

The Chemistry Of Violence

BY JIM WILSON, Science/Technology Editor,

• Understanding why Vincent Van Gogh cut off his ear may provide an important new clue in explaining violent crime. Two scientists say they have strong evidence that violent rages can be sparked by the accumulation of harmful metals in the brain. Some believe the outburst that led Van Gogh to take a razor to his ear may have been triggered by metals in his paints. It is no coincidence, says one scientist, that counties with high rates of violent crime are also those at most risk from metal contamination.

An early clue to a link between metals and violence came from autopsies. When criminals die while committing violent crimes their bodies are tested for alcohol and drugs. In some cases scalp hair is analyzed as well. This slow-growing hair acts as a sort of log of the chemicals to which an individual has been exposed. It was with this thought in mind that medical examiners ordered an analysis of hair samples from mass murderer James Oliver Huberty, who in 1984 was shot to death by police after killing 21 people in a San Ysidro, California, restaurant.

What they found in Huberty's hair was startling: "He had the highest cadmium level we had ever seen in a human being," recalls William J. Walsh, the president of the Pfeiffer Treatment Center of Naperville, Illinois, and an expert on the link between metal poisoning and violence. "I remember getting a call from the assistant medical examiner who was working on the case. 'I have one question for you,' he said. 'If Huberty had this much cadmium in his body, why wasn't he dead?'"

Suspect metals

Cadmium kills by destroying the kidneys. As investigators looked more deeply into Huberty's background, they discovered that indeed the metal had nearly killed him, twice. On each occasion, emergency room teams had coaxed his failing kidneys back from the brink, Walsh reports.

There was no mystery about the source of the cadmium. Before coming to California, Huberty had worked as a welder. "During an exit interview his employer asked him why he was leaving. He said that the

fumes were making him crazy," says Walsh.

Strange as this tale may seem, it is a familiar story to Walsh. He had seen similar off-the-scale metal readings in scalp hair samples from the most notorious mass murderers and serial killers. The evidence has made Walsh a firm believer that the body's ability or inability to manage several common metals can spell the difference between good and evil.

Since 1989, he and his staff at Pfeiffer, an outpatient treatment center, have been working with children, mostly young boys, who have displayed severe behavioral problems. "We're talking about kids who are terrors at age one and torturing the cat when they

volunteer work with prisoners. But while Walsh—a chemical engineer by training—looks inward at the imbalances of metals in individuals, Masters looks outward, toward the effects of metals on communities.

"Prevailing theories of violent crime properly implicate a host of social, economic and psychological variables," says Masters. But these factors alone do not explain why U.S. counties have rates of violent crime that vary from less than 100 to more than 3000 per 100,000 people.

To explain this variability, Masters decided to focus on two metals: lead and manganese. Both were plentiful in some parts of the country but not others. Furthermore, there was solid scientific evidence that both could alter brain chemistry in a way that could cause learning disabilities, poor impulse control and aggressiveness, he says.

The deleterious mental effects of lead—which was once actually used to sweeten bad wines—were observed by Hippocrates and later by Benjamin Franklin. More recent research has strongly linked lead with lower IQs in some urban children. Prolonged exposure to low levels of lead can also impair a person's ability to be deterred by the threat of punishment, says Masters. So much for long sentences discouraging criminals.

Although legislation prohibiting lead in gasoline additives and paint has reduced lead levels in blood by 78% since 1976, the release of lead and lead compounds remains a serious problem, says Masters, due mostly to aging water systems and pollution from factories and mines.

Manganese might not be as well known as lead, but it too has been associated with behavioral disturbances, including loss of impulse control and outbursts of violent behavior under stress. Like lead, it is pervasive. "Early in this century, cast iron was the most typical material for pipes and



are two," he says. Chiefly by adjusting the children's diets, he says, the center has been able to prevent troubled children from becoming ruined adults.

Walsh is not the only one to draw a line between certain metals and behavioral problems. Roger D. Masters, a professor of government at Dartmouth College, is also intrigued by the connection. Like Walsh, Masters does

conduits. No. 20 gray cast iron normally contains .4% to .6% manganese," Masters explains. "Aging or rusting pipes could therefore leach toxins like lead and manganese into water supplies, particularly in the decaying inner cities now inhabited by the poor."

Reverse Prozac

Neuroscientists believe that manganese inflicts its damage by lowering the amount of serotonin in the brain. Serotonin belongs to a class of chemicals called neurotransmitters. Their function is to carry signals between the gaps that separate individual brain cells.

"Low levels of serotonin in the brain are associated with mood disturbances, poor impulse control and increases in aggressive behavior," says Masters. He points out that these problems have been treated with Prozac, a drug that helps the brain make better use of available serotonin, and other pharmaceuticals.

Vitamin and mineral deficiencies—an especially serious problem among the poor—also play an important role in increasing lead and manganese uptake. "The combination of calcium insufficiency and manganese toxicity could therefore be described as reverse Prozac," Masters says.

With two likely metallic suspects in

mind, Masters pored over the U.S. Environmental Protection Agency's Toxic Release Inventory. Breaking this information down county by county, he factored in crime report data from the Federal Bureau of Investigation, alcoholism statistics from the Department of Health and Human Services and socioeconomic and demographic data from the Census Bureau.

When this massive number-crunching job was done, the findings were startling. "In counties with no reported releases of lead or manganese and below-average deaths from alcoholism, rates of violent crime are below average. That is, 216 [crimes] per 100,000 [people] compared to the national mean of 298," Masters says.

By contrast, there were 920 violent crimes per 100,000 people in the 52 counties where toxic releases from both metals were present and where there were also above-average rates of alcoholism. Alcohol might seem to be the culprit. Masters acknowledges that it is important—its ability to reduce inhibitions are, after all, legendary—but the difference in crime could not be attributed to spirits alone. Even in counties with a below-average number of alcohol-related deaths, the violent crime rate was about twice as high when lead and manganese were present. It

wasn't a statistical fluke. There truly was a pollution-violence link.

Changes ahead

Masters says his research suggests that traditional approaches to deterring violence need to be reconsidered. The effect of metals and other compounds that damage nerve function may be especially important in explaining why rates of crime have differed so widely by geographical region and by ethnic group, he says. "Our analysis shows that neurotoxic metals significantly contribute to rates of violent crime."

"It's the breakdown of the [brain's] inhibition mechanism that's the key to violent behavior," says Masters. "The presence of pollution is as big a factor [in predicting crime] as poverty."

Some of those who have been following Masters' work—which will be published later this year—believe his findings should become the rallying point for an entirely new approach to violence and crime control.

"Perhaps," suggests Michael Zimmerman, a biologist who is also dean of the University of Wisconsin College of Letters and Science, "conservatives who have long argued that it is time to get tough on crime will now join with environmentalists to get tough on industrial polluters." **PM**

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