Virtual solution to carbon cost of conferences

Improved technology is making virtual meetings more like real ones, without the flights.

Sir — Every year, many thousands of scientists jet off to a host of destinations all around the world to attend conferences. Emissions of carbon dioxide, a greenhouse gas, from air travel are growing at an alarming rate. In 1992, at 500 million tonnes, they constituted about 13% of all CO_2 emissions from transportation sources. By 2050, the Intergovernmental Panel on Climate Change estimates that aircraft emissions will triple to 1.5 billion tonnes of CO_2 per year.

During the past few years, an increasing number of conference organizers have recognized this pollution problem and have attempted to mitigate their climate impact (see, for example, www.fhio.gc.ca/commuting/carbon_neutral.htm#Conf_guide). Some recent environmental conferences have aimed to offset the greenhouse-gas emissions caused by their participants' travel by funding tree-planting schemes. Others strive to be entirely 'carbon neutral', sourcing their electricity from renewable sources, and others even buy carbon credits to offset conference-related emissions. Now, a new technology, the Access Grid system (www.accessgrid. org), is promising to change the face of our conferencing habits.

Access Grid is similar to video conferencing but lets groups from numerous different locations communicate among themselves at one time. Instead of only being able to see the speaker (a limitation of traditional video conferencing), delegates can also see and talk to other groups of delegates — in the next town, in another country or on a different continent. Speakers can manipulate their presentations to all viewers simultaneously so that, as each one moves through the slides on his or her own screen, all the viewers' screens are also updated.

A key aim of Access Grid is to solve the problems faced by many researchers in the developing world, who are prevented from attending international conferences by economic constraints. There is, however, a significant start-up cost of around US$25,000 for the technology, and few locations in the developing world are currently able to meet the requirement of Access Grid conferences for broadband network access (greater than 1Mb per second minimum bandwidth).

Several international conferences have already successfully used the Access Grid, with many more such meetings planned and an ever-growing number of institutions able to co-host conferences. The huge environmental dividend of virtual conferencing is demonstrated by the estimate for a recent genomics meeting, where travel-related CO_2 emissions of the order of 900 tonnes were avoided (www.ndsu.nodak.edu/virtual-genomics/Proc_VCGB2002.pdf, or see W. A. Valdivia-Granda, E. L. Deckard & W. Perrizo *Proc. Virt. Conf. Genom. Bioinf.* **1,** 1–3; 2002).

The combination of this new technology with ever-improving video and sound (for example, Hewlett-Packard's new Coliseum immersive teleconferencing system) means that the old objection — that virtual conferences are impractical and impersonal — is rapidly breaking down. Though many of us may feel it is unfair to deprive ourselves of all-expenses-paid international trips and the outside-meeting socializing common to most conferences, we should not ignore the environmental impact of these meetings. 'Real world' conferences will always have a place, but given the huge number of international conferences, even limited use of Access Grid virtual conferencing has the potential to reduce CO_2 emissions by many thousands of tonnes.

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Looking into the safety of AAV vectors

Sir — The News story "Harmful potential of viral vectors fuels doubts over gene therapy" (*Nature* **423,** 573–574: 2003) suggests that there is a reasonable probability that recombinant AAV vectors may cause or contribute to cancer in gene therapy subjects. As authors of the paper discussed in your story (H. Nakai *et al. Nature Genet.* **34,** 297–302; 2003), we would like to emphasize that there is no evidence that AAV causes cancer in animals or humans, and that your concern is unfounded.

Our studies demonstrate that AAV vector DNA will preferentially integrate into active genes when delivered into the livers of mice. This has raised concerns because of recently published reports of leukaemia in two of nine patients treated with a recombinant retroviral vector for a lethal genetic disease, X-linked severe combined immunodeficiency disorder (SCID). The leukaemia was caused at least in part by the retroviral insertion and activation of an oncogene (insertional mutagenesis) in bone-marrow progenitor cells. Because retroviral vectors preferentially integrate into intragenic regions of the chromosome, your News story suggests that recombinant AAV vectors may pose similar risks in gene-therapy trials.

There are substantial differences between retroviral and AAV-mediated integration. First, unlike retroviral vectors, AAV-mediated vector integration is relatively uncommon. Second, retroviral vectors contain additional regulatory elements that are more likely than AAV vectors to activate a gene that they insert next to. Third, retroviral vectors contain the protein machinery needed to cause host chromosomal DNA breaks, whereas AAV does not. It is possible that AAV preferentially integrates into DNA regions that are already damaged within treated cells.

A symposium entitled "Safety considerations in the use of AAV vectors in gene transfer clinical trials", jointly sponsored by the NIH and the FDA, was held in March 2001 (see www4.od.nih.gov/oba/rac/Transcript3-7-011.pdf). On the basis of data from hundreds of normal mice treated with the vector, the conclusion was reached that there was no evidence to suggest that the vector caused cancer.

In addition, the leukaemia found in patients treated with X-linked SCID gene therapy may be unique to this particular disease because of the unusual physiological events that occur after treatment. In X-linked SCID, the genetic reconstitution of a very few precursor cells results in the selective proliferation of immune cells genetically corrected with the vector. Any additional proliferation stimulus, such as the activation of an oncogene, may result in the further growth and expansion of these cells. This type of growth advantage is not a factor in most gene-therapy trials, and AAV has not been used in clinical trials to treat such disorders.

Although we support additional long-term safety studies, we believe the risk of cancer in current AAV trials is negligible, on the basis of infrequent integration efficiency and the quiescent nature of the target tissues.

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