

In real life, pollutants occur together rather than singly and effects are changed due to weather, smoking, infectious agents, et cetera. What is the likely magnitude of error in cost-benefit judgments for standard selection when criteria are established only for each pollutant alone? Does the large number of possible combinations rule out criteria establishment for complex atmospheres?

Dr. MIDDLETON. That is fairly easy to answer. It is easy to answer in the sense that you are probably less likely to make errors for single pollutants based on the fact that they are acting in concert, since synergistic or enhancement effects are likely to mean that the numbers should be smaller than the criteria will be for the single pollutants.

Let me illustrate the case—

Mr. FELTON. In which way?

Dr. MIDDLETON. In the way that an ozone level that causes damage to tobacco is a very different number and much smaller when sulfur dioxide is also present. Five times less ozone is required to produce the same effect, and sulfur oxide in neither instance causes any effect.

Mr. FELTON. So that, if you issued criteria for ozone alone you might, in fact, err?

Dr. MIDDLETON. We might not be protecting the public as well as we should.

Mr. WILLIAMS. Yes.

Mr. CARPENTER. Then how do you propose to deal with these possible synergistic effects?

Dr. MIDDLETON. By trying to get the knowledge that shows what is happening in synergistic systems. Until we know something about the synergistic effects, we are obliged to use the best scientific knowledge that is available for the individual pollutants.

Mr. CARPENTER. Do you put a safety factor in?

Dr. MIDDLETON. No; our criteria are statements of fact. Let's make that clear: Criteria are expressions of effects that occur for a given dose.

Mr. CARPENTER. Would you recommend that a State using your criteria to set standards use a safety factor because of a lack of knowledge of synergism?

Dr. MIDDLETON. That certainly ought to be considered whenever standards are set. If an adverse health effect, to give you an example, is caused by a tenth of a part per million of something—that is the minimum threshold effect—and half that, 0.05 parts per million of the same pollutant causes agricultural damage of economic concern—

Mr. CARPENTER. You choose that.

Dr. MIDDLETON (continuing). Then you choose that to assure that at least you are not going to hurt people and you may even get the support of farmers in cleaning up the air to help their own economic interests.

These are the kind of things that have to be done at the local level.

Mr. CARPENTER. Now the other question I had—

Dr. MIDDLETON. Excuse me a minute. I want to ask if Dr. Landau can give us an example of synergistic action that affects people?

Dr. LANDAU. The most common one is the combination of particulate matter and sulfur oxides.

The Russians have taken this into account. They have standards for individual pollutants, 96 of those currently, but they also have