Letter Health Consultation

UNIVERSITY OF ARKANSAS AT PINE BLUFF

PINE BLUFF, ARKANSAS

MAY 13, 2008

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

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In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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LETTER HEALTH CONSULTATION

UNIVERSITY OF ARKANSAS AT PINE BLUFF

PINE BLUFF, ARKANSAS

Prepared By:

Arkansas Department of Health and Human Services
Under Cooperative Agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

Arkansas Department of Health

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Governor Mike Beebe
Paul K. Halverson, DrPH, FACHE, Director and State Health Officer

April 16, 2008

Dr. Calvin Johnson, Dean
School of Education
University of Arkansas at Pine Bluff
1200 North University Drive
Mail Slot 4986
Pine Bluff, AR 71601

Dear Dr. Johnson:

At the request and submittal of water quality data sent to the Arkansas Department of Health (ADH) Engineering Division from the ADH Environmental Health Division, Southeast Region, from your university, our office has become involved in investigating the water from the school swimming pool on the University of Arkansas at Pine Bluff (UAPB) campus. On the basis of a review of the swimming pool sampling data collected on February 20, 2008, by Pollution Management, Inc. (PMI), the ADH Environmental Epidemiology Section, in a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), has prepared this health consultation letter to address any public health issues related to detected levels of compounds from the data submitted to our office on March 13, 2008.

Background and Statement of Issues

I received an email from Raymond Thompson of the ADH Engineering Division, referring this site to our office. This email had an attached file containing a letter addressed to Sherri Woodus from you, requesting ADH to provide a review and recommendation of the past exposures due to water quality of the campus swimming. Also attached were the cover letter and data results from PMI. According to a phone conversation on March 13, 2008, with Ms. Woodus, this swimming pool had been drained in November of 2007 and refilled with new water in January of 2008. Hence, the water sampling data that we have reviewed from PMI (collected on February 20, 2008, and analyzed by Arkansas Analytical Inc. on February 21, 2008) reflects only the water quality of the UAPB swimming pool on the day of sampling. We can not make any review or recommendation of the water quality of the UAPB campus swimming pool either before or after the February 20, 2008 collection data since we do not have any other data reflecting water quality conditions prior to or after this sampling event.

On April 1, 2008, a teleconference was held to provide a verbal communication of the data review performed by our office. In attendance were Dr. Todd Garner, Paul Wilson, and yourself

from UAPB, and Becky Binz, Marty Chambers, Lori Simmons, and myself from ADH. I presented a review of the contents of this letter. UAPB informed us that currently the pool is drained; however, because the college is anxious to reopen the swimming pool for classes to resume, you informed us that UAPB will now refill the swimming pool. Sherri Woodus, the Environmental Health Specialist from the Southeast Regional Health Unit of ADH, will be notified by UAPB when the swimming pool has been refilled, and will make a standard health inspection to check chlorination, pH, and alkalinity levels.

Discussion

Exposure to compounds of concern is determined by examining human exposure pathways. An exposure pathway has five parts:

1. A source of exposure to compounds (e.g., compound(s) placed in a swimming pool),
2. An environmental medium such as water, soil, or air that can hold or move the compounds,
3. A point at which people come in contact with a compound source (e.g., swimming),
4. An exposure route, such as skin contact or accidental ingestion with water from a swimming pool, and
5. A population who could come in contact with the compounds.

An exposure pathway is eliminated if at least one of the five parts is missing and will not occur in the future. For a completed pathway, all five parts must exist and exposure to a contaminant must have occurred, is occurring, or will occur. For this evaluation, a complete pathway has been identified, since there was a possible source of external compounds being present in the swimming pool while people had access to and used the pool.

Based on the data results from PMI (and performed by Arkansas Analytical, Inc.), four compounds were detected at concentrations above the laboratory Method Detection Limit (MDL). These compounds are chloride (53.3 milligrams per liter (mg/L)), fluoride (0.878 mg/L), sulfate (3.79 mg/L), and chloroform (0.0108 mg/L).

Further screening of these compounds was conducted by calculating an exposure dose using standard exposure assumptions in ATSDR's Toxicological Profile and Health Assessment Toolkit (TopHat) [1]. TopHat is a software program that provides the health assessor a means by which one can take site-specific concentration levels and estimate a theoretical excess risk expressed as the proportion of a population that may be affected by a compound during a specified time of exposure. In the "skin contact to swimming pool water" scenario, an exposure time of 1.5 hours per day for 365 days per year was used. In the "accidental ingestion of swimming pool water" scenario, an ingestion rate of 8 fluid ounces per day was used as the exposure estimate. Standard values for body weight, permeability coefficients, and exposed body surface area were also used to correspond with the exposure scenario and receptor (population group), as applicable. All exposure values used are very conservative in order to

represent the "worst case" scenario. However, this does not mean that the worst case would happen, it is merely another layer of caution built-in to the estimated risk calculations to represent all sensitive sub-populations, where applicable.

Public Health Implications of Dermal (Skin) Exposure

To put the calculated exposure doses into a meaningful context for non-cancer effects, the Hazard Quotient (HQ) was calculated for each potentially exposed child, adolescent, or adult. An HQ is the average daily intake of swimming pool water divided by a chemical specific reference dose (RfD) set by the Environmental Protection Agency (EPA). If the HQ for a chemical is equal to or less than one, it is believed that there is no appreciable risk that non-cancer health effects will occur. If the HQ exceeds one, there is some possibility that non-cancer effects may occur, although an HQ above one does not indicate an effect will definitely occur. This is because of the margin of safety inherent in the derivation of all RfD values. The larger the HQ value, the more likely it is that an adverse effect may possibly occur.

NOTE: There is no RfD published for chloride; therefore, the RfD for chlorine was used as a surrogate. Because chlorine has different toxicological properties from chloride, and is considered to be more hazardous, this adds another layer of conservatism to the potential risks. Were chloride to have a standard RfD, it is my professional judgment that the HQ would more than likely be less than one. See Table 1 for all calculations.

Table 1. Skin Contact Exposure Calculations from University of Arkansas at Pine Bluff (UAPB) Swimming Pool Sample (collected February 20, 2008).

Compound	Concentration (mg/L)	Population Group	Exposure Dose (mg/kg/day)	Reference Dose mg/kg/day	Hazard Quotient (HQ)
Chloride	53.3	Child (3 - 12 yrs.)	0.15	0.10	1.5
		Adolescent (12 - 18 yrs.)	0.14		1.4
		Adult (18 - 70 yrs.)	0.12		1.2
Fluoride	0.878	Child (3 - 12 yrs.)	0.089	0.06	1.5
		Adolescent (12 - 18 yrs.)	0.086		1.4
		Adult (18 - 70 yrs.)	0.07		1.2

mg/L = milligram per liter; mg/kg/day = milligram per kilogram per day

Public Health Implications of Accidental Ingestion Exposure

After calculating incidental ingestion exposure dose values using TopHat for a child, adolescent, or adult, it was compared to the EPA RfD for each corresponding compound. When evaluating potential risks, it was determined that all calculated exposure dose values for chloride, fluoride, sulfate, and chloroform fell below the standard RfD. Therefore, no further analysis was needed as it was determined that no potential adverse health effect risks were apparent.

Conclusions

Based on the results seen in Table 1, all population groups (child, adolescent, and adult) marginally exceed an HQ value of one for the "skin contact exposure scenario" for past exposure. However, the values range from 1.2 to 1.5, which represents only a slight possibility that non-cancer, short-term health effects *may* occur. This calculation also assumes the "worst case scenario" that an individual will be exposed to the swimming pool water every day of the year, which adds an extra layer of conservatism into the value.

The most common health effects associated with chloride and fluoride, which can be reversible when treated, are irritation to the skin, eyes, nose, throat, or respiratory tract. In general, people who suffer from respiratory conditions such as allergies or hay fever, or who are heavy smokers, tend to experience more severe effects than healthy subjects or nonsmokers [2, 3].

ADH/ATSDR has reviewed the laboratory data collected from PMI on February 20, 2008, and concludes that there is a complete exposure pathway for the individuals (child, adolescent, or adult) having skin contact with the UAPB campus swimming pool. This represents an ***indeterminate public health hazard*** from dermal exposure to chloride and/or fluoride in the campus swimming pool water collected on February 20, 2008. An indeterminate public health hazard is used when data is limited or site information is incomplete. A public health hazard due to skin contact would only be likely *in the event that an individual met the scenario criteria* of daily exposure of 1.5 hours of swimming in the campus pool for a full year. Also, based on the data and HQ calculations, it is possible that a more sensitive individual may experience adverse health effects more readily than a healthier individual. So, without knowing the physical condition of each individual that had exposure to the pool water and other limited information, ADH/ATSDR concludes an indeterminate hazard for skin contact for this past exposure.

Calculations were also performed using an "accidental ingestion of swimming pool water" scenario. All values in this scenario were determined to be below health screening values, and therefore, do not represent a likelihood of causing any adverse health effects should someone ingest any of the swimming pool water accidentally. ADH/ATSDR concludes that there is ***no apparent public health hazard*** from past exposure to chloride, fluoride, sulfate, or chloroform for an infant, child, or adult from accidentally drinking water from the UAPB campus swimming pool, under the conditions present during the sample collection on February 20, 2008.

Note that the findings represent the water conditions at the time the swimming pool sample was collected. Since the campus swimming pool has since been drained with plans to refill it, the conclusions here may not represent current or future exposure conditions, only the conditions at the time of sampling in February 2008.

Recommendations

- ADH/ATSDR recommends further sampling of the UAPB campus swimming pool water after it has been refilled in order to ascertain current and/or future conditions of skin contact exposure, should the college wish to accept that responsibility.
- If an individual experiences any adverse health effects while in contact with the swimming pool water, they should cease use of it until it can be determined by their physician or health care provider what caused their sensitive reaction to the pool water.
- Any future modifications to the UAPB campus swimming pool should be reported to the ADH Environmental Health Division in accordance with all federal and state regulations.
- Based on a follow-up site visit performed on April 8, 2008, by Becky Binz and Sherri Woodus of ADH, it is recommended that the sand bed in the filtration system of the pool be inspected to detect any epoxy materials in order to determine if there is accumulation in the filter bed. If accumulation is detected, the sand should be replaced by a pool service specialist.

References

1. Agency for Toxic Substances and Disease Registry (ATSDR) *TopHat Tool*. Exposure Dose Calculator. Accessed March 13, 2008.
2. Agency for Toxic Substances and Disease Registry (ATSDR) ToxFAQs for Chlorine. Available at: http://www.atsdr.cdc.gov/tfacts172.html. Accessed March 14, 2008.
3. Agency for Toxic Substances and Disease Registry (ATSDR) ToxFAQs for Fluorides. Available at: http://www.atsdr.cdc.gov/tfacts11.html. Accessed March 14, 2008.

Thank you for allowing ADH/ATSDR the opportunity to work with you on this site. Please feel free to contact me at 501-280-4041, if you have any questions regarding this data review. If any future data is collected from this swimming pool, we will be happy to assess it using the same exposure assumptions used in this current evaluation.

Sincerely,

Ashley Whitlow, M.S.
ADH Sr. Epidemiologist
ATSDR Health Assessor
Environmental Epidemiology

cc: Lori Simmons, M.S., Section Chief for Environmental Epidemiology, ATSDR Program Manager, ADH
Carrie Poston, B.S., CHES, ATSDR Public Health Education Supervisor, ADH
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Becky Binz, Environmental Health Specialist, Environmental Health Division, ADH
Marty Chambers, Environmental Health Manager, Southeast Region, ADH
Sherri Woodus, Environmental Health Specialist, Southeast Region, ADH

Certification

The Arkansas Division of Health prepared this health consultation for the University of Arkansas Pine Bluff swimming pool under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodology and procedure existing at the time the health consultation was initiated. Editorial review was completed by the cooperative agreement partner.

Jeff Kellam
Technical Project Officer
Division of Health Assessment and Consultation (DHAC)
ATSDR

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this health consultation and concurs with its findings.

Alan W. Yarbrough
Cooperative Agreement Team Leader, DHAC, ATSDR