PHYSICAL – CHEMICAL PROPERTIES

A Robust Summary, Final Report, and Protocol on the physical-chemical properties of perfluorooctanesulfonate are included for each of the following parameters:

PARAMETER	DATE OF REPORT	RESULTS
Melting Point/Melting Point Range	2/24/99	$\geq$400°C
Vapor Pressure	5/5/99	3.31×10^{-4}P@20°C
n-Octanol/Water Partition Coefficient	2/11/00	Not calculable; three phases
Air-Water Partition Coefficient	3/19/00	0($<2 \times 10^{-6}$)
Solubility in pure water	5/3/99	570mg/l
Solubility Measurements on FC-95	2/6/81	1080mg/l

The data presented in the study "Solubility Measurements on FC-95," was determined by indirect measurement, not by actual analysis. Therefore, the data is not reliable.

Please note that the March 1, 2000 submittal to EPA entitled "Sulfonated Perfluorochemicals in the Environment Sources, Dispersion, Fate and Effects" included solubility data on water other than pure (i.e., fresh water; filtered sea water; unfiltered sea water). These data were developed, however, in support of other studies and not produced using GLP Standards. For this reason, Robust Summaries, Final Reports, or protocols for this specific data are not being provided.

ENVIRONMENTAL FATE AND TRANSPORT

This section presents information and test results from abiotic, and biotic degradation and soil adsorption studies. Degradation studies include hydrolysis, photolysis, and biodegradation. Much of this work is in progress with final reports scheduled for the June to August, 2000 timeframe.

As these studies progress, there are certain key findings that can be presented as preliminary results:

1. There has been no indication that perfluorooctanesulfonate undergoes any degradation from hydrolysis, photolysis, or biodegradation mechanisms.

2. In all hydrolysis and photolysis studies, perfluorooctanesulfonate has not been detected as a degradation product in any conclusive experiment. This preliminary finding calls into question the assumption of expected degradation of other fluorochemicals to perfluoroctanesulfonate.

3. In the studies focused on hydrolysis of fluorochemical polymers that form the structure of the specific industrial and consumer products, it has been determined that these materials are relatively stable in the environment. For example, the following half-lives are estimated for various polymers:

POLYMER	HALF-LIFE
Acrylate and ester	1-5 years
Polyethylene glycol based	3-50 years
Urethane	>500 years

For hydrolysis to occur, polymers must be subjected to an aqueous environment, which is not expected to occur in a municipal or industrial landfill.

4. Relative to photolysis, the current data suggests a hypothesis that these materials will photolyze to carboxylate structures. These structures have much different properties then sulfonates in that they are much less bioaccumulative in ecological species.

Additional discussion of these results and ongoing studies will be presented in subsequent submissions and reports.

ECOTOXICITY ELEMENTS

This section presents information and test results from a series of ecotoxicity studies on perfluorooctanesulfonates. The information is presented as Robust Summaries, Final Report and Protocol for each ecotoxicity element.

The studies performed during 1999 and in early 2000 were carried out using GLP Standards. In contrast, ecotoxicity studies performed during the period 1974 to 1998 were conducted using protocols and analytical methodologies available at the time of the study. In addition, in these older tests, the sulfonated perfluorochemical products were variable mixtures and contained more impurities. Several tests were hampered by the insolubility of the perfluorochemical and results are expressed as "greater than" the measured solubility. Therefore, the data presented in these historical reports may not be reliable.

ENVIRONMENTAL MONITORING:
PART ONE – MULTI-CITY STUDY

The multi-city study was designed to obtain preliminary data about dispersion of fluorochemicals in the environment, uptake into foods and presence in drinking water to understand the potential sources of human and environmental exposures that might result from this type of dispersion. The multi-city study paired a city having manufacturing or commercial use of fluorochemical products based on customer sales with a city that does not. Initially six cities, (three pairs) are being examined. The study may be expanded depending on further results.

The multi-city study will yield environmental distribution data as well as data on potential sources of human exposure. The cities were selected to represent urban locations with various levels of fluorochemical releases and various types of municipal water supplies. The samples to be obtained, where possible, include: urban air, surface water column and surface microlayer, sediment, river fish, drinking water intake, treated drinking water, tap water, the influent to and effluent from publicly-owned waste treatment works, sludge, and municipal landfill leachate. Additionally, a "market basket" of several food products will be sampled. These include: beef, pork, chicken, hot dogs, catfish, eggs, milk, bread, green beans, apples from grocery stores and, if possible, produce from local farmers' markets.

The attached material data provides more detail on the design and structure of the study and represents the first results from the multi-city study. Included are reports on the quality assurance plan and field sampling procedures used and the results of the drinking water samples taken from the six cities. The results indicate that drinking water in four cities (Decatur, Alabama; Cleveland, Tennessee; Mobile, Alabama; and Port St. Lucie, Florida) did not contain detectable levels of fluorochemicals. Only two cities (Columbus, Georgia, and Pensacola, Florida) contained detectable levels of sulfonated fluorochemicals in the drinking water. The results show that the levels are in the range of 40-60 parts per trillion of perfluoroctane sulfonate. Only one city, Columbus, Georgia, showed very low detectable levels of perfluorooctanoate.

Also included is a copy of a draft "lifetime" drinking water health advisory developed for PFOS. This advisory reflects a very conservative approach based on application of "safety factors." The advisory level of 1 part per billion should not be misconstrued as threshold for danger or concern, but only a reference point based on application of conservative methods and the information available to date. A comparison of the drinking water data from the multi-city study indicates that there are two orders of magnitude of safety between the draft drinking water advisory and the results from these two cities in the multi-city study.

ENVIRONMENTAL MONITORING:
PART TWO – BIOSPHERE SAMPLING AND ANALYSIS

A plan to assess potential environmental exposure to perfluorooctanesulfonate and other fluorochemical substances has been developed by 3M and outside experts. One component of this plan involves characterization of the geographic distribution of fluorochemicals in biotic and abiotic receptors. Two studies are in progress, one focused in the vicinity of the 3M Decatur, Alabama manufacturing facility, and the other a much more comprehensive global biosphere monitoring program. The preliminary results obtained to date have been reported in the 3M Environmental White Paper entitled "Sulfonated Perfluorochemicals in the Environment: Sources, Dispersion, Fate and Effects."

The study in the Decatur, Alabama area is being designed to understand the impact, if any, of production operations in the local environment. Samples of the groundwater, surface water, sediments and fish and bird species will be collected in May and June, 2000 for analyses. This data will be used to evaluate the environmental presence of fluorochemicals and to assess the potential of any effects using ecotoxicological test results.

The Biosphere monitoring program was designed in consultation with Dr. John Geisy of Michigan State University. This plan is being viewed as an iterative process to assess global distribution of fluorochemicals. As results are obtained from the global environment, the plan is to concentrate on those areas where fluorochemicals are detected in samples and focus on additional sampling and analyses in those specific locations.

Initially, samples of tissues and blood plasma are being collected from archived specimens covering different species and locations. Areas of focus include North America (Great Lakes and coastal marine locations), the arctic region, and Europe. Species to be studied include lake trout, walleye, salmon, catfish, and brown trout; cormorants, eagles and albatross; mussels and shellfish; marine mammals; and other species. This sampling plan is in progress and as data is obtained and reports generated, additional submissions will be made to EPA.

Included in this section are the following documents:

1. LCMSMS Analysis of Extracts reported in: "Preliminary Report Analysis of Perfluorinated Compounds in Environmental Samples" by P. Jones and K. Kannan - 4/7/99

2. Final Laboratory 3M Reports on Analysis of Fluorochemicals in Wild Bird Livers – 4/28/99

3. Screening of PFOS levels in Eagle and Albatross - 5/8/98