MEMORANDUM

TO: Theresa Pugh  
   American Public Power Association

FROM: Elizabeth E. Aldridge  
      Hunton & Williams

DATE: November 13, 2006

Fish Kills and Other Potential Effects of \textit{Pfiesteria}: Is it a Risk For Your Facility, Your Employees or Those Who Fish Near Your Facility?

At the request of APPA, I have prepared the following memorandum on environmental and human health concerns raised by \textit{Pfiesteria}. APPA member utilities – especially those with water utilities or those located in coastal areas – should be aware of the controversy about whether \textit{Pfiesteria} causes human health effects or fish kills. APPA member utilities with fish stocking programs and public events for fishing may also find this memorandum useful.

While as counsel to APPA we do not see any significant threat of \textit{Pfiesteria} at power plants or water utilities, we know that APPA member utilities have a unique role in communities where a water utility may also be managed. Public perceptions of risk are just as important to manage as real risks.

Since the early 1990s, public health and environmental scientists have been concerned about \textit{Pfiesteria} outbreaks. \textit{Pfiesteria} is the family name for a group of dinoflagellates. These outbreaks are reported to cause fish kills and many people believe the outbreaks are also dangerous to human health. In fact, some scientists think that exposure to \textit{Pfiesteria} can cause serious neurological problems such as loss of memory, confusion, and headaches, as well as skin rashes. Several federally funded studies are underway to determine if there is any public health threat from \textit{Pfiesteria}. 
Amidst this climate of uncertainty, APPA members should know about *Pfiesteria* so that they are prepared to deal with any outbreaks or, more likely, with public concerns about potential outbreaks. This memorandum provides an overview of what is known about *Pfiesteria* and the potential environmental and human health risks it may pose.

**What is *Pfiesteria***?

*Pfiesteria* is a family of dinoflagellates – microscopic free-swimming, single-celled organisms. Centers for Disease Control and Prevention, (CDC), Harmful Algal Blooms, [http://www.cdc.gov/hab/pfiesteria](http://www.cdc.gov/hab/pfiesteria). *Pfiesteria piscicida* was first identified in fish tissue collected from several major fish kills that occurred along the North Carolina coast. Subsequently, a related species called *Pfiesteria shumwayae* was discovered. Normally, the presence of *Pfiesteria* in estuarine waters presents no problem. But occasionally, and for reasons that are not yet fully understood, certain estuarine waters may experience a *Pfiesteria* “bloom” that can result in a fish kill.

EPA describes the effect of *Pfiesteria* blooms on fish as follows: “Fish attacked by *Pfiesteria* have lesions or large, gaping holes on them as their skin tissue is broken down; the lesions often result in death.” 66 Fed. Reg. 7,176, 7,241 (Feb. 17, 2003). For a photograph of fish lesions allegedly caused by *Pfiesteria*, see [http://www.whoi.edu/redtide/foodweb/pfiesteriafishsores.html](http://www.whoi.edu/redtide/foodweb/pfiesteriafishsores.html).

Additionally, the alleged human health effects from exposure to *Pfiesteria*, including memory loss, confusion, headaches, diarrhea, and other symptoms, have led to serious concern by the Centers for Disease Control and state health departments. CDC researchers have termed the group of symptoms “possible estuary-associated syndrome” or PEAS. However, ongoing public health surveillance programs in states prone to *Pfiesteria* outbreaks have not yet yielded strong evidence of human health problems. A $9 million study sponsored by the CDC of over
700 fishermen in Virginia, North Carolina, and Maryland found no evidence of health effects. Environmental Public Health Surveillance: Possible Estuary-Associated Syndrome, *Environmental Health Perspectives*, Vol. 109, Supp. 5, Oct. 2001. The study authors, however, noted the absence of any major *Pfiesteria* outbreaks during the time period of study. *Id.*

**Where is *Pfiesteria* Found?**

Dinoflagellates exist in many types of waters, but *Pfiesteria* are only known to occur in Atlantic and Gulf Coast estuary waters. *Pfiesteria* does not occur in fresh water. Harmful *Pfiesteria* blooms have been identified in the Tar-Pamlico watershed (North Carolina), the Neuse River (North Carolina), and the Pocomoke River in Maryland. *Pfiesteria* outbreaks in Florida have been alleged. *Pfiesteria* also have been identified in Virginia’s portion of the Pocomoke River. Virginia Department of Health, *What You Should Know about Pfiesteria and Virginia’s Waters*, VDH website, [http://www.vdh.virginia.gov/epi/dzee/waterborne/pfiesteria.asp](http://www.vdh.virginia.gov/epi/dzee/waterborne/pfiesteria.asp).

**History of *Pfiesteria* Controversy**


In 1997, Dr. Burkholder announced that she expected to have the chemical identity of the toxin very shortly. *Id.* However, other scientists have raised serious doubts about whether *Pfiesteria* species cause fish kills through release of a toxin. Research conducted at the Virginia Institute of Marine Science (VIMS) on another species of *Pfiesteria* (*Pfiesteria shumwayae*) demonstrated conclusively that *Pfiesteria* does not kill fish unless it comes into direct contact with them. This research suggests that *Pfiesteria* eats away at the flesh of fish causing open
lesions. The fish become subject to infections because of the lesions and die from the infections. If this theory is correct, *Pfiesteria* do not produce a toxin and pose much less of a risk to human health than originally believed. However, Dr. Burkholder has contended that the VIMS researchers and others who have conducted similar experiments were using the wrong strain of *Pfiesteria*, one that happened to be non-toxic. For further information about the scientific debate, see the following two web sites:

Virginia Institute of Marine Science:  [http://www.vims.edu/env/projects/pfiesteria](http://www.vims.edu/env/projects/pfiesteria)

North Carolina State University:

[http://www.ncsu.edu/wq/aboutCAAE/facilities/pfiesterialab.html](http://www.ncsu.edu/wq/aboutCAAE/facilities/pfiesterialab.html)

Also, the continuing scientific controversy is discussed in the following *Science* magazine article: *The Pfiesteria Conundrum: More Study, Less Certainty*, 303.5654 (Jan. 2, 2004), p. 25.

**Congress and the States Respond to the Perceived Threat**

In 1996, several major fish kills were attributed to *Pfiesteria*. As a result of these fish kills, federal and state legislatures began to address the problem. North Carolina adopted fishing ban rules for *Pfiesteria* outbreaks. 15A NCAC 031.0119. In 1998, Congress passed the Harmful Algal Bloom and Hypoxia Research and Control Act (HABHRCA), which provided funding for research on *Pfiesteria* as well as other harmful algal blooms such as “red tide.” In conjunction with the Act, Congress noted “the recent outbreak of the harmful microbe *Pfiesteria piscicida* in the coastal water of the United States is one example of potentially harmful algal blooms composed of naturally occurring species that reproduce explosively and that are increasing in frequency and intensity in the Nation’s coastal waters.” HABHRCA, Sec. 602 (1). The Act established a Federal Task Force on harmful algal blooms and hypoxia and provided for
assessments of ecological and economic consequences of harmful algal blooms, including *Pfiesteria*. In 2004, Congress reauthorized the Act and renewed its funding.

The sustained federal funding has ensured continuing research on *Pfiesteria* and its alleged health effects. The Centers for Disease Control note the following federal activities related to *Pfiesteria*:

- Beginning in 1998, CDC worked with East Coast states to develop a surveillance system to collect information about exposure to estuarine water and subsequent health effects. This federal research has yet to identify any health risks from *Pfiesteria*.

- CDC supported Maryland, North Carolina, and Virginia in the study of potential acute and chronic health effects that might result from occupational exposure to *P. piscicida* or any toxins that *P. piscicida* might produce.

On September 7, 2006, the United States Interagency Working Group on Harmful Algal Blooms, Hypoxia, and Human Health released its report titled *National Assessment of Efforts to Predict and Respond to Harmful Algal Blooms in U.S. Waters*, [http://ocean.ceq.gov/about/docs/iwg4h_prrpt_final.pdf](http://ocean.ceq.gov/about/docs/iwg4h_prrpt_final.pdf). The report addresses both the state of research and the methods for predicting and responding to harmful algal blooms. The report is just a first step in attempting to coordinate various agencies’ efforts to predict (and ameliorate) algal blooms, and does not address environmental and human health effects of *Pfiesteria* blooms. However, in December 2007, the Interagency Working Group will be publishing its *Scientific Assessment of Marine Harmful Algal Blooms*, which could contain very significant findings about the prevalence and causes of *Pfiesteria* blooms. Availability of the report will be noticed in the Federal Register.
Legal Liability for *Pfiesteria* Blooms and their Environmental or Health Effects

Despite continuing uncertainty about *Pfiesteria*’s health effects, litigation regarding illnesses allegedly caused by *Pfiesteria* appears to be very rare. The North Carolina Industrial Commission recently heard a workers’ compensation case in which the plaintiff claimed exposure to mold in the workplace caused symptoms such as tremors, headaches, nausea, and dizziness. *Santorre v. Administrative Office of the Courts*, 2005 N.C. Wrk. Comp. LEXIS 360 (Nov. 1, 2005). The plaintiff consulted a Maryland doctor who was very involved with the *Pfiesteria* incidents in Maryland, and who authored a book on his experiences. The doctor diagnosed the worker as suffering from “biotoxin associated illness.” However, the Workers’ Compensation Board found that the plaintiff failed to establish that her doctor’s opinion was based on medically accepted standards of practice. The Court further said: “Further study may support his hypothesis and methods, and the same may become standard protocols in the field of exposure to biotoxins. However, at this time, the greater weight of the scientific evidence in the medical field fails to support his methods and conclusions.” Although this case did not involve allegations of *Pfiesteria* toxic effects, it is instructive for the weight the Court gave to the opinion of a purported *Pfiesteria* expert.

In a very recent mold exposure case, however, the same Maryland doctor who proclaims himself a *Pfiesteria* and biotoxin expert was allowed to give testimony, even though the opposing insurance company argued the doctor’s opinion was based on “new science” and was “unreliable.” *Montgomery Mutual Ins. Co. v. Chesson*, 2006 Md. App. LEXIS 217 (Md. Ct. Spec. App. Sept. 20, 2006).

Possible Synergistic Effects with Typical Power Plant Effluents

Do power plant effluents have any potential effect on the presence of *Pfiesteria* blooms? The short answer is there is no evidence of a power plant causing or contributing to a *Pfiesteria*
outbreak. In fact, there is little research demonstrating that any type of discharge causes 
Pfiesteria blooms. As already noted, EPA and some scientists suspect that nutrient runoff (such as runoff from concentrated animal feed lots or poultry farming) may be a catalyst for Pfiesteria outbreaks. While some power plants may discharge nutrients through release of ammonia slip from SCRs, these discharges have not been linked to any Pfiesteria problems.

It is an open question, however, whether increased temperatures such as those that could be generated by a power plant could trigger a Pfiesteria outbreak. According to the Maryland Office of Environmental Health, Pfiesteria “becomes toxic to fish under certain conditions, which include calm waters, large amounts of fresh fish excreta, brackish to near-fresh water, and warm water temperatures (ranging from 50F to 90F).” See http://www.cha.state.md.us/oeh/html/facts.html (emphasis added). Therefore, despite the lack of scientific evidence, it is possible that states and environmental groups may accuse power plants of contributing to water temperatures that are conducive to Pfiesteria blooms. Recently, health officials in Virginia have raised questions about health impacts in waters used for recreation near power plant discharges. While these officials were not focusing on Pfiesteria, power plants should be aware that state health offices are beginning to question the health effects of high discharge temperatures in waterbodies used for recreational purposes. If Pfiesteria becomes an issue in your area, it could be another factor used by authorities to impose more stringent thermal limits.

**Power Plants and Pfiesteria**

If your facility is located on fresh water, Pfiesteria should not be a concern. Any fish kill that occurs in your vicinity will be due to some other cause. In any event, if a fish kill occurs in the area of your discharge, you should report it to your state environmental agency. That agency will normally conduct an investigation to identify the causes of the fish kill.
If your facility is located on brackish or salt water, it is possible, although very unlikely, that *Pfiesteria* may contribute to or cause a fish kill. As with any fish kill, you will want to monitor your state agency’s conduct of the investigation to the extent possible, and you may want to request split samples of any water or fish samples the agency collects.

If you discharge into a estuarine water and you suspect *Pfiesteria* as a cause of the fish kill, public health officials may be consulted. During the pendency of the investigation, it would be prudent to advise your employees and anyone else who might come into contact with dead fish to stay out of the area. For detailed health recommendations, you may wish to contact your state health department. The North Carolina Health Department’s advice on *Pfiesteria* can be found at the following site: [http://www.epi.state.nc.us/epi/hab/faq.html](http://www.epi.state.nc.us/epi/hab/faq.html).

If the public has access to your facility for fishing or other recreational purposes and the waterbody is estuarine or brackish, you should consider prohibiting access to the waterbody whenever there is either a severe algal bloom or a fish kill, no matter what the cause of the condition. In this way, you should be able to rule out any possible *Pfiesteria* contact. Also, you should be aware of any health advisories (whether they are for mercury contamination, *Pfiesteria*, or other causes) issued for your waterbodies. Health advisories for *Pfiesteria* are very rare, and typically issued by state health departments.

**Drinking Water Utilities and *Pfiesteria***

Should owners and operators of water systems or water utilities be concerned about *Pfiesteria*? In 1998, EPA took a hard look at the potential for human health impacts from *Pfiesteria* in drinking water. The Agency considered listing *Pfiesteria* on its drinking water contaminant candidate list (CCL). See 63 Fed. Reg. 10,275, 10,281 (Mar. 2, 1998). EPA concluded, however, that *Pfiesteria* did not pose a threat to drinking water. EPA stated:
Pfiesteria’s habitat is estuarine or brackish water. Current data indicate that, like most other dinoflagellates, the organism grows poorly in fresh water and does not elaborate toxins in this milieu, thus, there is no evidence that Pfiesteria occurs or could occur in drinking water. Moreover, the size ranges from 5-450 µm, with the dormant cyst stages 7-60 µm in diameter. Thus filtration that is effective for removing Cryptosporidium (4-6 µm) should be effective for removing Pfiesteria. For these reasons, EPA believes that Pfiesteria does not represent a health threat in drinking water systems, and thus did not include Pfiesteria on the final CCL.

Id.

Since there are no drinking water regulations pertaining to Pfiesteria, water utilities have no Pfiesteria monitoring requirements.

As to workers in public power water utilities that may be exposed to Pfiesteria present in untreated water, the risk of any human health consequences appears to be very small. Drinking water utilities generally do not use brackish water as their source water. To the extent that workers may come into contact with brackish water, it is unlikely to contain high levels of Pfiesteria. Furthermore, a new four-year study of over 100 Maryland fishermen has concluded: “Although high-level or outbreak associated exposure to Pfiesteria species (or specific strains within a species) may have an effect on health, routine occupational exposure to estuarine environments in which these organisms are present does not appear to pose a significant health risk.” Occupational Exposure to Pfiesteria Species in Estuarine Waters is Not a Risk Factor for Illness, Environmental Health Perspectives Volume 114, No. 7, July 2006. Nonetheless, as a precaution, water utilities may want to monitor for severe algal blooms and fish kills in their vicinity.
For more information about *Pfiesteria*, you may also contact the Centers for Disease Control (CDC). The CDC maintains a web site about *Pfiesteria* at:

http://www.cdc.gov/hab/pfiesteria/.

E.E.A.

Elizabeth E. Aldridge  
(804) 788-8549  
ealdrige@hunton.com