lesions were produced by *A. hydrophila* or if the lesions were even of bacterial origin. Other gram-negative bacteremias of crocodilians, not involving *A. hydrophila,* have been attributed to having their origins in skin abscesses from puncture wounds (Novak and Seigel, 1986; Heard *et al.*,1988). Since *A. hydrophila* was isolated from intestinal samples in large numbers, entrance by this bacterium to the blood stream, in any case, would most likely have occurred through the intestine.

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