

Appendix C. RISK QUOTIENT METHOD AND LEVELS OF CONCERN

The Risk Quotient Method is the means used by the Office of Pesticide Programs (OPP), Environmental Fate and Effects Division (EFED) integrates the results of exposure and ecotoxicity data. For this method, Risk Quotients (RQs) are calculated by dividing exposure estimates by the acute and chronic ecotoxicity values (i.e., $RQ = EXPOSURE/TOXICITY$). These RQs are then compared to OPP's levels of concern (LOCs). These LOCs are criteria used by OPP to indicate potential risk to non-target organisms and the need to consider regulatory action. EFED has defined LOCs for acute risk, potential restricted use classification, and for endangered species.

The criteria indicate that a pesticide used as directed has the potential to cause adverse effects on non-target organisms. LOCs currently address the following risk presumption categories:

- (1) **Acute** - there is a potential for acute risk; regulatory action may be warranted in addition to restricted use classification;
- (2) **Acute restricted use** - the potential for acute risk is high, but this may be mitigated through restricted use classification;
- (3) **Acute endangered species** - the potential for acute risk to endangered species is high, regulatory action may be warranted; and
- (4) **Chronic risk** - the potential for chronic risk is high, regulatory action may be warranted.

Currently, EFED does not perform assessments for chronic risks to plants or chronic risks to non-target insects.

The ecotoxicity test values (*i.e.*, measurement endpoints) used in the acute and chronic RQs are derived from required studies. Examples of ecotoxicity values derived from short-term laboratory studies that assess acute effects are: (1) LC_{50} (fish, birds, and terrestrial invertebrates), (2) LD_{50} (birds, mammals, and terrestrial invertebrates), (3) EC_{50} (aquatic plants and aquatic invertebrates), and (4) EC_{25} (terrestrial plants). Examples of toxicity test effect levels derived from the results of long-term laboratory studies that assess chronic effects are: (1) the Lowest Observed Adverse Effect Concentration (LOAEC) (birds, fish, and aquatic invertebrates), and (2) the No Observed Adverse Effect Concentration (NOAEC) (birds, fish and aquatic invertebrates). The NOAEC is generally used as the ecotoxicity test value in assessing chronic effects.

Risk presumptions, along with the corresponding RQs and LOCs, are summarized below.

Risk Presumptions and LOCs

Risk Presumption	RQ	LOC
Birds		
Acute Risk	Dietary based: EEC ^a (ppm or ppb ^b) / LC ₅₀ (ppm or ppb) Dose based: EEC (mg/kg-bw/d) / LD ₅₀ (mg/kg-bw/d) ^c	0.5
Acute Restricted Use	Dietary based: EEC (ppm or ppb) / LC ₅₀ (ppm or ppb) Dose based: EEC (mg/kg-bw/d) / LD ₅₀ (mg/kg-bw/d)	0.2
Acute Endangered Species	Dietary based: EEC (ppm or ppb) / LC ₅₀ (ppm or ppb) Dose based: EEC (mg/kg-bw/d) / LD ₅₀ (mg/kg-bw/d)	0.1
Chronic Risk	Dietary based: EEC (ppm or ppb) / NOAEC (ppm or ppb) Dose based: EEC (mg/kg-bw/d) / NOAEL (mg/kg-bw/d)	1.0
Wild Mammals		
Acute Risk	Dietary based: EEC (ppm or ppb) / LC ₅₀ (ppm or ppb) Dose based: EEC (mg/kg-bw/d) / LD ₅₀ (mg/kg-bw/d)	0.5
Acute Restricted Use	Dietary based: EEC (ppm or ppb) / LC ₅₀ (ppm or ppb) Dose based: EEC (mg/kg-bw/d) / LD ₅₀ (mg/kg-bw/d)	0.2
Acute Endangered Species	Dietary based: EEC (ppm or ppb) / LC ₅₀ (ppm or ppb) Dose based: EEC (mg/kg-bw/d) / LD ₅₀ (mg/kg-bw/d)	0.1
Chronic Risk	Dietary based: EEC (ppm or ppb) / NOAEC (ppm or ppb) Dose based: EEC (mg/kg-bw/d) / NOAEL (mg/kg-bw/d)	1.0
Aquatic Animals		
Acute Risk	EEC (ppm or ppb) / (LC ₅₀ (ppm or ppb) or EC ₅₀ (ppm or ppb))	0.5
Acute Restricted Use	EEC (ppm or ppb) / (LC ₅₀ (ppm or ppb) or EC ₅₀ (ppm or ppb))	0.1
Acute Endangered Species	EEC (ppm or ppb) / (LC ₅₀ (ppm or ppb) or EC ₅₀ (ppm or ppb))	0.05
Chronic Risk	EEC (ppm or ppb) / NOAEC (ppm or ppb)	1.0
Terrestrial and Semi-Aquatic Plants		
Acute Risk	EEC (lbs ai/A) / EC ₂₅ (lbs ai/A)	1.0
Acute Endangered Species	EEC (lbs ai/A) / (EC ₀₅ or NOAEC (lbs ai/A))	1.0
Aquatic Plants		
Acute Risk	EEC (ppm or ppb) / EC ₅₀ (ppm or ppb)	1.0
Acute Endangered Species	EEC (ppm or ppb) / (EC ₀₅ or NOAEC (ppm or ppb))	1.0
Terrestrial Invertebrates		
Acute Risk	EEC (ppm or ppb)/LD ₅₀ (ppm or ppb) or LC ₅₀ (ppm or ppb)	0.05

^a EEC = estimated environmental concentration

^b ppm or ppb = parts per million or parts per billion

^c mg/kg-bw/d = milligrams per kilogram of body weight per day