Chronic stress still lingers near TMI

Several years ago, researchers discovered a mild but nagging stress reaction among some people living near the Three Mile Island nuclear power plant (SN: 5/8/82, p. 308). The stress appeared to be linked to a sense of uncertainty following the 1979 TMI accident.

The same investigators now report that a significant portion of a sample of people living within 5 miles of TMI experienced persistent, low-level stress five years after the 1979 incident. Their stress includes psychological as well as physiological symptoms that could lead to hypertension and other cardiovascular disorders, add the researchers.

"We didn't [find] the extreme 'post-traumatic stress disorder' associated with Vietnam veterans," psychologist Andrew Baum of the Uniformed Services University of the Health Sciences in Bethesda, Md., said last week at the annual meeting of the American Psychosomatic Society in Washington, D.C. "But our data suggest that someone who experiences chronic levels of stress that are still in the normal range may also have post-traumatic stress."

Baum and his colleagues examined 52 TMI area residents and 35 people living 80 miles from the power plant. Subjects completed a questionnaire containing scales for two major characteristics of post-traumatic stress disorder — avoidance (diminished interest in outside activities, detachment from others) and intrusive thoughts (recurrent, disturbing thoughts and dreams about a traumatic event). Reported levels of intrusive thoughts were significantly higher among the TMI residents.

The researchers split the TMI group in half based on these scores; subjects in the upper half reported more physical complaints, problems with interpersonal relationships, depression, anxiety, anger, fear, suspicion and alienation than those in the lower half. In addition, subjects with higher scores had higher blood pressure and increased amounts of urinary norepinephrine and cortisol. These hormones are secreted in response to nervous arousal and tend to elevate blood pressure, says Baum. Intrusive thoughts were closely related to these symptoms, he observes, because TMI residents are exposed to constant reminders of the 1979 accident, including the ever-present power plant stacks and continuing media coverage. Avoidance behavior was less strongly associated with emotional and physical stress symptoms.

Since beginning their research in 1980, the Maryland researchers have studied an estimated 85 TMI area residents. About 40 percent report chronic, mild stress; 30 percent fluctuate between periods of stress and calm; and another 30 percent report no stress effects. At this point, however, it is impossible to tell whether stress reactions will lead to a higher incidence of physical problems such as hypertension, cautions Baum. "None of the subjects we studied is in immediate physical or emotional trouble," he says.

But preliminary data released by the same researchers last week suggest that the number of disease-fighting lymphocytes may be dropping among TMI area residents with chronic stress. As with the previous findings, says Baum, a larger sample is needed before any conclusions can be drawn. —*B. Bower*

Climate conspires against oxygen and oysters

"It used to be wall-to-wall oysters in the Chesapeake Bay," muses biologist Howard Seliger. "Oysters used to be present almost completely from one end of the bay to the other, in every tributary." Over the last 30 years, however, the oyster population has declined precipitously.

One factor contributing to the oysters' demise, some researchers think, is an increase in runoff and sewage effluent entering the bay (SN: 1/7/84, p. 6). This provides nutrients for a greater number of marine organisms, which in turn use up more and more oxygen in respiration and in the bacterial decay of organic matter. When anoxic, or oxygen-depleted, waters settle in near oyster beds for more than a few days, oysters and other marine organisms in the area die.

Now it appears that the problem may be exacerbated by climate. Seliger suspects that the added nutrients make the bay ecosystem more vulnerable to climatic events that might act to prolong and spread the anoxic waters. He and his colleagues at Johns Hopkins University in Baltimore believe that four such climatic events in 1984 conspired to produce an unusually intense bout of anoxia in the bay that killed many oysters.

Seliger feels that his group's paper in the April 5 SCIENCE is the first to directly correlate climate with anoxia and Chesapeake biology. If this is a valid link, he says, it may be possible to predict at least several months in advance the effects of climate on complicated ecosystems.

Seliger also suspects that similar episodes happened in the past, not only in the Chesapeake but also in other estuary environments like the New York Bight, which suffered major marine life casualties and extensive anoxia during 1976.

Many researchers share Seliger's belief that climate can influence the physical processes and biology of the Chesapeake and that the climatic conditions in 1984 could very well have led to marine life mortality. But at least one of these scientists, Thomas Malone of Horn Point Environmental Laboratories in Cambridge, Md., does not think that Seliger's group has enough data to actually prove this link. Malone also argues that since there have been no comprehensive and continuous surveys of dissolved oxygen in the bay in the past, it is very hard to know if 1984 really was an unusual year.

Some anoxia is natural for the bay. Every summer the deepest channels in the middle of the Chesapeake become oxygen-depleted as fresh water from the Susquehanna River flows in, covering the denser, salty waters from the ocean. The stratification of less salty water on top of more saline water inhibits vertical mixing between the two regions, so that bottom waters, oxygen-depleted by the marine life there, are not replenished by oxygen-rich water from the surface. Usually, the only completely anoxic waters are at the very bottom, and even these are rejuvenated with oxygen in the fall and winter when stirred up by surface winds, colder air temperatures and strong tidal forces bringing in salty oceanic water at the bottom.

Last year was different, however. The streamflow from the Susquehanna at the end of winter was the highest on record. From June through August it far exceeded mean values measured over the last 34 years, reports Seliger's group. This, combined with relatively calm, windless summer weather, created a sharp stratification of the bay.

Then, in August, persistent southwest winds from a stationary high over the Atlantic forced more saline water into the bay, say the researchers. This essentially spread the severely anoxic bottom waters to unusually shallow levels, allowing them into tributaries that are normally safe from anoxia.

According to the scientists, a survey of oyster bars in one such tributary, the Choptank River, on Sept. 6 and 7 revealed that all of the shellfish below 6 meters had died. Oysters and many other marine organisms are able to survive short stints of anoxia, but the high mortality, especially of bottom-dwelling species, indicates that the waters had been oxygen-depleted for longer than a few days.

"The stratification and the demand for oxygen in the bottom waters began earlier and continued for longer than I have measured previously," says Seliger, who has been measuring these sorts of things since 1969.

He and his colleagues also believe that many more oysters and marine animals would have died if not for a month-early drop in air temperatures starting the first week of September. The colder air cooled the top waters, which became more dense; in the process of sinking, the heavier, oxygen-rich water mixed with and regenerated the oxygen-poor layers below.

—*S. Weisburd*