

G077
Phenylenediamines

Results of Testing

Chemical Name	CAS No.	Study Code/Type	Protocol/Guideline	Species	Exposure	Dose/Concentration	No. per Group	Results	Reference
<i>p</i> -Phenylene-diamine	106-50-3	EEATOX Acute fish toxicity (Voluntary test)	Non-TSCA Protocol/ Guideline	fathead minnow (<i>Pimephales promelas</i>)	static, 96 hr	0, 0.003, 0.007, 0.015, 0.03, 0.12, 0.25, 0.5, 1.0 mg/L (nominal)	20/group (10/replicate)	The test substance exhibited extreme acute toxicity to fathead minnows under static un aerated test conditions. At 0.12 mg/L and greater some fish exhibited clinical signs of toxicity including rapid respiration, swimming at the surface and darkening in color. The LC ₅₀ was determined to be 0.057 mg/L.	51 FR 6468; 2/24/86 OTS0528712
<i>p</i> -Phenylene-diamine	106-50-3	EEATOX Acute aquatic toxicity (Voluntary test)	Non-TSCA Protocol/ Guideline	<i>Daphnia magna</i>	static, 48 hr	0, 0.08, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0, 1.5, 2.0 mg/L (nominal)	20/group (10/replicate)	The test substance exhibited extreme acute toxicity to <i>Daphnia magna</i> under static un aerated test conditions. The LC ₅₀ was determined to be 0.28 mg/L.	51 FR 6468; 2/24/86 OTS0528712
<i>p</i> -Phenylene-diamine	106-50-3	EEATOX Acute fish toxicity	40 CFR 797.1400	rainbow trout	flow-through, 96 hr	ranged from 0.061 to 16 mg/L (mean measured)	20 (10/replicate)	The 96-hour LC ₅₀ was 3.9 (95% confidence limits = 3.1-5.0) mg/L.	55 FR 50055; 12/4/90 OTS0528740
<i>p</i> -Phenylene-diamine	106-50-3	EEATOX Acute invertebrate toxicity	40 CFR 795.120	<i>Gammarus fasciatus</i> (amphipod)	flow-through, 96 hr	ranged from 1.9 to 9.7 mg/L (mean measured)	20 (10/replicate)	The 96-hour LC ₅₀ was 8.1 (95% confidence limits = 7.1-9.4) mg/L.	56 FR 5688; 2/12/91 OTS0533309
<i>p</i> -Phenylene-diamine	106-50-3	EEATOX Algae acute toxicity (Voluntary test)	Non-TSCA Protocol/ Guideline	<i>Selenastrum capicornutum</i> (alga)	96 hr	Not specified	Not applicable	The LC ₅₀ was determined to be 0.28 mg/L.	51 FR 6468; 2/24/86 OTS0528712
<i>p</i> -Phenylene-diamine	106-50-3	EECTOX Daphnid life-cycle	40 CFR 797.1330	<i>Daphnia magna</i>	flow-through, 21 days	0.00204, 0.00834, 0.0252, 0.0709, 0.211, 0.419, 1.28 mg/L	10/replicate	The 21 day EC ₅₀ value was 0.0411 mg/L. The NOEC for immobility was 0.00834 mg/L. The NOEC for total neonates per surviving adult was 0.0709 mg/L. The NOEC for length in millimeters was 0.00204 mg/L.	58 FR 7784; 2/9/93, Docket# OPPTS- 44595
<i>p</i> -Phenylene-diamine	106-50-3	EFADEG Oxidation in water (Voluntary test)	Non-TSCA Protocol/ Guideline	Not applicable	well water, 25 °C, 21 days	2.5 and 25 mg/L	Not applicable	The oxidative half-life was determined to be 4.1 hours at 2.5 mg/L (k = 0.17 hr ⁻¹) and 8.9 hours at 25 mg/L (k = 0.08 hr ⁻¹). There was no statistically-significant difference in the degradation at 2.5 compared to 25 mg/L. In general, the test substance appears not to be refractory.	51 FR 6468; 2/24/86 OTS0528712
<i>p</i> -Phenylene-diamine	106-50-3	EFADEG Oxidation in water (Voluntary test)	Non-TSCA Protocol/ Guideline	Not applicable	river water, 25 °C	10 mg/L (nominal)	Not applicable	The oxidative half-lives in Delaware River water was determined to be approximately 4.0 hr (aerated) and 4.7 hr (non-aerated).	51 FR 6468; 2/24/86 OTS0528712

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<i>p</i> -Phenylene-diamine	106-50-3	EFADEGPHOT Indirect photolysis screening	40 CFR 795.70	Not applicable	distilled water, synthetic humic water, pH 7	1 - 10 ppm	Not applicable	The aqueous photolysis of the test substance was not enhanced by the presence of natural humic acid. The loss of the test substance was 1.6 times faster in the presence of humic acid than in distilled water.	55 FR 50055; 12/4/90, 55 FR 53348; 12/28/90 OTS0528741
<i>p</i> -Phenylene-diamine	106-50-3	HENEUR Functional observational battery, acute	40 CFR 798.6050 (modified)	rats	oral (gavage)	0, 20, 40, 80 mg/kg/day	12/sex/dose	At all the levels tested females displayed significant dose related effects on body weight gain. Males demonstrated similar effects but only at the two higher doses. In terms of FOB assessments females demonstrated statistically significant dose related signs of general malaise (postural changes, palpebral closure, and decreased arousal). Males demonstrated similar responses but they were not statistically significant from controls. There is no evidence that the test substance exerted a primary effect on the nervous system.	55 FR 50055; 12/4/90 OTS0528739
<i>p</i> -Phenylene-diamine	106-50-3	HENEUR Functional observational battery, subchronic	40 CFR 798.6050 (modified)	rats	gavage, 90 days	0, 4, 8, 16 mg/kg	10/sex/dose	No substance-related deaths were observed. Wet chin, inguen, and perineum were observed in animals at 16 mg/kg. No treatment-related effects were found in Functional observational battery. The NOEL was 8 mg/kg.	57 FR 33348; 7/28/92, Docket OPPTS-44589
<i>p</i> -Phenylene-diamine	106-50-3	HENEUR Motor activity, acute	40 CFR 798.6200 (modified)	rats	oral (gavage)	0, 20, 40, 80 mg/kg/day	12/sex/dose	At all the levels tested females displayed significant dose related effects on body weight gain. Males demonstrated similar effects but only at the two higher doses. Dose-related motor activity decreases greater than those shown by controls were demonstrated, however, in the absence of other signs of neurological impairment, the motor activity response is interpreted as being indicative of general malaise at the levels tested. There is no evidence that the test substance exerted a primary effect on the nervous system.	55 FR 50055; 12/4/90 OTS0528739
<i>p</i> -Phenylene-diamine	106-50-3	HENEUR Motor activity, subchronic	40 CFR 798.6200 (modified)	rats	gavage, 90 days	0, 4, 8, 16 mg/kg	10/sex/dose	No substance-related deaths were observed. Wet chin, inguen, and perineum were observed in animals at 16 mg/kg. No treatment-related effects on motor activity were observed. The NOEL was 8 mg/kg.	57 FR 33348; 7/28/92, Docket OPPTS-44589
<i>p</i> -Phenylene-diamine	106-50-3	HENEUR Neuropathology, subchronic	40 CFR 798.6400	rats	gavage, 90 days	0, 4, 8, 16 mg/kg	10/sex/dose	No substance-related deaths were observed. Wet chin, inguen, and perineum were observed in animals at 16 mg/kg. Neuropathology showed no treatment-related abnormalities and no ocular tissue effect. The NOEL was 8 mg/kg. No observed effect was considered neurotoxic.	57 FR 33348; 7/28/92, Docket OPPTS-44589

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<i>m</i> -Phenylenediamine	108-45-2	EEATOX Acute fish toxicity (Voluntary test)	Non-TSCA Protocol/ Guideline	fathead minnow (<i>Pimephales promelas</i>)	static, 96 hr	0, 750, 1000, 1300, 1800, 2400, 3200, 4200, 5600, 7500, 10,000 mg/L (nominal)	20/group (10/replicate)	The test substance exhibited extreme low acute toxicity to fathead minnows under static unaerated test conditions. At 1800 mg/L and greater some fish exhibited clinical signs including darkening in color, erratic swimming, lying on the bottom and swimming at the surface. The LC ₅₀ was determined to be 1618 mg/L.	51 FR 6468; 2/24/86 OTS0528712
<i>m</i> -Phenylenediamine	108-45-2	EEATOX Acute aquatic toxicity (Voluntary test)	Non-TSCA Protocol/ Guideline	<i>Daphnia magna</i>	static, 48 hr	0, 1.0, 1.3, 1.8, 2.4, 3.2, 4.2, 5.6, 7.5, 10.0 mg/L (nominal)	20/group (10/replicate)	The test substance exhibited moderate acute toxicity to <i>Daphnia magna</i> under static unaerated test conditions. The LC ₅₀ was determined to be 5.9 mg/L.	51 FR 6468; 2/24/86 OTS0528712
<i>m</i> -Phenylenediamine	108-45-2	EEATOX Acute fish toxicity	40 CFR 797.1400	rainbow trout	flow-through, 96 hr	ranged from 107 to 1108 mg/L (mean measured)	20 (10/replicate)	The 96-hour LC ₅₀ was 512 (95% confidence limits = 466-561) mg/L.	55 FR 50055; 12/4/90, 56 FR 5688; 2/12/91 OTS0533309
<i>m</i> -Phenylenediamine	108-45-2	EEATOX Acute invertebrate toxicity	40 CFR 795.120	<i>Gammarus fasciatus</i> (amphipod)	flow-through, 96 hr	ranged from 3.8 to 23.4 mg/L (mean measured)	20 (10/replicate)	The 96-hour LC ₅₀ was 4.6 (95% confidence limits = 4.3-5.1) mg/L.	56 FR 5688; 2/12/91 OTS0533309
<i>m</i> -Phenylenediamine	108-45-2	EEATOX Algae acute toxicity (Voluntary test)	Non-TSCA Protocol/ Guideline	<i>Selenastrum capicornutum</i> (alga)	96 hr	Not specified	Not applicable	The LC ₅₀ was determined to be 2.4 mg/L.	51 FR 6468; 2/24/86 OTS0528712
<i>m</i> -Phenylenediamine	108-45-2	EECTOX Chronic aquatic toxicity (Voluntary test)	Non-TSCA Protocol/ Guideline	<i>Daphnia magna</i>	continuous-flow, 21 days	0.1, 0.2, 0.4, 0.75, 1.5, 3.0 mg/L	20/group (10/replicate)	Reproduction (number of young/day and total young produced) was the most sensitive indicator of the toxicity of the test substance to <i>Daphnia magna</i> , where the NOEL was determined to be 0.2 mg/L. A NOEL for growth of 1.5 mg/L was determined. Survival was the least sensitive indicator. The Maximum Allowable Toxicant Concentration (MATC) is between 0.2 and 0.4 mg/L.	51 FR 6468; 2/24/86 OTS0528712
<i>m</i> -Phenylenediamine	108-45-2	EFADEG Oxidation in water (Voluntary test)	Non-TSCA Protocol/ Guideline	Not applicable	well water, 25 °C, 21 days	2.5 and 25 mg/L	Not applicable	The oxidative half-life was determined to be 13.4 days at 2.5 mg/L (k = 0.05 d ⁻¹) and 33.6 days at 25 mg/L (k = 0.02 d ⁻¹). Results indicate that higher concentrations of the test substance may be slightly resistant to degradation under these test conditions. In general, the test substance appears not to be refractory.	51 FR 6468; 2/24/86 OTS0528712

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<i>m</i> -Phenylenediamine	108-45-2	EFADEGPHOT Indirect photolysis screening	40 CFR 795.70	Not applicable	distilled water, synthetic humic water, pH 7	1 - 10 ppm	Not applicable	The aqueous photolysis of the test substance was significantly enhanced by the presence of natural humic acid. The rate constants for the indirect photolysis were found to be 0.86 d ⁻¹ . The loss of the test substance was considerably faster in the distilled water. The test substance is very photolabile. Maximum rate constants of 0.34, 0.50, 0.18, 0.069 d ⁻¹ and photolysis half-lives of 2.0, 1.4, 3.8, and 10 days for spring, summer, fall, and winter, respectively.	55 FR 50055; 12/4/90, 55 FR 53348; 12/28/90 OTS0528741
<i>m</i> -Phenylenediamine	108-45-2	HEGTOXCHRM Mammalian bone marrow micronucleus assay	40 CFR 798.5395	mice	oral (gavage), 2 x, 24 hr apart	0, 16, 33, 65 mg/kg/dose	3/sex	<i>m</i> -Phenylenediamine did not induce micronuclei, but a significant depression in the ratio of young, polychromatic erythrocytes to mature, normochromatic erythrocytes was noted in high-dose males at the 48-hour sampling interval.	56 FR 5688; 2/12/91 OTS0533308
<i>m</i> -Phenylenediamine	108-45-2	HEGTOXMUTA Sex-linked recessive lethal assay	40 CFR 798.5275	<i>Drosophila melanogaster</i>	injection	0.3 µL at 10,000 ppm	Not specified	The test substance is equivocal with respect to its ability to induce mutations in the post-meiotic germ cells of fruit flies when administered by injection to adult males. The sex-linked recessive lethal results was determined to be 29/22189 (0.131%).	56 FR 22715; 5/16/91 OTS0533310
<i>m</i> -Phenylenediamine	108-45-2	HENEUR Functional observational battery, acute	40 CFR 798.6050 (modified)	rats	oral (gavage)	0, 75, 150, 300 mg/kg/day	12/sex/group	The test substance demonstrated toxicity at all dose levels. Females appeared to be generally more sensitive to the systemic toxicity effects observed than males. Those effects included reduced body weight gain, reduced feed consumption and certain FOB parameters. On the day of dosing, FOB assessments detected palpebral closure in the majority of both sexes. Grip strength (forelimb and hind limb) and foot splay measures were not affected. The general malaise encountered was accompanied in some cases by postural changes, decreased arousal, gait alterations and breathing. There is no evidence that the test substance exerted a primary effect on the nervous system.	55 FR 50055; 12/4/90 OTS0528739
<i>m</i> -Phenylenediamine	108-45-2	HENEUR Functional observational battery, subchronic	40 CFR 798.6050 (modified)	rats	gavage, 90 days	5, 10, 20 mg/kg	10/sex	No mortality was observed. Lethargy and salivation were observed at 10 and 20 mg/kg. Reduction in weight gain and feed efficiency were observed at 20 mg/kg. Decreased hindlimb grip strength in females was observed at 20mg/kg. The NOEL was 5mg/kg.	57 FR 33348; 7/28/92, Docket OPPTS-44589

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<i>m</i> -Phenylenediamine	108-45-2	HENEUR Motor activity, acute	40 CFR 798.6200 (modified)	rats	oral (gavage)	0, 75, 150, 300 mg/kg/day	12/sex/group	The test substance demonstrated toxicity at all dose levels. Females appeared to be generally more sensitive to the systemic toxicity effects observed than males. Those effects included reduced body weight gain, reduced feed consumption and certain MAT parameters. Grip strength (forelimb and hind limb) and foot splay measures were not affected. The general malaise encountered was accompanied in some cases by postural changes, decreased arousal, gait alterations and breathing. While the extent and duration of these and the motor activity changes were found to be generally dose related, motor activity response was interpreted to be attributable primarily to general malaise resulting from systemic toxicity. There is no evidence that the test substance exerted a primary effect on the nervous system.	55 FR 50055; 12/4/90 OTS0528739
<i>m</i> -Phenylenediamine	108-45-2	HENEUR Motor activity, subchronic	40 CFR 798.6200 (modified)	rats	gavage, 90 days	5, 10, 20 mg/kg	10/sex	No mortality was observed. Lethargy and salivation were observed at 10 and 20 mg/kg. Reduction in weight gain and feed efficiency were observed at 20 mg/kg. Reduction in vertical and horizontal motor activity counts were found at 10 and 20 mg/kg. The NOEL was 5 mg/kg.	57 FR 33348; 7/28/92, Docket OPPTS-44589
<i>m</i> -Phenylenediamine	108-45-2	HENEUR Neuropathology, subchronic	40 CFR 798.6400	rats	gavage, 90 days	5, 10, 20 mg/kg	10/sex	No mortality was observed. Lethargy and salivation were observed at 10 and 20 mg/kg. Reduction in weight gain and feed efficiency were found at 20 mg/kg. Neuropathology revealed no treatment-related abnormalities and no ocular tissue effect. The NOEL was 5 mg/kg. No observed effect was considered neurotoxic	57 FR 33348; 7/28/92, Docket OPPTS-44589
<i>o</i> -Phenylenediamine	95-54-5	EEATOX Acute aquatic toxicity (Voluntary test)	Non-TSCA Protocol/ Guideline	<i>Daphnia magna</i>	static, 48 hr	0, 0.3, 0.4, 0.6, 0.8, 1.0, 1.5, 2, 3, 4 mg/L (nominal)	20/group (10/replicate)	The test substance exhibited high acute toxicity to <i>Daphnia magna</i> under static un aerated test conditions. The LC ₅₀ was determined to be 0.88 mg/L.	51 FR 6468; 2/24/86 OTS0528712
<i>o</i> -Phenylenediamine	95-54-5	EEATOX Acute fish toxicity (Voluntary test)	Non-TSCA Protocol/ Guideline	fathead minnow (<i>Pimephales promelas</i>)	static, 96 hr	0, 10, 15, 20, 25, 35, 45, 60, 75, 100 mg/L (nominal)	20/group (10/replicate)	The test substance exhibited moderate acute toxicity to fathead minnows under static un aerated test conditions. At 45 mg/L and greater some fish exhibited clinical signs including erratic swimming, swimming at the surface, lying on the bottom, lethargy, partial loss of equilibrium and gasping for air. The LC ₅₀ was determined to be 0.44 mg/L.	51 FR 6468; 2/24/86 OTS0528712

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<i>o</i> -Phenylene-diamine	95-54-5	EEATOX Acute fish toxicity	40 CFR 797.1400	rainbow trout	flow-through, 96 hr	ranged from 6.8 to 210 mg/L (mean measured)	20 (10/replicate)	The 96-hour LC ₅₀ was 42.9 (95% confidence limits = 35.4-52.5) mg/L.	55 FR 50055; 12/4/90 OTS0528740
<i>o</i> -Phenylene-diamine	95-54-5	EEATOX Acute invertebrate toxicity	40 CFR 795.120	<i>Gammarus fasciatus</i> (amphipod)	flow-through, 96 hr	ranged from 4.1 to 23.2 mg/L (mean measured)	20 (10/replicate)	The 96-hour LC ₅₀ was 9.1 (95% confidence limits = 8.0 - 10.5) mg/L.	56 FR 5688; 2/12/91 OTS0533309
<i>o</i> -Phenylene-diamine	95-54-5	EEATOX Algae acute toxicity (Voluntary test)	Non-TSCA Protocol/ Guideline	<i>Selenastrum capicornutum</i> (alga)	96 hr	Not specified	Not applicable	The LC ₅₀ was determined to be 0.16 mg/L.	51 FR 6468; 2/24/86 OTS0528712
<i>o</i> -Phenylene-diamine	95-54-5	EECTOX Daphnid life-cycle	40 CFR 797.1330	<i>Daphnia magna</i>	flow-through, 21 days	0.018, 0.084, 0.38 mg/L	10/replicate	The 21-day EC ₅₀ was 0.28 mg/L. The MATC was 0.18 mg/L. The NOEC was 0.084 mg/L.	58 FR 9174; 2/19/93, Docket OPPTS-44596
<i>o</i> -Phenylene-diamine	95-54-5	EFADEG Oxidation in water (Voluntary test)	Non-TSCA Protocol/ Guideline	Not applicable	well water, 25 °C 21 days	2.5 and 25 mg/L	Not applicable	The oxidative half-life was determined to be 2.7 days at 2.5 mg/L (k = 0.26 d ⁻¹) and 4.5 days at 25 mg/L (k = 0.16 d ⁻¹). There was no statistically significant difference in the degradation at 2.5 compared to 25 mg/L. In general, the test substance appears not to be refractory.	51 FR 6468; 2/24/86 OTS0528712
<i>o</i> -Phenylene-diamine	95-54-5	EFADEGPHOT Indirect photolysis screening	40 CFR 795.70	Not applicable	distilled water, synthetic humic water, pH 7	1 - 10 ppm	Not applicable	The aqueous photolysis of the test substance was approximately 6.0 d ⁻¹ in both distilled water and humic acid. No significant difference between reactions in distilled water and synthetic humic water. The test substance was determined to be very photolabile.	55 FR 50055; 12/4/90, 55 FR 53348; 12/28/90 OTS0528741
<i>o</i> -Phenylene-diamine	95-54-5	HENEUR Functional observational battery, acute	40 CFR 798.6050 (modified)	rats	oral (gavage)	0, 225, 450, 900 mg/kg/day	12/sex/group	At all the levels tested the test substance produced systemic toxicity which caused dose-related malaise. Significant body weight losses were observed as well as sharply decreased feed consumption. The general malaise, demonstrated by a majority of the animals with postural changes, partial or entirely closed eyes and decreased arousal. Neither forelimb or hind limb grip strength, or foot splay were affected by treatment. There is no evidence that the test substance exerted a primary effect on the nervous system.	55 FR 50055; 12/4/90 OTS0528739

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<i>o</i> -Phenylene-diamine	95-54-5	HENEUR Functional observational battery, subchronic	40 CFR 798.6050 (modified)	rats	gavage, 90 days	20, 40, 80 mg/kg	10/sex	No substance-related deaths were observed. Decreased body weight gain, reduced feed efficiency, slight palpebral closure, enhanced tail pinch responses, soiled fur, and yellow staining of perineum, inguen, abdomen, and underbody were observed at 80 mg/kg. No treatment-related effects were seen in the Functional observational battery. The NOEL was 40 mg/kg.	57 FR 33348; 7/28/92, Docket OPPTS-44589
<i>o</i> -Phenylene-diamine	95-54-5	HENEUR Motor activity, acute	40 CFR 798.6200 (modified)	rats	oral (gavage)	0, 225, 450, 900 mg/kg/day	12/sex/group	At all the levels tested the test substance produced systemic toxicity which caused dose-related malaise. Significant body weight losses were observed as well as sharply decreased feed consumption. The general malaise, demonstrated by a majority of the animals with postural changes, partial or entirely closed eyes and decreased arousal. Neither forelimb or hind limb grip strength, or foot splay were affected by treatment. Motor activity was dramatically influenced as a function of dose. There is no evidence that the test substance exerted a primary effect on the nervous system.	55 FR 50055; 12/4/90 OTS0528739
<i>o</i> -Phenylene-diamine	95-54-5	HENEUR Motor activity, subchronic	40 CFR 798.6200 (modified)	rats	gavage, 90 days	20, 40, 80 mg/kg	10/sex	No substance-related deaths were observed. Decreased body weight gain, reduced feed efficiency, slight palpebral closure, enhanced tail pinch responses, soiled fur, and yellow staining of perineum, inguen, abdomen, and underbody were found at 80 mg/kg. The NOEL was 40 mg/kg.	57 FR 33348; 7/28/92, Docket OPPTS-44589
<i>o</i> -Phenylene-diamine	95-54-5	HENEUR Neuropathology, subchronic	40 CFR 798.6400	rats	gavage, 90 days	20, 40, 80 mg/kg	10/sex	No substance-related deaths were observed. Decreased body weight gain, reduced feed efficiency, slight palpebral closure, enhanced tail pinch responses, soiled fur, and yellow staining of perineum, inguen, abdomen, and underbody were observed at 80 mg/kg. Neuropathology revealed no treatment-related abnormalities and no ocular tissue effects. The NOEL was 40 mg/kg. No observed effect was considered neurotoxic except pinch tail at 80 mg/kg.	57 FR 33348; 7/28/92, Docket OPPTS-44589