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**Effect of Perchloroethylene,
Smoking, and Race on Oxidative
DNA Damage in Female
Drycleaners**

Objective

**Determine if increased oxidative
damage, including the formation of
oxidative DNA adducts, is elevated in
female dry cleaners to PERC**

PERC oxidized by cytochrome P450 to
trichloroacetyl chloride
trichloroethanol
trichloroacetic acid (TCA)

TCA is a metabolite of PERC in both man and
experimental animals

TCA is also a rodent hepatocarcinogen

TCA induces lipid peroxidation and oxidative DNA
damage

Vitamin E protects against PERC toxicity in mice

Un-repaired oxidative DNA damage can result in
mutation and possibly cancer

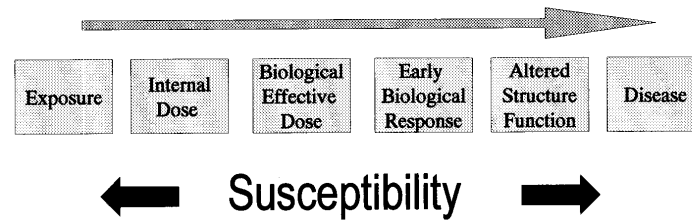
Oxidative DNA damage used to assess exposures to chemicals that induce oxidative stress

8-Hydroxydeoxyguanosine (8-OHdG) adduct used extensively as a biomarker of effect

Rats did not exhibit elevated oxidative DNA damage following a single exposure to PERC

If PERC induces oxidative stress, biomarkers of oxidative damage could serve as biomarkers of exposure for workers in the dry cleaning industry.

Exposure Disease Continuum



Demographics

	Laundries	Dry cleaners
Facilities	3	4
Workers	20	18
Race W/B	14/6	13/5
Smokers	10	10
Age	39 ₊₉	40 ₊₁₃
BMI, kg	29 ₊₄	28 ₊₅

Exposure Indices

PERC	Launderers	Dry cleaners
Day 1 TWA, ppm	<0.02	2.4±3.4
Day 2 TWA, ppm	<0.02	3.8±5.3
Blood, ug/l	0.19±0.44	74.8±104.3

Potential Confounders

	Launderers	Drycleaners
Cotinine (smokers) mg/g creatinine	1504±879	1642±1216
Beta-carotene ug/Dl blood	8.7±5.6	19.9±24.0
Vitamin E alpha mg/l blood	8.4±3.1	9.0±2.2
Vitamin E beta mg/l blood	2.4±1.5	1.9±0.9

Oxidative Damage in PERC Exposed and Control Workers

	Launderers	Drycleaners
Leukocyte 8-OHdG	16.0 ± 7.3	8.1 ± 3.6 *
Pre-shift 8-epiPGF	535 ± 258	604 ± 314
Post-shift 8-epiPGF ^f	433 ± 141	417 ± 174
Pre-shift 8-OHdG	2.8 ± 1.7	2.8 ± 1.2
Post-shift 8-OHdG	3.5 ± 1.3	3.1 ± 1.2

	PERC TWA	Blood PERC Launderers	Blood PERC Dry Cleaners	Blood PERC Dry Cleaners + Launders
Pre-shift				
Urine 8-epi-PGF ng/g creatinine	0.3587 ^a 0.157 ^b 17 ^c	-0.3199 0.211 17	0.0932 0.741 15	-0.0854 0.642 32
Urine 8-OHdG, μg/g creatinine	-0.1199 0.635 18	0.4661 0.044 19	0.3079 0.246 16	0.1782 0.306 35
Leukocyte 8-OHdG ng/mg dG	0.3296 0.196 17	-0.3032 0.237 17	0.2016 0.471 15	-0.5812 0.001 32
Post-shift				
Urine 8-epi-PGF ng/g creatinine	0.4688 0.058 17	0.0797 0.761 17	0.1843 0.511 15	-0.0954 0.604 32
Urine 8-OHdG μg/g creatinine	-0.3577 0.145 18	0.4296 0.075 18	0.0878 0.747 16	-0.0549 0.758 34

Oxidative Damage in PERC Exposed and Control Workers Stratified by Smoking Status

PERC exposure (<i>n</i>)	Urinary 8-epi-PGF ng/g creatinine	Urinary 8-OHdG μg/g creatinine	Leukocyte 8-OHdG/dG ng/mg dG
Control nonsmoker (10)	476 ± 199	3.1 ± 1.5	17.1 ± 7.4 ^a
Control smoker (10)	479 ± 141	3.1 ± 1.3	14.8 ± 7.5 ^a
Exposed nonsmoker (8)	439 ± 177	2.8 ± 1.3	7.8 ± 2.6 ^b
Exposed smoker (10)	539 ± 256	3.1 ± 1.1	8.4 ± 4.4 ^b

Oxidative Damage in PERC Exposed and Control Workers Stratified by Race

PERC exposure (<i>n</i>)	Urinary 8-epi-PGF ng/g creatinine	Urinary 8-OHdG μg/g creatinine	Leukocyte 8-OHdG ng/mg dG
Control, black (6)	411 ± 90	2.8 ± 1.1	11.8 ± 5.9 ^a
Control, white (14)	506 ± 188	3.2 ± 1.5	17.8 ± 7.4 ^b
Exposed, black (5)	457 ± 171	3.1 ± 1.4	5.9 ± 1.2 ^a
Exposed, white (13)	509 ± 246	2.9 ± 1.1	9.0 ± 3.9 ^a

**PERC exposure was not associated
with oxidative stress or increased
oxidative DNA damage**

**Results indicate a reduction in oxidative
DNA damage in PERC exposed dry
cleaners relative to launderers,

but PERC could not clearly be defined as
the source of the effect**

The Guilty

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- Avima Ruder
- Christy Forrester
- Lauralynn Taylor
- David L. Ashley
- Patty Mathias
- Kate L. Marlow
- Kenneth L. Cheever
- Edward Krieg
- Howard Wey