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CANCER PREVALENCE IN SUBJECTS EXPOSED TO PERFLUOROOCTANONIC ACID (PFOA)

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ABSTRACT

Perfluorooctanoic Acid (PFOA) is a man-made perfluorinated chemical, also referred to as C8. PFOA is a key ingredient agent in the production of Teflon® and other fluorinated products and is biopersistent and bioaccumulative. There has been documented chronic exposure to PFOA of the residents near a plant using PFOA and other fluorinated chemicals.

Our aim was to compare cancer distribution and cancer prevalence rates in a PFOA-exposed population (residents) to that of the industry cancer registry data from an occupational exposed population and finally to the general population (SEER). We performed a questionnaire on 599 residents living near a PFOA using manufacturing plant operated by Dupont. Cancer registry data from the PFOA exposed Dupont workers was made available through discovery in pending litigation against Dupont and was not previously made available to the scientific community for review. The SEER data was used for comparison to the general population.

The overall cancer prevalence rate is higher in the PFOA-exposed population when compared to the general population. Comparison of cancer prevalence rates for the industry cancer registry data, resident data and SEER is shown in Table 1.

Our findings indicate that the PFOA exposed residential population and PFOA-exposed workers have elevated cancer prevalence (Table 1). Prostate cancer in the residents was proportionately elevated among young males. Cervix and stomach cancer rates in women were also higher in the resident population compared to the U.S. general population.

The distribution of cancers in the residents and workers is different than expected. Of note are the findings of elevated prevalence rates of atypical cancers such as Non-Hodgkin's lymphoma, Leukemia, and Multiple Myeloma.

This data suggests that exposure to PFOA may alter cancer distribution in exposed populations (workers and residents) and may be an important risk factor for an excess of cancer cases.

INTRODUCTION

- PFOA is a man-made perfluorinated chemical
 - Referred to as C8
 - Key ingredient agent in the production of Teflon®
 - Biopersistent and bioaccumulative
- Documented chronic exposure to PFOA of residents near C8 plant
 - Table 1
- Evidence in animal studies that PFOA are responsible for multiple adverse health effects
- Human epidemiological studies reported statistically significant prevalence of cancer in the prostate, kidney, bladder, colon, and others
- Report results of self-reported cancers in residents near a C8 plant
 - SEER U.S. cancer rates
 - Industry cancer registry data

Discussion

- Resident cancer prevalence rate significantly higher than U.S. rate
- PFOA exposed worker cancer prevalence rate higher than U.S. rate
- Similar cancer rates and cancer distribution
 - Residents
 - Workers
- Review of cancer registry forms used in Dupont cancer study reveals additional 9 breast cancers, 7 cervix/ovarian cancers, & 25 melanomas
 - Extra cancers not added to Dupont Worker data in Table 2
 - Numbers are conservative
- Recall Bias?
 - Unlikely with cancer, all confirmed
- Selection bias
 - Cohort was not selected on basis of illness
 - Cohort was recruited from the entire community
- Litigant Bias?
 - No statistically significant difference in litigant's versus nonlitigant's (Allred 1995)

Materials and Methods

- Residents were recruited by invitation via radio, TV and newspaper advertisements to participate in the study
- Questionnaires were performed on 599 subjects
- All subjects are members of a class action lawsuit filed against a local company that uses PFOA in their production process
- Class members have C8 water levels of 0.85 µg/L or greater
- Inclusion: subjects exposed to PFOA contaminated water for at least one year
- Cancer data on PFOA exposed workers obtained through discovery in litigation against Dupont
- Cancer prevalence rates for the general U.S. population obtained from SEER website

Conclusions

- PFOA significantly alters cancer distribution and prevalence in exposed populations (workers and residents)
- PFOA appears to be a risk factor responsible for an excess of cancer in the near neighbors of a PFOA using plant
- PFOA increases cancer risk in humans

Results

TABLE 1.

Area	PFOA Levels (ppb)	Location	Households	Population*
1	1.7-4.3	Little Hocking, Ohio	4200	11760
2	0.4-3.9	Lubeck, WV	3700	10360
3	0.25-0.37	Tuppers Plains, Ohio	4800	13440
4	0.08-0.13	Beire, Ohio	6000	16600
5	0.06-0.1	Mason, WV	4200	11760
6	0.06-0.07	Pomeroy, Ohio	1000	2800
7	1.0-5.0	Dupont, Washington Works	N/A	2200
8	1.75-1.87	GE Plastics	N/A	700
9	0.05-8.6	68 Private Wells WVA & Ohio	58	190

* Estimated as 2.8 people per household
N/A Not Applicable

TABLE 2.

Type of Cancer	Dupont Worker Study Cancers/Population	Rate	Resident Data Cancers/Population	Rate	US Rate	Worker/Resident Ratio	US/Worker Ratio
Bladder	18	0.0008%	4	0.0002%	0.0008%	2.98	8.07
Bone	2	0.0001%	0	0.0000%	0.0001%	3.62	
Brain	8	0.0004%	0	0.0000%	0.0004%	7.74	
Breast	8	0.0004%	6	0.0003%	0.0008%	2.29	
Cervix/Uterus	1	0.0001%	1	0.0001%	0.0002%	1.01	
Colon Rectum	32	0.0018%	4	0.0002%	0.0012%	1.70	1.68
Esophagus	3	0.0002%	0	0.0000%	0.0004%	13.68	
Hodgkin's	4	0.0002%	1	0.0001%	0.0001%	3.62	8.34
Kidney	18	0.0009%	2	0.0001%	0.0007%	4.68	4.77
Larynx	6	0.0003%	0	0.0000%	0.0002%	5.43	
Oral Cavity	11	0.0006%	2	0.0001%	0.0004%	3.98	6.88
Leukemia	18	0.0009%	1	0.0001%	0.0009%	7.74	4.17
Liver	4	0.0002%	1	0.0001%	0.0008%	12.07	2.72
Lung	84	0.0048%	7	0.0004%	0.0020%	12.86	12.98
Melanoma	17	0.0009%	4	0.0002%	0.0012%	2.67	5.58
Myeloid	9	0.0005%	2	0.0001%	0.0009%	18.00	1.10
Non-Hodgkin's	9	0.0005%	5	0.0003%	0.0009%	2.04	10.43
Pancreas	9	0.0005%	0	0.0000%	0.0009%	16.30	
Prostate	14	0.0008%	0	0.0000%	0.0012%	0.00	1.12
Stomach	2	0.0001%	0	0.0000%	0.0004%	2.59	
Testicular	6	0.0003%	0	0.0000%	0.0009%	2.23	
Thyroid	3	0.0002%	1	0.0001%	0.0009%	1.08	3.34
TOTAL	309	0.0018%	60	0.0004%	0.0012%	2.99	4.62

* Based on Total Cancer Counts

* Based on SEER First Malignant Primary

Figure 1.

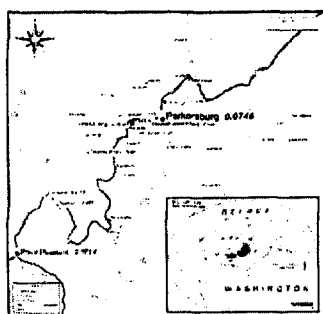


Figure 2. Overview of Washington Works Plant



Figure 3. Washington Works

