

# INVESTIGATING A POSSIBLE LINK BETWEEN WATER FROM AQUIFERS CONTAINING LIGNITE DEPOSITS AND KIDNEY DISEASE IN THE USA: LOUISIANA PROJECT

Joeseeph Bunnell<sup>1</sup>, Rebecca Bushon<sup>2</sup>, William Orem<sup>1</sup>, Calin A. Tatu<sup>1</sup>,  
Bradford Hanson<sup>3</sup>, Douglas Carlson<sup>3</sup>, Runhua Shi<sup>4</sup>

<sup>1</sup>U.S. Geological Survey, Geologic Discipline, Reston, VA.

<sup>2</sup>U.S. Geological Survey, Water Resources Discipline, Ohio Dist Microbiology Laboratory,  
Columbus, OH

<sup>3</sup>Louisiana Geological Survey / LSU, Water Resources and Environment Section, Baton Rouge, LA

<sup>4</sup>Louisiana State University School of Medicine, Shreveport, LA

## ABSTRACT

In May 2002, 15 wells and four surface water sites were sampled, and in September 2002, those same wells and sites plus four additional surface sites were sampled in five parishes of northwestern Louisiana. A geographic information system (GIS) was used to select residential water wells for sampling. Well water samples were analyzed for pH, conductivity, organic compounds, and nutrient and anion concentrations. All samples were further tested for presence of fungi (maintained for up to 28 days and colonies counted and identified microscopically), and metal and trace element concentration by inductively coupled plasma mass spectrometry and atomic emission spectrometry. Surface water samples were tested for dissolved oxygen and presence of leptospiral bacterial presence. A polymerase chain reaction protocol was optimized for detection of pathogenic leptospires, and the sensitivity of the assay was ascertained. The Spearman correlation method was used to assess the association between the endpoints for these field/laboratory analyses and cancer of the renal pelvis incidence obtained from the Louisiana Tumor Registry. Significant associations were revealed between the cancer rate and the overall number of organic compounds, the fungi Zygomycetes, the nutrients PO<sub>4</sub> and NH<sub>3</sub>, and thirteen chemical elements (As, B, Br, Cl, Cr, F, Li, Na, P, Rb, Se, Sr, W) from the well water as compared to the controls. Among the species of fungi from the total of 136 isolates were 12 *Penicillium* spp., at least two *Aspergillus* spp., a number of other genera (*Alternaria* sp., *Eupenicillium* lapidosum, *Cladosporium* sp., *Epicoccum* sp., *Trichoderma* sp., *Paecilomyces* sp., *Chrysosporium* sp., *Chloridium* sp.), and Zygomycetes, and Coelmycetes — some of which are known mycotoxin

producers. The two control wells yielded a mean of 6.5 (SD = 3.5355) individual isolates, while the mean number of isolates from all other sites was 7.6 (SD = 4.4866). Presence of human pathogenic leptospire was detected in 4/8 (50 percent) of the surface water sites sampled. These initial results suggest that additional investigation is warranted.