

Increased Suicide Rate is Possibly Linked to Chemicals from Asphalt Plants

Source: <http://sci.tech-archive.net/Archive/sci.med/2004-12/1883.html>

From: jdaves (jdaves_at_nob.biz)

Date: 12/15/04

Date: Wed, 15 Dec 2004 07:58:02 -0600

Exposure to low levels of hydrogen sulfide and possibly other airborne chemicals from nearby asphalt plants may have contributed to an increased suicide rate in a North Carolina community, a study suggests for the first time. In 2003, the suicide rate in two Salisbury, N.C., neighborhoods was found to be 192 per 100,000 individuals a year, roughly 16 times the statewide average, as stated in community reports confirmed by death certificates for that year by the Blue Ridge Environmental Defense League (BREDL).

>*From Duke University:*

Increased Suicide Rate is Possibly Linked to Chemicals Released from Nearby Asphalt Plants

Exposure to low levels of hydrogen sulfide and possibly other airborne chemicals from nearby asphalt plants may have contributed to an increased suicide rate in a North Carolina community, a study suggests for the first time.

In 2003, the suicide rate in two Salisbury, N.C., neighborhoods was found to be 192 per 100,000 individuals a year, roughly 16 times the statewide average, as stated in community reports confirmed by death certificates for that year by the Blue Ridge Environmental Defense League (BREDL).

The study's lead author is Dr. Richard H. Weisler, adjunct professor of psychiatry at the University of North Carolina at Chapel Hill School of Medicine, adjunct assistant professor of psychiatry at Duke University Medical Center and BREDL volunteer.

Other collaborators in this research were Dr. Jonathan R.T. Davidson, professor of psychiatry at Duke University Medical Center; Dr. Lynn Crosby, a toxicologist with BREDL; Lou Zeller, BREDL director; Hope Taylor-Guevera, director of Clean Water for North Carolina; Sheila Singleton, executive director of the N.C. Depression and Bipolar Support Alliance; and Melissa Fiffer and Stacy Tsougas, undergraduates

sci.med: Increased Suicide Rate is Possibly Linked to Chemicals from Asphalt Plants

at Duke University's Nicholas School of the Environment and BREDL summer interns.

The neighborhoods comprising two U.S. census tract block groups contained a total of 1,561 residents who were living immediately downwind from a liquid asphalt terminal; an asphalt hot-mix plant, which also contained a former N.C. Department of Transportation solvent-contaminated cleanup site where the DOT had previously dumped solvents used for testing asphalt; and a contaminated former petroleum tank farm.

Between 1994 and 2003, death certificate evaluations for the two Salisbury neighborhoods showed a 3.5-fold statistically significant increase in the suicide rate, the study found. Four deaths by suicide in adults were reported from the 687 residents in the census tract block group 1. Three deaths by suicide in adults were reported among the 874 residents of census tract block group 2. Only two deaths by suicide would be expected for this population over a 10-year period, but seven suicides were observed.

"For example, here in the block group 1 neighborhood in the mid-90s, we found one death by suicide for about every 230 people during the worst 12-month period, versus an average of one death by suicide for every 8,621 people in the rest of North Carolina," Weisler said.

"When we saw this data it gave us pause."

Weisler said of hydrogen sulfide, "The odor was frequently apparent when I lived there as a child and later when I visited my mother, who lived in the neighborhood from 1962 until her death in 2001."

That year (2001), the N.C. Department of Environment and Natural Resources (NCDENR) estimated the average maximum hydrogen sulfide level in a large part of the affected area at 215 parts per billion (ppb), while some sections of the neighborhoods were reported as low as 30 ppb. Moreover, based on their own air modeling study, the NCDENR estimated that historical releases of hydrogen sulfide reached average maximum levels of 860 ppb in a few residences very near the asphalt facilities.

By comparison, the World Health Organization has a 10-minute exposure standard of five ppb. The California one-hour standard is 30 ppb. The newly revised, but not yet implemented, North Carolina 24-hour hydrogen sulfide standard is 86.2 ppb.

These exposures accompanied 574 formal complaints to the City of

Salisbury from March 11, 1999, to Oct. 15, 2004, for noxious odors and associated respiratory problems, which are still occurring — though at a reduced rate — said Weisler.

In addition to suggestions of an increased suicide rate, the incidence rate of primary brain cancers in these neighborhoods from 1995 to 2000 showed an increase about 6.4 times greater than expected for the population, possibly due to benzene and other solvent exposures, Weisler said.

Several studies have shown increased rates of lung and brain cancer among workers with long-term exposure to asphalt emissions, the researchers said.

Weisler and his study team made a hypothetical link between hydrogen sulfide and suicides due to biological plausibility. They noted that hydrogen sulfide affects brain neurochemistry as a direct gaseous neuromodulator that potentially affects mood states and the psychological stress response. In animal studies, it has been shown to alter the neurotransmitters serotonin, norepinephrine, dopamine, aspartate and glutamate levels.

Hydrogen sulfide also affects the hypothalamic pituitary adrenal axis and corticotropin releasing factor in animal studies, the report said.

"This is the part of the brain involved in the stress response, and we think it's also involved in psychological resiliency, how people deal with stressors," Weisler said. "It's frequently associated with mood disorders, and there are suggestions that resiliency is impaired when people are suicidal."

The study team reported that additional neurotoxic compounds such as benzene, chlorinated solvents and carbon disulfide, among others, were released in unknown quantities by the asphalt terminal and hot-mix asphalt plant. Carbon disulfide, also a neurotoxin, has been linked to personality changes, mood disorders and suicides in occupational settings, the researchers said.

In addition, "Some research suggests that highway workers exposed to asphalt-solvent fumes show an increase of suicide rates and brain cancers."

A full characterization of the types of chemicals and the levels of releases at the liquid asphalt terminal is needed, said Weisler.

Also needed, he added, is the retrospective ground water contamination modeling study called for in 2002 by the N.C. Department of Health and Human Services to more completely understand the possible causes of health problems in the affected neighborhoods.

"I do not know if ground water modeling would help us understand the suicides, but since there were exposures it would be quite useful to have that modeling information. The same modeling would certainly help with interpreting the cancer data as people with brain, lung, blood, pancreatic, breast, and colon cancers had been or may have been using

sci.med: Increased Suicide Rate is Possibly Linked to Chemicals from Asphalt Plants

solvent contaminated well water for extended periods," Weisler said.

Davidson said the most important point for people to remember is that effective treatments exist for suicidal depression.

"Given that suicide can be a tragic consequence to depression, people who are experiencing persistent symptoms of depression should contact their health-care provider for a professional evaluation," he said.

"The findings of this study may suggest another potential risk factor for suicide, but this needs to be confirmed in future studies."

The most common symptoms of depression include loss of interest in activities once considered pleasurable, social withdrawal, changes in appetite, low mood, inability to function effectively in work or family situations and, often, a feeling of hopelessness and despair.

"It is the hopelessness that can lead to suicidal thoughts or actions," Davidson added.

A person with a family history of suicide attempts or substance abuse may be at greater risk than others, he said, adding that the study findings may eventually suggest yet another risk factor for suicide — making further study all the more important.

Weisler and Davidson both emphasized the need to educate residents of the affected areas about mood and anxiety disorders as well as substance use disorders and their treatments.

City of Salisbury and Rowan County Health and Mental Health officials are working with suicide and chemical exposure experts at the U.S. Centers for Disease Control and Prevention to implement a psychoeducation and referral program for area residents, as well as educational programs for area health and mental health providers, Weisler said.

Formal health studies of the two neighborhoods and other potential sites with chemical exposures are being planned in further collaboration with the CDC and UNC's School of Public Health.

The health status of residents who died by suicide will be investigated further in a study involving Dr. Steven B. Wing, associate professor of epidemiology, and others at UNC's School of Public Health.

Significant steps have already been taken, said Weisler, but reducing potentially toxic exposures from the industrial plants and safe cleanup of the solvent and petroleum contaminated area sites will be crucial.

"We do not know with scientific certainty that the area suicides are linked to hazardous chemical exposures, but we know enough to recommend that it is not worth taking any more chances on the

sci.med: Increased Suicide Rate is Possibly Linked to Chemicals from Asphalt Plants
potential association."

Weisler presented the findings Nov. 19 to the 17th Annual U.S.
Psychiatric and Mental Health Congress in San Diego.