

Among the studies released last year in the United States, one indicated health costs in the United States were perhaps as high as \$50 billion a year from air pollution and another indicated it was perhaps several hundred billion per year. There are no comparable long-term epidemiological studies in Canada particularly tying the synergistic impacts of these three terrifying air phenomena together. Perhaps you could spend a moment on why we should focus on the synergy rather than on one piece at a time.

**Dr. Bates:** There are answers at several different levels. Let us take the simplest. If you take an asthmatic child and expose him or her to a very low level of ozone, well below the Canadian standard, and then the next day expose him or her to a very low level of sulphuric acid, not enough in itself to do anything, the fact that they got ozone the day before means that they have a marked response to the sulphuric acid the next day. This is exactly what is happening in the northeast. You have to envision children going out on a Tuesday afternoon, which may be a high ozone day, and on the next day hitting a peak of acidity, just like the one I showed you in Dunnville.

In other words, at the first level, particularly children are sensitive to these pollutants in sequence. It is not enough just to look at each one separately. If they get ozone the day before, the sulphur dioxide and sulphuric acid is much more damaging a day later. This is the level-one answer to your question.

The level-two answer is that they are very closely interrelated chemically. It is thought now that the ozone is what is driving the rapid formation of sulphuric acid from sulphur dioxide. Sulphur dioxide is not anything near as harmful as sulphuric acid for the same equivalent weight of sulphur. So ozone is having an effect chemically in worsening the situation you are into as a result of sulphur dioxide. They interact chemically in that way.

Thirdly, on a final level, the plant physiologists have been telling us for at least 20 years that plants are very sensitive to these alternating pollutants, alternating acidity and ozone, in other words. The data we now have on children are exactly like the data the plant people have been telling us about the effect on plant growth. When you look at the situation now even in our Fraser Valley, which does not get any acidity—it just gets ozone—the effect on growth rate is detectable to the extent of \$2 million or \$3 million a year in reduced productivity.

In California the economic costs in reduced productivity are enormous. There is no visible damage, but a Los Angeles meeting I was at documented that the production of grapes in the Napa Valley is cut 15% to 20% by the ozone drifting up from San Francisco. This has reduced productivity. It is not damage that you can photograph on a leaf.

Even forgetting our global contributions, even if you were to put those on one side, which I do not think you should do, major reductions of the kind now possible with modern technology, as I indicated, 60% in nitrous oxide emissions, 80% in carbon dioxide emissions, these things are now technically within reach. The question is how to get Canada to implement them.