

Streambed bugs eat gasoline pollutants

Microbes dwelling in the muck at the bottom of a stream can digest certain pollutants before they well up into the water, a new study finds.

Scientists have determined that microbes in sediment can dispose of methyl tertiarybutyl ether (MTBE) and tertiarybutyl alcohol (TBA). The two compounds are commonly added to gasoline to reduce vehicle emissions of carbon monoxide, an air pollutant. However, MTBE and TBA contaminate drinking water supplies in various ways, and the Environmental Protection Agency has classified MTBE as a possible human carcinogen.

The new finding should help environmental engineers more accurately assess the threat posed to streams by MTBE, says James E. Landmeyer. He, Paul M. Bradley, and Francis H. Chapelle, all of the U.S. Geological Survey in Columbia, S.C., report their findings in the June 1 ENVIRONMENTAL SCIENCE AND TECHNOLOGY.

"There has been considerable concern that this compound doesn't degrade," says Robert C. Borden of North Carolina

State University in Raleigh. "If [the finding] turns out to be true, that would be very encouraging."

The USGS scientists looked at two sites in South Carolina where gasoline that contains MTBE had leaked from underground storage tanks. The researchers took sediment from nearby streambeds to their lab for testing.

They added radioactively labeled MTBE and TBA to the samples and traced the breakdown of the compounds into carbon dioxide. Over about 3 months, organisms—probably bacteria—in the sediment degraded up to 73 percent of the MTBE and 84 percent of the TBA. In contrast, if the scientists removed oxygen or heated the sediment to kill all the microbes, the pollutants remained intact.

Other groups have found bacteria that feed on MTBE in special environments, such as sewage sludge. "This study is the first to show that it happens in a natural system," Landmeyer says.

MTBE also enters the environment through gasoline spills and evaporation

at the pump. The evaporated pollutant returns to Earth in rainwater, which soaks into the ground and eventually seeps up through streambeds.

"Bacteria in the groundwater don't have the correct digestive systems to degrade MTBE," Landmeyer notes, nor do they have access to oxygen. "But once MTBE reaches the stream, the bacteria just gobble it up." To microbes used to feeding on decaying leaves and such, MTBE "is just another organic compound to chew on," he says.

The evidence is convincing, but it's only part of the picture, comments Robert M. Cowan of Rutgers University in New Brunswick, N.J. A study of this duration, says Cowan, prompts a question: Is the rate of degradation fast enough to destroy pollutants as they flow through sediments in streams? "They haven't taken it to that point yet," he remarks.

The results, though encouraging, don't mean that people can rest easy about MTBE, Landmeyer cautions. Water in underground wells and rain that falls directly onto a stream won't benefit from this microbial filter. —C. Wu

Elderly show their emotional know-how

Scientists have documented a depressing list of memory and intellectual losses that mount as healthy adults advance into old age. A new study indicates, however, that when it comes to dealing with emotions, seniors rule.

From young adulthood to well past retirement age, positive emotions occur at a fairly constant rate, while the frequency of negative emotions declines markedly, a research team finds. Adults of all ages cite comparable intensities for the entire spectrum of emotions.

After bottoming out at around age 60, the amount of negative emotion experienced from day to day slowly rises, but it stays well below the peak level of people in their early 20s, reports psychologist Laura L. Carstensen of Stanford University, who directed the investigation.

Moreover, positive emotions linger longer, and negative ones make briefer intrusions as adults age, she says. Older people also tend to experience richer mixes of feelings, such as simultaneous anger at and affection for a close friend.

Carstensen described her investigation last week in Denver at the annual meeting of the American Psychological Society.

"These findings support growing evidence that older people regulate their emotional states better than younger people," the Stanford researcher holds.

An earlier study, for instance, found that elderly spouses display particular expertise at reining in negative emotions while discussing trouble spots in their marriages (SN: 9/13/97, p. 175).

Carstensen's team recruited 184 individuals ranging in age from 18 to 84 years. Each participant carried an electronic pager for a week. At 35 randomly chosen times during days and evenings, the researchers paged each one. Using a response sheet that listed 19 emotions, the volunteer described the nature and intensity of his or her current emotions. Participants mailed their sheets to the researchers daily.

As adulthood progresses, a growing sense of having limited time left in life creates interest in promoting the emotional quality of established relationships, Carstensen theorizes. Younger people, who think of themselves as having lots of time yet to live, often sacrifice emotional depth to pursue a broad range of contacts and experiences, she proposes.

Still, young adults can also respond to a sense of having limited time, according to Carstensen. For instance, college seniors approaching graduation may spend their free time with their best friends rather than trying to make new acquaintances, as they had in past semesters.

However, this process operates most strongly in old age, Carstensen holds. In another study that she directed, only the elderly volunteers expressed a pronounced desire to develop close emotional ties to a wide variety of people.

"It's encouraging that older people are often doing well at emotional regulation despite their personal losses," comments Philip A. Cowan of the University of California, Berkeley. —B. Bower

Controversy simmers at atomic-waste site

Deep within the parched landscape of southwest Nevada, scientists are analyzing the geologic personality of an unassuming ridge called Yucca Mountain. At issue is whether the bald, elongated promontory has a stable character—steadfast enough to house the highly radioactive waste generated by nuclear power plants across the United States. The range must lock up this hot debris for the next 10,000 years.

During the past 15 years, hundreds of geologists have crawled over Yucca Mountain, making it the best-studied piece of real estate on the planet. Recently, however, a debate has erupted over some curious events discovered in the mountain's past that could signal an underlying restlessness in its constitution.

"The implications of this finding can be very serious for the [planned] repository," says Yuri V. Dublyansky, a Russian geologist studying Yucca mountain under contract with the state of Nevada, which opposes the repository.

Scientists with the U.S. Geologic Survey counter that the unruly behavior was confined to Yucca Mountain's infancy, millions of years ago, and has no bearing on its current character. The Department of Energy (DOE), which oversees the investigation into Yucca Mountain, is now conducting an independent review of Dublyansky's controversial findings, hoping to resolve the scientific wrangling. The two sides discussed their work last week at a meeting of the Ameri-