Taking Stock of Saddam's Fiery Legacy in Kuwait

While major effects on global weather haven't materialized, there's still concern about possible health effects

SIX MONTHS AFTER SADDAM HUSSEIN'S FRUSTRATED attempt to take over Kuwait turned into the spiteful torching of more than 700 Kuwaiti oil wells, health officials, meteorologists, and environmental experts convened during mid-August in Cambridge, Massachusetts, to assess the impact of the vengeful deed.

Their conclusions? The early counterattack by meteorologists against the doomsday scenarios of Carl Sagan and his associates—that the fires could touch off a global weather catastrophe—was correct (see *Science*, 25 January, p. 372). The soot cloud produced by the fires hasn't produced a "nuclear winter," nor are the carbon dioxide and other gases released going to have an appreciable effect on global warming, although regional weather changes are possible (see box). What's more, so far at least, adverse health effects from the heavy pall of pollution caused by the fires have been surprisingly mild. This isn't to say that premature deaths will not occur—indeed some models suggest these could number around a thousand a year—but many scientists had feared much worse. Nevertheless, all researchers concede that the data for this particular conclusion are still preliminary, and they expressed concerns that health problems may worsen in the coming months.

Most of the health effects are expected in a region blanketed by a plume of smoke 800 to 1000 kilometers long, which includes Kuwait, where 60% of the fires are still burning, western Saudi Arabia, and Oman. But while the smoke plume looks ominous and at times can blot out the midday sun, the average concentrations of the primary pollutants it contains, carbon-based particles and sulfur dioxide, are similar to those in any large urban center, according to independent surveys done by a Japanese group headed by Toshiichi Okita of Obirin University in Tokyo and a French group led by Phillipe Lameloise of Air Parif in Paris.

And the health problems up to now are consistent with that type and level of pollution, according to preliminary data obtained by Ruth Etzel of the Centers for Disease Control in Atlanta, who compared visits to emergency rooms in two Kuwaiti hospitals before and after the fires were set. Her results: A moderate rise—about 6%—in complaints for chronic heart and lung conditions.

Still, the oil fires increase the pollution burden on Kuwait, which already had a problem with particulates in the air, and some epidemiologists expect that the extra pollutants will take their toll. George Thurston at New York University and, independently, Haluk Ozkaynak of Harvard's Risk Assessment Group both predicted as many as 1000 additional deaths in Kuwait—a 10% increase—over the next year. They compared the pollution over Kuwait with previous instances of severe air pollution, like those of the London fogs of 1952 and 1962, in which stagnant air masses caused pollutants to accumulate in the city and may have accounted for as many as 4000 deaths. What's more, Kuwaitis are anticipating that the pollution may worsen when the shemal winds of spring and summer die down this fall.

Still, acute episodes of air pollution like those in London cannot help predict the long-term consequences of the oil fires. For example, there is some concern that potentially carcinogenic compounds such as the polycyclic aromatic hydrocarbons can be formed. Other possible hazards come from the evaporation of nearly 400,000 barrels of volatile hydrocarbons from the more than 20 million barrels of oil leaked from unburned wells that now form Kuwait's vast "oil lakes." In addition, heavy metals such as vanadium and nickel that are released from the fires may eventually make their way into water and food supplies and may, when ingested, wreak metabolic havoc in the future.

And some of the chemicals being emitted from the fires may not have been seen before in industrial pollution, and their health risks remain unknown. Without knowing exactly which toxins are present, the conferees agreed it would be difficult to anticipate, much less prevent, their effects on human health.

The oil fires have essentially turned Kuwait into a giant experiment in environmental pollution, a fact lamented by Sami Nima Mohamed Al-Yakoob of the Kuwait Institute for Scientific Research. "Kuwait," he asserts, "is not an animal laboratory."

■ MICHELLE HOFFMAN

Rainy Forecast for Gulf Area?

Predictions about the impact of the oil fires in Kuwait on climate are about as changeable as, well, the weather. Since the fires were set 6 months ago, scientists have variously forecast global warming and global cooling, neither of which is now expected. Then they predicted droughts. Now the outlook calls for increased rain.

The new prediction, presented at the Kuwaiti oil fire conference earlier this month (see story above) by Thomas Sullivan, a meteorologist at the Lawrence Livermore National Laboratories in California, is based on an observation made by Geoff Jenkins of the UK Meteorological Research Flight in Farnborough, England, who found that the particles emitted from the fires can actually bond with water. That was unexpected because the particles are rich in hydrocarbons and, like oil, are not supposed to mix with water.

The observation led Sullivan to propose a theory even he concedes is controversial. The particles in the atmosphere, Sullivan suggests, may act as "seeding agents," upon which water can collect until it eventually falls as rain. In a scenario that Sullivan called "highly speculative," he proposed that the mass of polluting particles detected moving from Kuwait to the gulf of Bengal in mid-April may have accounted for the intense rains over Bangladesh later that month. Similarly, said Sullivan, unusually high rainfall reported in India, and possibly as far away as China, may be linked to the pollution in Kuwait. And Kuwait itself may be experiencing greater-than-normal amounts of rain since the fires were set, said Jasem Al-Hassan, a biochemist at the University of Kuwait.

Predicting the weather is always uncertain business, and in this case the uncertainties are multiplied. A major problem for Sullivan and other meteorologists to overcome will be making certain that pollutants are actually coming from the oil fires and not some other source. Sullivan will continue to monitor anomalous rainfall throughout the subcontinent to see whether his theory holds water. ■ M.H.