

FINAL REPORT
Epidemiology, 220-3W-05
Medical Department
3M Company
St. Paul, MN 55144

Date: March 19, 2001

Title: Descriptive Summary of Serum Fluorochemical Levels among 236 Building Employees

Study

Start Date: September 20, 2000

Protocol Number EPI-0015

IRB Approval

Exempt Expedited

X

IRB Approval Date: (not applicable)

Principal Investigator: Geary W. Olsen, D.V.M., Ph.D.¹

Co-investigators Diane C. Madsen, M.A.¹
Jean M. Burris, R.N., M.P.H.¹
Jeffrey H. Mandel, M.D., M.P.H.¹

Study Director: Jeffrey H. Mandel, M.D., M.P.H.¹

1. 3M Medical Department, 220-3W-05, St. Paul, MN 55144-1000

ABSTRACT

Through communication efforts by their supervisors and Corporate Occupational Medicine, Building 236 employees engaged in fluorochemical research and Specialty Materials Markets Division (SMMD) Environmental Health Safety and Regulatory (EHSR) activities were offered the voluntary opportunity to have their blood tested for seven fluorochemicals. A total of 45 employees participated. Geometric mean serum levels for perfluorooctanesulfonate (PFOS), perfluorooctanoate (PFOA) and perfluorohexanesulfonate (PFHS) were (95% confidence interval in parenthesis): 0.116 ppm (0.008-0.152); 0.053 ppm (0.027-0.076); and 0.018 ppm (0.013-0.024). The majority of the employees tested for the remaining four fluorochemicals had values that were below the lower limit of quantitation.

INTRODUCTION

Through communication efforts by their supervisors and Corporate Occupational Medicine, Building 236 employees engaged in fluorochemical research and Specialty Materials Markets Division (SMMD) Environmental Health Safety and Regulatory (EHSR) activities were offered the voluntary opportunity to have their blood tested for seven fluorochemicals.

Methods

Blood collection was performed by a medical technician (DCM) in Building 236 on September 20, 22 and October 4, 2000. A signed consent form was required from each participating employee. A total of 45 employees participated. According to human resource records, the 45 employees were assigned to several Specialty Materials Manufacturing Division laboratories including: Internal Chemicals (Specialty Coatings Group), Analytical (Methods Group, Physical Properties Group), Commercial Process Technology Development (Technology Development, Process Development and Factory Support), Process Development Internal Chemicals and the Fluorochemical Materials Research Group. Also tested were some employees from the Chemical EHSR function.

Sera samples were extracted using an ion-pairing extraction procedure. The extracts were quantitatively analyzed for PFOS (perfluorooctanesulfonate), PFOA (perfluorooctanoate, which is also known as C8 acid or POAA), PFHS (perfluorohexanesulfonate), PFOSAA (N-ethyl perfluorooctanesulfonamidoacetate), M570 (N-methyl perfluorooctanesulfonamidoacetate), PFOSA (perfluorooctanesulfonateamide) and M556 (perfluorooctanesulfonamidoacetate) using

high-pressure liquid chromatography/electrospray tandem mass spectrometry

(HPLC/ESMSMS) and evaluated versus an extracted curve from human sera.

Endogenous levels of certain fluorochemical were determined in the standard matrix and additional fluorochemical was spiked into the matrix. The total amount of each specific fluorochemical (endogenous + spiked) was used to construct an extracted standard curve.

All serum fluorochemical analyses were determined by Northwest Bioanalytical Laboratory Inc. (Salt Lake City, UT).

All employee serum values for PFOA and PFHS were above their respective lower limit of quantitations (LLOQ). There was 1 employee who was determined to be below the LLOQ for PFOS (0.0368 ppm). There were 34 (76%) employees who were below the LLOQ for PFOSAA (0.0042 ppm); 15 (33%) employees were below the LLOQ for M570 (0.0037 ppm); 43 (96%) employees were below the LLOQ for PFOSA (0.001 ppm) and 40 (89%) employees were below the LLOQ for M556 (0.0038 ppm).

Measures of central tendency were not calculated for PFOSAA, M570, PFOSA and M556 because of the many employees who were below the LLOQ. For PFOS, the midpoint between zero and the LLOQ was assigned for the one individual who had a value recorded below the LLOQ (0.037 ppm). Stratified analysis of the data by laboratory departments was likely considered to be non-representative due to the low voluntary participation rates. Therefore, only summary findings are presented for these 45 individuals.

RESULTS

Presented in Table 1 (below) are the summary findings in parts per million (ppm) for the seven fluorochemicals measured.

Table 1

Arithmetic Mean, Range, Geometric Mean and 95% Confidence Interval of Serum Fluorochemical Levels, 236 Building Employees (N = 45)

	Arithmetic Mean (ppm)	Range (ppm)	Geometric Mean (ppm)	95% Confidence Interval (ppm)
PFOS	0.182	<0.0368-1.036	0.116	0.008-0.152
PFOA	0.106	0.008-0.668	0.053	0.037-0.076
PFHS	0.027	0.002-0.103	0.018	0.013-0.024
PFOSAA	-	<0.0042-0.010	-	-
M570	-	<0.0037-0.195	-	-
PFOSAA	-	<0.001-0.001	-	-
M556	-	<0.0038-0.052	-	-

DISCUSSION

The serum fluorochemical levels of Building 236 laboratory and EHSR employees were, on average, one order of magnitude lower (or more) than those reported for production workers at Antwerp, Cottage Grove and Decatur. Building 236 laboratory workers may have, on average, 2- to 4-fold higher serum PFOS levels than those reported in the general (non-occupational) population.

All employees who participated in this voluntary serum fluorochemical examination were sent a letter to their home address which provided their individual

results. Employees were informed that the serum levels observed among Building 236 employees have not been associated with adverse health findings based on medical surveillance exams of 3M's production employees. Employees were encouraged to discuss their results with a Corporate Occupational Medicine physician (JHM) should they have additional questions.