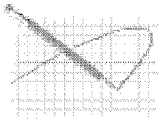

Dale L. Bacon

12/26/2000 04:31 PM

To: Katherine E. Reed/US-Corporate/3M/US@3M-Corporate
Michael A. Santoro/US-Corporate/3M/US@3M-Corporate
Larry R. Zobel/US-Corporate/3M/US@3M-Corporate
Charles Reich/US-Corporate/3M/US@3M-Corporate
cc:
Subject: stuff

FYI

---------- Forwarded by Dale L. Bacon/ET-ET&S/3M/US on 12/26/2000 10:27 AM ----------

JGiesy@aol.com on 12/21/2000 02:52:26 PM

To: Dale L. Bacon/ET-ET&S/3M/US@3M-Corporate
cc:
Subject: stuff

DB:

Just back from Japan.

I have attached a draft article that rebecca renner is planning to send to Scientific American. Any comments? I guess she has been talking to Mike about this.

Also, I learned taht EPA is gearing up to do a large number of studies of PFOS in rats. They seem to ahve no clue what they are looking for, but say they want to look for subtle effectgs and determine mechanisms of action to explain the effects of teh 3M multigen study. They are also going to gear up their own analytical lab to do some survey work. I think they are also goig to do some aquatic tox work at teh Duluth lab. That is all I was able to learn from Bob Kavlock about what they are are doing. He seemed to indicate that it would be their major effort. He was aware of my involvement with 3M, I did not mention it. He brought up the subject ove beers one night in Japan so I used the opportunity to try to learn what they are up to.

JPGiesy

 - The discovery of a new class of POP.doc

Exhibit
1749
State of Minnesota v. 3M Co.,
Court File No. 27-CV-10-28862

The discovery of a new class of POP

Last May 3M Corporation surprised many by announcing that it would stop making its popular Scotchgard fabric protector and discontinue other fluorinated organic compounds by 2002. In addition to Scotchgard, 3M fluorochemicals are used in hundreds of products ranging from microwave popcorn bags and fast food wrappers to semiconductor coatings and airplane hydraulic fluid. 3M decided to abandon its fluorishing fluorchemical business because researchers had found a particular persistent flurochemical in the blood of humans and animals from pristine areas far from any apparent source

The particular compound is perfluoro-octane sulfonate, or PFOS, which is a breakdown product of other 3M flurochemicals. PFOS is so ubiquitous that 3M even found it in the unadulterated chow fed to lab rats, but couldn't figure out how the contamination occurred. "This is a new class of persistent organic pollutants" says Michael Santoro, environmental director of 3M in St Paul, Minn. "The conventional approach to understanding environmental behavior or predicting toxic effects is all changed from what we previously understood" he says.

There are still more questions than answers, but what the scientists have discovering is a new class of persistent organic pollutants. Environmental scientists already know a great deal about some persistent organic pollutants. These POPs, such as dioxin, PCBs and DDT persist in the environment, accumulate in fat, and show signs of toxic effects at environmentally relevant concentrations. But PFOS is a different kind of pollutant - while as persistent as the others, it bioaccumulates in a different way. Animal tests indicate that PFOS causes death in adult monkeys and rat offspring that received high doses in utero, but the toxic action is difficult to understand. Not to mention that it sure can travel. Despite a relatively low production volume, under 10 million pounds a year, it has spread around the world in the 40 years since 3M began production.

"PFOS redefines the meaning of persistence. It doesn't just last a long time, it lasts forever", according to University of Toronto chemist Scott Mabury. The persistence comes from a chain of eight carbon atoms surrounded by fluorine atoms, he says. The fluorine-carbon bond, one of the strongest covalent bonds, is practically unknown in nature. This may, in part explain why nothing in nature appears to be able to break PFOS down.

Fluorochemicals have a myriad of uses because they are stable and chemically inert. They repel both water and oil, reduce surface tension better than other surfactants and work well under harsh conditions. These very unusual characteristics make their behavior in the environment unusual and hard to

understand.

But Don Mackay, Tim Cahill and xxx who study the fate of chemicals in the environment at Trent University, Canada have some ideas. For a chemical, global travel usually means atmospheric transport. Because PFOS is not volatile, they believe that some other more volatile chemicals involved in the production of fluorochemicals are getting into the air and travelling the world. This could be part of the production process or part of the process when other manufacturers incorporate fluorochemicals into their products, for example, as a factory-applied stain protector for new carpets. It's also possible that a volatile fluorchemical is coming from materials that have been thrown away in landfills.

Whatever the transport mechanism, once PFOS gets into an animal, it stays and accumulates. PFOS binds to protein in the blood and then accumulates in the liver or gall bladder, according to environmental chemist Kurunthachalam Kannan, who with zoologist John Giesy has analysed over 2000 archived animal tissue samples on behalf of 3M. Kannnan and Giesy at at Michigan State University's National Food Safety and Toxicology Center, in East Lansing, Mi have found levels up to 6 ppm in mink and eagles, with lower ppm levels in polar bears, seals, and other animals.

Such levels in the environment raised flags for some toxicologists. Richard Purdy, an independent toxicologist who worked for 3M for 19 years, notes that these levels are only about ten times less than concentrations where lab toxicity tests have showed adverse effects. This means the safety margin is ten-fold or less which is too low considering variability in species sensitivities, he says. "The numbers are close enough to convince me that wildlife are being killed by this compound now", he says.

But most researchers say this is premature. "We have to learn a lot more about its toxicity," says Kannan, noting that most of the values in wildlife are about 50-fold less than the minimum thresholds from rat or monkey feeding studies. "These feeding studies focussed on just a few outcomes. We need to look at more sensitive indicators of adverse effects. But at this stage we don't know what those indicators are", he says.

The findings about PFOS are also bringing other flurochemicals under scrutiny by scientists and regulators. The Organisation of Economic Cooperation and Development is assessing the problem on a global scale. The US, UK, Canada and Japanese environmental agencies are also working on it. 3M is the major manufacturer of flurocompounds that degrade to PFOS, but other companies use a different process to make perfluoronated chemicals with different structures, but with similar uses. These companies are currently embarking on a research program to see if their products, precursors or breakdown products act like PFOS in the environment.