

Executive Summary

Assessment of Potential Human Health Risks Associated with Exposure to Copper Tebuconazole-Treated Wood

July 10, 2003

Gradient Corporation (Gradient) prepared a human health risk assessment (HHRA) for Bayer Corporation to quantify potential human health risks associated with exposures to copper azole Type B (CA-B) treated wood. Exposures to azole (*i.e.*, tebuconazole) and copper on the surface of CA-B-treated wood and in soil near CA-B-treated structures were evaluated.

The HHRA was conducted in accordance with current U.S. Environmental Protection Agency (USEPA) risk assessment guidance USEPA (1989; 1992; 2001). Four different scenarios, including occupational (*e.g.*, adult builders), resident handler (adult female), subchronic (child) and chronic (child to adult) residential, and playground (child and teenager) were evaluated. Where applicable, central tendency exposure (CTE) and reasonable maximum exposure (RME) assumptions and parameters were used in each of the exposure scenarios.

Exposures evaluated in the risk assessment include incidental ingestion and dermal contact with dislodgeable residue from the surface of CA-B-treated wood and soil impacted with azole and copper, inhalation of sawdust from CA-B-treated wood, and inhalation of resuspended soil particulate. Dislodgeable residue refers to azole and copper on the surface of CA-B-treated wood that can be removed from the wood surface by dermal contact with the hands. We assumed that most of the copper and all of the azole in soil is the result of azole and copper that has migrated (*via* rainwater run-off) from a treated wood structure to underlying and adjacent soils.

A number of conservative assumptions were used to evaluate exposures in the HHRA, including the assumption that all of the time outdoors at either a residence or a playground is spent exposed to both dislodgeable residue and impacted soil simultaneously, that all of the PM₁₀ sawdust and resuspended soil particulate are respirable and absorbed in the lung, and that both azole and copper are 100% bioavailable¹ *via* the ingestion route. Furthermore, the results of a sensitivity analysis conducted by Gradient for the exposure route with the lowest MOE (*i.e.*, incidental ingestion of copper in soil for the child resident ages

¹ Because the oral toxicity criterion for copper is not dependent on absorption of copper in the stomach, the potential health effect is dependent on the bioaccessibility of copper. However, for convenience, bioavailability is used in the HHRA.

1-6 years) indicates that RME estimates used to assess exposure for this receptor are not significantly different than alternative high-end values, and therefore, it is unlikely that the MOE for this receptor is overestimated.

Non-cancer health risks are expressed as margin of exposure (MOE), which is a ratio of the no observed effect level (NOEL) or the lowest observed effect level (LOEL) for a constituent, to an estimated exposure level for the constituent. The greater the MOE, the less likely that exposure to the constituent will pose a potential health risk. Based on our evaluation, the lowest MOE of 170, is for incidental ingestion of copper in soil for the child resident (ages 1-6 years). Based on USEPA guidance, an MOE of 10 is the benchmark for this exposure route. Thus no adverse health effects are expected. Most of the MOEs calculated in the HHRA are greater than 1,000, and therefore, none of the exposures to azole or copper evaluated pose a potential health risk. Cancer risks were not assessed because according to the USEPA neither azole nor copper is a known or probable human carcinogen. Table ES-1 contains a summary of the estimated MOEs.

**Table ES-1
Summary of Estimated Margin of Exposure**

Receptor	Exposure Scenario	Exposure Medium	Exposure Route	Margin of Exposure			
				Azole		Copper	
				CTE	RME	CTE	RME
Adult (ages 18-65 years)	Occupational	Treated Wood and Sawdust	Incidental Ingestion	3.3E+06	2.9E+06	8.5E+03	7.4E+03
			Dermal Contact	4.8E+05	4.2E+05	--	--
			Inhalation (sawdust)	1.6E+05	1.4E+05	7.1E+02	6.3E+02
	Resident Handler		Incidental Ingestion	4.8E+07	2.4E+07	1.4E+05	6.8E+04
			Dermal Contact	5.8E+06	2.9E+06	--	--
			Inhalation (sawdust)	2.3E+06	1.2E+06	1.0E+04	5.2E+03
	Resident Handler (Acute Exposure)		Incidental Ingestion	9.2E+06	--	7.9E+03	--
			Dermal Contact	1.1E+06	--	--	--
			Inhalation (sawdust)	1.3E+05	--	6.0E+02	--
Child (ages 1-6 years)	Resident	Treated Wood and Soil	Incidental Ingestion - Dislodgeable	3.8E+06	8.4E+05	4.3E+04	9.4E+03
			Dermal Contact - Dislodgeable	2.3E+05	6.8E+04	--	--
			Incidental Ingestion - Soil	2.4E+06	2.0E+05	2.0E+03	1.7E+02
			Dermal Contact - Soil	1.9E+04	1.1E+04	--	--
			Inhalation (soil)	2.0E+07	1.3E+07	2.2E+05	1.5E+05
			Incidental Ingestion - Dislodgeable	1.2E+07	2.5E+06	4.5E+04	9.2E+03
Child and Adult (ages 1-30 years)	Resident	Treated Wood and Soil	Dermal Contact - Dislodgeable	3.7E+05	1.0E+05	--	--
			Incidental Ingestion - Soil	2.8E+07	1.1E+06	7.1E+03	3.0E+02

			Dermal Contact - Soil	3.0E+04	1.7E+04	--	--
			Inhalation (soil)	2.0E+07	1.3E+07	2.2E+05	1.5E+05

Table ES-1 (continued)
Summary of Estimated Margin of Exposure

Receptor	Exposure Scenario	Exposure Medium	Exposure Route	Margin of Exposure			
				Azole		Copper	
				CTE	RME	CTE	RME
Child (ages 1-6 years)	Public Playground	Treated Wood and Soil	Incidental Ingestion - Dislodgeable	8.1E+06	2.0E+06	9.1E+04	2.3E+04
			Dermal Contact - Dislodgeable	3.5E+05	9.2E+04	--	--
			Incidental Ingestion - Soil	5.0E+06	4.7E+05	4.3E+03	4.1E+02
			Dermal Contact - Soil	2.9E+04	1.5E+04	--	--
			Inhalation (soil)	1.3E+09	2.9E+08	1.5E+07	3.3E+06
Older Child (ages 7-12 years)	Public Playground		Incidental Ingestion - Dislodgeable	2.8E+07	5.9E+06	1.5E+05	3.2E+04
			Dermal Contact - Dislodgeable	4.9E+05	3.0E+05	--	--
			Incidental Ingestion - Soil	4.9E+07	2.1E+06	2.0E+04	8.5E+02
			Dermal Contact - Soil	4.6E+04	2.8E+04	--	--
			Inhalation (soil)	1.4E+09	3.0E+08	1.6E+07	3.4E+06
Teenager (ages 13-17 years)	Public Playground		Incidental Ingestion - Dislodgeable	5.0E+07	8.6E+06	1.6E+05	2.8E+04
			Dermal Contact - Dislodgeable	8.6E+05	4.3E+05	--	--
			Incidental Ingestion - Soil	1.2E+08	4.3E+06	3.1E+04	1.1E+03
			Dermal Contact - Soil	7.5E+04	3.7E+04	--	--
			Inhalation (soil)	2.4E+09	3.8E+08	2.7E+07	4.3E+06

Notes:

-- = not applicable

MOEs based on comparison of administered dose to a dermal no observed effect level (NOEL) are not presented in this table.

References

U.S. Environmental Protection Agency (USEPA). 1989. "Risk Assessment Guidance for Superfund (RAGS), Vol. I, Human Health Evaluation Manual (Part A)." Office of Emergency and Remedial Response, Washington, D.C. OSWER Directive 9285.7-01A. EPA-540/1-89-002. December.

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U.S. Environmental Protection Agency (USEPA). 2001. "Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim." Office of Emergency and Remedial Response, Washington, DC. September.