the retina detaches and rolls up like a scroll.

The prevailing hypothesis on how to prevent ROP dates back to the oxygen study of three decades ago. It was the first randomized controlled clinical trial in the United States and it showed that the standard medical practice in the 1940's and 1950's of giving 50 percent oxygen for 28 days to all premature babies, whether they needed it or not, was leading to ROP.

Since that study, however, there have been virtually no randomized controlled clinical trials of methods to prevent or treat ROP. And there have been many false trails. "This disorder is filled with one trap after another," says Silverman. "It's *unbelievable*. Unless the clinical science is good, you've got to scream. So many mistakes have been made."

And even though the original study implicated oxygen in the development of ROP, it is not at all clear what that study means today. "The baby getting ROP now has a totally different oxygen history than the baby getting ROP in the 1930's and 1940's," says Flynn. "The duration of oxygen administration, the concentrations of oxygen, and the reasons for giving oxygen all have changed." Now, says Lucey, ROP seems clearly to be primarily a disease of very sick babies—not necessarily a disease of too much oxygen. "If the sick eye is a reflection of a sick baby, as every study seems to show, I don't think we can do much about it in the next few years," he remarks. The best hope is prevention of low-birth-weight babies in the first place.

In the meantime, however, medical researchers are pursuing a number of strategies that they hope might lower the incidence of ROP and, once a baby develops the disorder, limit the damage it does. One highly controversial hypothesis is that perhaps vitamin E can prevent the damage that oxygen might inflict. But the studies so far have not provided good evidence that high doses of vitamin E are truly beneficial. And vitamin E is not innocuous, Avery points out. If it is given in high doses, it can lead to sepsis and necrotizing enterocolitis, a disorder in which the lining of the gut breaks down. The babies then are vulnerable to systemic infections from bacteria that normally live in their intestines and to gangrene of the bowel.

For these reasons Flynn warned that, "it is incumbent on the vitamin E-ologists—and you know who you are—to get yourselves together and do a clinical trial. You have to be sure you are not endangering the lives and future health of these babies. You also need to verify the oxygen hypothesis—and it is an hypothesis."

Once ROP begins, physicians would like

Methane Doubling Upheld

A reanalysis of 35-year-old spectra of the sun has shown that atmospheric methane has been increasing by about 1 percent per year. The same analysis supports recent measurements showing carbon monoxide increases during the past several years. It is now clear that, as predicted, the complex web of chemical reactions involving trace gases has taken a jolting blow. Aside from a reduced capacity of the atmosphere to absorb greater abuse, one result will be an increased global warming due to methane's greenhouse effect.

In three papers in the 21 November issue of *Nature*, Curtis Rinsland, Joel Levine, Thomas Miles, and Geoffrey Tennille of NASA's Langley Research Center in Hampton, Virginia, present their reanalysis and interpretation of solar spectra recorded in 1950 and 1951 at the Jungfraujoch International Scientific Station, 3600 meters up in the Swiss Alps. Astronomers were then using the spectra to study the solar atmosphere, but they could also determine the concentration of both methane and carbon monoxide in the troposphere (the lowest 10 kilometers of the atmosphere) by measuring the gases' absorption of sunlight in the spectra. The originally determined values for methane have been cited recently in support of the constancy of methane concentrations until the late 1970's, when direct sampling began to suggest a 1 to 2 percent per year increase. Analyses of air trapped in glacial ice, on the other hand, seemed to support strongly an increasingly rapid increase beginning several hundred years ago.

Rather than accept the cited values, Rinsland, who was trained as an astronomer, and his colleagues gathered the original spectra and started from scratch. The resulting concentrations were distinctly lower than present values as well as values previously reported for that time. They found 1.14 parts per million by volume (ppmv) of methane in 1951–52 compared with about 1.68 ppmv at present. B. Stauffer and his colleagues at the University of Bern recently reported a concentration of 1.16 ppmv from ice formed in 1949–50. Thus, the upward trend in methane of the past few years is only the most recent part of a long-term increase of about 1.1 percent per year that has indeed been faithfully recorded in ice cores. The previously reported stability of methane concentrations resulted from the use of less imprecise values for the absorption per molecule of methane.

The determination of carbon monoxide in the historical solar spectra presented greater difficulties than in the case of methane. The concentration of carbon monoxide varies by a factor of about 2 through the year and from hemisphere to hemisphere, so that the spectra from 9 days over the course of 1 year clearly fall short of a thorough sample. The best the Langley group can do is cite an average rate of increase over Europe since 1950 of about 2 percent per year with an uncertainty range of 0.5 to 4.1 percent per year. But that, they say, is consistent with more recent measurements of increasing carbon monoxide around the world.

Computer models depicting the possible effects of increasing methane and carbon monoxide point to a significant weakening of the system of chemical reactions that would normally keep trace gases, both natural ones and some pollutants, in balance. The pivotal element in this balance is the highly reactive hydroxyl radical. Without hydroxyl radicals, few trace gases would react with each other and any additions, whether natural or pollutant, would lead to increases in abundance.

During the past 35 years, according to a computer model that was run by the Langley group, the methane and carbon monoxide accumulating from anthropogenic sources have overwhelmed the hydroxyl radical and reduced its abundance by perhaps 25 percent. Such estimates are vital because, despite its central role, atmospheric chemists have yet to reliably measure hydroxyl radicals.

Old astronomical spectra should provide valuable insight to the behavior of some trace gases at times before chemists reliably measured them directly. The Langley group is now working on the measurement from the 1950–51 spectra of two other greenhouse gases, carbon dioxide and Freon-12, and earlier records may also prove usable. ■ **Richard A. Kerr**