

Warming may disrupt pace of seasons

As spring returns to the Northern Hemisphere, a controversial report warns that climate change may be tripping up the steady march of the seasons.

"This may be worse for people than just a simple increase in temperature," says David J. Thomson, a statistician at AT&T Bell Labs in Murray Hill, N.J.

Thomson reached this conclusion after analyzing long-term temperature records, paying close attention to the annual seasonal swing. At one site in central England, records going back to 1659 show that the seasons arrived slightly later each year, lagging progressively behind the calendar by about 1.4 days each century, Thomson reports in the April 7 *SCIENCE*.

He attributes this change to slight differences in ways of defining the length of a year. The Gregorian calendar now in use was designed to stay in tune with the equinoxes, whose timing depends on the tilt of Earth's axis. Another definition of a year uses Earth's closest approach to the sun, called perihelion, as a marker. Long-term changes in orbit cause the two definitions to differ by about 20 seconds a year, so the date of perihelion has drifted 1.4 days per century.

The seasons in central England fol-

lowed the perihelion year until 1940, when they started lagging behind the calendar even more. Temperature data for other locations also show a marked shift in the rate of seasonal drift around 1940, as do records of the average northern hemispheric temperature.

Thomson notes that the hemispheric change started when atmospheric carbon dioxide concentrations began their steep buildup. The two have kept pace ever since, suggesting a possible connection. If so, future shifts in seasonal timing could severely disrupt agriculture and biological systems, he speculates. The new findings also add stronger statistical support for observations of a pronounced global warming over the last century.

The report has intrigued many researchers, although they remain wary about a statistical expert making climate speculations. Statistician Peter Bloomfield of Merrill Lynch in New York City questions Thomson's results for another reason. Bloomfield notes that Paris does not show the same shift in seasons as nearby Basel. He wonders whether local effects — such as growth of cities around weather stations — could have introduced some of the seasonal lags detected by Thomson. — R. Monastersky

AIDS progression fostered by dioxin?

Smokers infected with HIV-1 tend to develop AIDS more quickly than non-smokers. Some scientists have also observed that dioxinlike compounds foster the proliferation of this AIDS virus in cultured cells. New research offers one possible explanation for both findings.

It shows that HIV-1 possesses a hitherto unrecognized docking site for a cellular protein to which dioxins and many other toxic compounds bind. When this protein binds with a pollutant and the resulting complex links with the virus, it activates HIV's genes.

TCDD, the most toxic dioxin, and a number of related compounds all bind to this protein, known as the Ah (aryl hydrocarbon) receptor, which resides in the liquid interior of cells. The binding of a pollutant to this receptor initiates a transformation that suddenly renders the duo capable of entering a cell's nucleus, where they can inappropriately turn genes on or off.

In the April *ENVIRONMENTAL HEALTH PERSPECTIVES*, researchers at the University of Cincinnati Medical Center report finding a binding site for the Ah receptor in the portion of HIV's genetic material where regulatory proteins bind to activate viral genes — an area called the long-terminal repeat.

To gauge the receptor's importance, they inserted a bacterial gene known as CAT into that long-terminal repeat as a genetic flag. They then infected mouse liver cells with the modified HIV and monitored the extent to which the virus turned CAT on when the cells were exposed to a range of toxicants.

Benzo(a)pyrene, a carcinogen present in cigarette smoke, and aflatoxin B₁, a fungal poison, both quintupled CAT activity over the level seen in unstimulated cells or cells exposed to the solvent used to deliver the pollutants. TCDD and three combustion by-products doubled or tripled CAT activity.

But none of the compounds affected the activity of CAT in a mutant form of HIV lacking the Ah receptor binding site or in cells protected against reactive, biologically damaging molecular fragments known as free radicals (for their free, or unpaired, electron).

Those follow-up experiments confirm that both the receptor binding site and free radicals must be present in the cell for the activation of HIV by these types of pollutants, explains Alvaro Puga, who led the studies.

How important are these compounds to AIDS? That will depend on which cells host the virus, Puga says — specifically, whether they have Ah receptors and can foster the free radicals needed to cause damage. — J. Raloff

Whooping cough afflicts folk of all ages

If you thought only children got whooping cough, think again. Researchers report that one in five adults who sought relief for a nagging cough at a Nashville emergency room showed signs of pertussis, or whooping cough.

Indeed, this and other studies suggest that grown-ups could be the main carriers of the disease. That means physicians should be on the alert for children who may have contracted pertussis from an adult, says physician Seth W. Wright of Vanderbilt University Medical Center in Nashville. Wright and his colleagues report the work in the April 5 *JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION*.

For reasons not fully understood, pertussis cases reported to the Centers for Disease Control and Prevention jumped from a low of about 1,000 in 1976 to 6,000 in 1992-1993. Adults and adolescents form a growing proportion of cases — about 27 percent in 1993. In fact, says Wright, "the number of cases in adults probably dwarfs the number of cases in children. It's just that no one ever knows they have it."

Physicians rarely check adults for whooping cough because "most aren't aware that it's a disease of adults," Wright says. As childhood vaccination

fades, adults become susceptible to the disease but often don't show specific symptoms, making diagnosis difficult.

Wright and his colleagues examined 75 people over the age of 18 who went to the Vanderbilt emergency room complaining of a cough that had lasted at least 2 weeks. Blood tests showed that 16 of the 75 had signs of infection with the *Bordetella pertussis* bacterium.

The findings agree with those of two other recent studies, one of Australians with a chronic cough who visited specialists and another of cough-stricken students at the University of California, Los Angeles. Both studies found pertussis in 26 percent of these adults.

Often, the disease has nearly run its course by the time an adult visits a doctor. Wright recommends that children in the household of an adult with pertussis be treated with antibiotics at the first sign of a cough.

Wright's team also suggests that if further research confirms their results, physicians should consider vaccinating adults for pertussis. Since adults form the disease reservoir, "you might decrease it in adults and thereby decrease it in children," he says.

— J. Kaiser