Mr. Stephen H. Korzeniowski
Business Manager
Fluorosurfactants and Additives
E. I. Dupont de Nemours & Co., Inc.

Dear Mr. Korzeniowski:

While you addressed your inquiry to Dr. Dierdorf, I am responding as the writer of the letter in question.

Thank you for your interest in the Department of Defense AFFF Workshop and the efforts we are making to develop a plan for the department to respond to the Environmental Protections Agency's pending actions on fluorosurfactants. The department is concerned with long-term availability of these materials for use in Aqueous Film Forming Foam and the impact that would occur for military firefighting if they become unavailable.

The application of AFFF in firefighting is inherently dispersive and results in distribution of the chemical components of AFFF in surface and ground water. Concern about this distribution has prompted the individual services to investigate the biodegradation, possible remediation, toxicity, fate and transport of many of these components. These studies date back to 1983 or earlier and continue to the present. Based on these studies and the published literature the "Lowest Observed Adverse Effect Level" LOAEL for perfluorinated carboxylic acids is 0.1 mg/kg/day for mice.[1] The LOAEL for perfluoro-octanyl sulfonates is 0.4 mg/kg/day.[2] This is the basis my assertion that PFOA is more toxic than PFOS. The association of this result with Telomer is based on unpublished Air Force tests described below.

The allegations of surfactant related bird kill, several weeks after the large scaled firefighting use of AFFF in Jacksonville Bay, Florida, prompted a preliminary screening of potential components for non-persistent AFFF. The perfluorinated carboxylic and sulfonic acid surfactants were known to be persistent, leaving telomer surfactants as the only potentially non-persistent, commercially available, fluorosurfactant candidates. During 1998, the Air Force Research Laboratory, Fire Technology Group at Tyndall Air Force Base, Florida conducted the screening by monitoring the changes in "Soluble Chemical Oxygen Demand" COD and surface tension during biodegradation, using standard procedures for measuring "Biological Oxygen Demand" over a period of 28 days. Purely by coincidence, the telomer surfactants tested were "Zonyl" branded surfactants supplied as samples by your company. The key result of this effort was the observation that while the telomer fluorosurfactant was biodegraded as shown by decreased soluble COD, the surface tension remained essentially unchanged. Control samples of hydrocarbon surfactants showed decreased soluble COD

[1] **Developmental toxicity of perfluorodecanoic acid in C57BL/6N mice.** Harris MW, Birnbaum LS, Fundam Appl Toxicol, 1989, 442-8 (1989).
[2] **3M Submissions in EPA Docket AR-226.**

indicating biodegradation and as expected an increase in surface tension to that of water. The research staff involved in this work found the results consistent with the degradation of telomer surfactants to perfluorocarboxylic acids. In the case of Zonyl TBS, the only biodegradable segment is the 1,1,2,2 tetrahydro segment which can only result in formation of perfluorononanoic acid. They considered this information insignificant at that time with the required documentation being extensive research notes.

I'm sure that efforts in this area are being revived in light of the current regulatory activity. Dr. Dierdorf has indicated an interest in active collaboration with fluorosurfactant manufacturers to assure the development and commercial availability of non-persistent surfactants, which provide the properties essential to effective AFFF firefighting agents. Since Dr. Dierdorf is currently employed as an Air Force contractor, I suggest that you contact his Branch Chief, Mr. Dick Vickers at (850) 283-3707, email: Dick.Vickers@tyndall.af.mil obtain release and discussion of unpublished Air Force experimental data.

Sincerely,

[Click **here** and type your name]
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