

**Investigation of Neurological Vocal Tics and Repetitive  
Hiccups Reported Among Students Attending  
Essex Agricultural and Technical High School and  
North Shore Technical High School  
Essex County, Massachusetts**

**SUMMARY**

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## **Background/Introduction**

In winter 2012/2013, the Massachusetts Department of Public Health, Bureau of Environmental Health (MDPH/BEH) initiated several efforts to investigate reports of acquired vocal disorders such as neurological vocal tics and repetitive hiccups among approximately one to two dozen students who attended either Essex Agricultural and Technical High School (EATS) or North Shore Technical High School (NSTHS), located in Danvers and Middleton, respectively. After an initial meeting with school and local health officials in December 2012, the MDPH/BEH undertook an investigation to work with attending physicians to identify and confirm the number of students diagnosed with vocal tics/repetitive hiccups and provide a review of their medical records to identify any common factors (environmental or non-environmental) that may have contributed to the development of these conditions.

In response to specific environmental concerns raised by parents and concurrent with efforts to better understand the prevalence of vocal tics/chronic hiccups among the students, MDPH/BEH also conducted three separate environmental assessments that involved indoor air quality evaluations and visual inspections in school buildings and property areas at both EATS and NSTHS. In addition, MDPH/BEH evaluated several other possible common environmental exposure concerns specifically raised by parents including: reported access to abandoned tunnels at EATS, use of athletic fields at NSTHS and at East Street Field in Middleton, drinking water provided in large water coolers for team sporting events, and possible exposure to environmental contaminants during a

2011 explosion at the Bostik facility located in Middleton. The results of both the medical records review and environmental investigation efforts are summarized below.

## **Medical Records Review**

MDPH/BEH worked with the Board of Registration in Medicine (BORIM) to inform area physicians about the MDPH investigation and requested their assistance in identifying patients they have treated with an acquired vocal disorder (i.e. vocal tics/chronic hiccups) who attend(ed) one of the two schools. Extensive outreach to more than 2,600 physicians and specialists in more than 50 communities was conducted in March and May 2013. These efforts followed the MDPH/BEH provision of medical records consent forms directly to school parents at a February 2013 meeting and in response to several individual requests. In response to all of these outreach efforts, MDPH/BEH received signed medical records consent forms for slightly less than 50% (n=9) of the 19 students originally reported as having vocal tics/chronic hiccups. MDPH/BEH requested records from multiple medical care providers and specialists for the nine participants and all available medical records were reviewed by Dr. Jonathan Burstein, MDPH/BEH Chief Medical Officer.

Results of the medical records review indicated that all nine individuals were confirmed as experiencing vocal tics (i.e. hiccups, yelps, or grunts) with some variation in frequency of occurrence. The onset of vocal tics for all but one individual was reported to have occurred sometime within the previous year (i.e. 2012) while one of the nine individuals had been experiencing vocal tic symptoms for approximately four years.

Participation in school sports teams was reported in the medical records for eight of the nine individuals; however, no common medical factors were identified among the group that would suggest a common neurological, mechanical, infectious, or toxic etiology based on the information contained in the medical records. One of the nine individuals had a previously diagnosed chronic tic disorder (Tourette's Syndrome) and two others had a possible predisposition for vocal tics (i.e. personal/family history of seizures) although the medical records did not specifically describe these as being associated with vocal tics. A number of medical screenings and lab results were described, but none of the medical records reviewed identified a known exposure or specific agent of environmental or infectious concern.

## **IAQ Environmental Investigations**

In response to concerns raised by parents, MDPH/BEH staff conducted three separate Indoor Air Quality (IAQ) environmental assessments at the two regional high schools in spring 2013. Recommendations provided during the site inspections and summarized in three IAQ reports<sup>1</sup> were designed to improve the indoor environmental conditions in the existing buildings prior to completion of a new building that will consolidate the two schools. IAQ inspections included indoor air sampling as well as visual inspection of building materials for water damage and/or microbial growth. Based on observations and air measurements taken during the visits to the two schools, no substances or conditions were identified that would be likely to result in neurological

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<sup>1</sup> The first report is available at <http://www.mass.gov/eohhs/docs/dph/environmental/iaq/2013/essex-agricultural-tech-school-july-2013.pdf>. The additional indoor air quality assessment reports are being released with this report.

effects (e.g. carbon monoxide, volatile organic compounds, mercury), and importantly, were not at levels associated with health impacts based on the scientific/medical literature. MDPH/BEH staff did identify various conditions at both schools that can affect the comfort of building occupants and have made a number of recommendations to improve indoor environmental conditions.

No environmental pollutants were detected in air above background levels in two abandoned tunnels raised as a concern by parents at EATS and thus it is unlikely that exposure to chemical contaminants would result in any neurological symptoms. At the time of the site visit, MDPH/BEH recommended to the EATS representative that accompanied MDPH on the site visit that insulation-like material observed in one of the tunnels be evaluated by a licensed asbestos inspector to determine whether it contains asbestos and that access to the tunnels be restricted to prevent any exposure and/or physical injuries (i.e. from sliding rocks). Asbestos exposure is specifically associated with chronic lung disease (asbestosis) or a certain type of cancer (mesothelioma). Any individual who entered the tunnel in the past should consider consulting with their health care provider regarding possible asbestos exposure.

## **Evaluations of Other Environmental Concerns**

A number of parents raised several other possible common environmental exposure concerns in relation to students exhibiting vocal tics/chronic hiccups. In response, MDPH/BEH reviewed available information to address these concerns. Results of these reviews are summarized below.

- A detailed review of field maintenance practices, history of pesticide applications, and the patterns of use for sporting activities at both NSTHS and the East Street Field in Middleton, did not indicate anything unusual about these fields that would suggest their use could play a primary causative role. Further investigation (e.g. environmental testing) of these fields is not recommended.
- Based on a review of information regarding soil removal actions at EATS, historical releases of fuel oil to subsurface soils were remediated in several localized areas of school property (e.g. beneath school buildings). Student exposure or direct contact with these contaminated soils would not be expected.
- MDPH/BEH collected water samples from large refillable water cooler containers stored and filled at NSTHS for use by school sport teams. These samples were analyzed for a suite of regulated drinking water contaminants (e.g. metals, volatile organic compounds, pesticides). No contaminants were detected in these drinking water samples.
- A review of available information and environmental sampling results following a March 2011 explosion at Bostik Corporation in Middleton did not suggest any likely exposure impacts that could be uniquely associated with the onset of vocal tics/chronic hiccups among some EATS and NSTHS students.

## Conclusions

The results of observations and air measurements taken during the three IAQ environmental investigations at both EATS and NSTHS identified no environmental or indoor air conditions that would indicate the presence of a common environmental risk factor expected to result in neurological effects to students, including those experiencing vocal tics/chronic hiccups symptoms. MDPH/BEH staff did identify several conditions that affect IAQ/comfort of building occupants at both schools and suggest the schools implement a number of specific recommendations. However, since the investigation began, both schools have moved towards consolidation at the newly constructed Essex Aggie Complex, and therefore some of these building-specific IAQ recommendations may no longer apply if conditions have been updated or the buildings/structures are no longer in use.

Based on results of the medical records review, the crude prevalence estimate for the students with confirmed vocal tics/chronic hiccups at the schools is estimated at 1%, which appears consistent with prevalence estimates for tic disorders available in the scientific/medical literature. Three of the nine individuals who participated in the medical records review had at least one possible predisposition for vocal tics, and none of the other six individuals had any potential risk factors for vocal tics reported in their medical records. Other than specific mention of participation in sporting events reported in the medical records for eight of the nine students, no common factors were indicated that would suggest a common neurological, mechanical, infectious, or toxic etiology for vocal tics. In addition, no other symptoms or effects that would be indicative of a toxic

exposure (e.g. liver or kidney damage) were identified in any of the medical records reviewed.

In summary, based on the results of the indoor and ambient environmental investigations conducted at EATS and NSTHS and related properties, evaluation of several additional environmental exposure concerns raised by parents, and results of the medical records review, no environmental exposure factors were identified as being specifically associated with school attendance or participation in sports teams, or were otherwise unique to the students experiencing vocal tics/chronic hiccups.