

TABLE V-2: SUMMARY OF SELECTED EPIDEMIOLOGIC STUDIES OF LUNG CANCER IN WORKERS EXPOSED TO HEXAVALENT CHROMIUM

Chromate Pigment Production

Reference/Exhibit Number	Study Population	Reference Population	Chromium (VI) Exposure	Lung Cancer Risk
Langard & Vigander (1983, Ex. 7-36) Langard & Vigander (1975, Ex. 7-33)	133 Norwegian chromium pigment production workers employed between 1948 and 1972; 24 workers with 3+ years exposure to chromate dust; follow up through 1980	Cancer incidence from Norwegian Cancer Registry 1955-1976	Lead and zinc chromates with some sodium dichromate as starting material; Cr(VI) levels between 10 and 30 µg/m ³ 1975-1980. No reporting <1975	-O/E of 44 for subcohort of 24 workers based on 6 cancer cases. -5 of 6 cases were exposed primarily to zinc chromate
Davies (1984, Ex. 7-42) Davies (1979, Ex. 7-41)	1152 British chromate pigment workers from 3 plants with a minimum of 1 year employment between 1930-June, 1975; follow up through 1981	Mortality of England and Wales	Factory A: chromates - primarily lead; some zinc; minor barium Factory B: mostly lead and zinc chromates; minor strontium. Factory C: lead chromate only No Cr(VI) levels reported	-O/E of 2.2 (p<0.05) for high exposed in Factory A 1932-1954; 21 deaths -O/E of 4.4 (p<0.05) for high exposed in Factory B 1948-1967; 11 deaths -O/E of 1.1 (NS) for exposed Factory C 1946-1967; 7 deaths
Hayes et al. (1989, Ex. 7-46) Sheffet et al. (1982, Ex. 7-48)	1,946 male pigment workers from New Jersey facility employed for a minimum of one month between 1940 and 1969; follow up through March, 1982	U.S. Mortality	-Primarily lead chromate with some zinc chromate -Cr(VI) levels in later years reported to be >500 µg/m ³ for exposed workers	-O/E of 1.2 (NS) for entire cohort based on 41 deaths -O/E of 1.5 (p<0.5) for workers employed >10 yr based on 23 deaths -Upward trend (p<.0.01) with duration of exposure
Equitable Environmental Health (1983, Ex. 2-D-1) Equitable Environmental Health (1976, Ex. 2-D-3)	574 male chromate workers from three plants (West Virginia, New Jersey or Kentucky) with a minimum of 6 months of exposure to lead chromate prior to 1974.	U.S. white male mortality rates	-West Virginia: lead chromates -Kentucky: chromates- mostly lead, some zinc, minor strontium and barium -New Jersey: mostly lead and some zinc chromate -Median Cr(VI) in 1975 reported to equal or exceed 52 µg/m ³	-O/E of 1.30 (NS) for West Virginia plant based on 3 deaths -O/E of 2.16 (NS) for Kentucky plant based on 2 deaths -O/E of 2.31 (p<.05) for New Jersey plant based on 9 deaths
Deschamps et al. (1995, Ex. 35-234) Haguenoer et al. (1981, Ex. 7-44)	294 male pigment workers from French facility employed for a minimum of six months between 1958 and 1987	Death rates from northern France	-Mostly lead chromate with some zinc chromate -Cr(VI) levels in 1981 between 2 and 180 µg/m ³	-O/E of 3.6 (p<0.01) based on 18 deaths -Upward trend (p<0.01) with duration of exposure

Observed/Expected (O/E)
Relative Risk (RR)
Not Statistically Significant (NS)
Odds Ratio (OR)

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Langard and Vigander updated a cohort study of lung cancer incidence in 133 workers employed by a chromium

pigment production company in Norway (Ex. 7-36). The cohort was originally studied by Langard and Norseth (Ex. 7-33). Twenty four men

had more than three years of exposure to chromate dust. From 1948, when the company was founded, until 1951, only lead chromate pigment was produced.