

# Chemical Synonyms, Molecular Structure and Toxicological Risk Assessment of Synthetic Textile Dyes: A Critical Review

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## Abstract

Textile industry has been considered for years to be one of the major sources of worldwide pollution problems. Huge amount of wastewater is generated at different stages of textile manufacturing. These waste products are mostly released in the environment without prior consideration. In Fact, they are highly contaminated with lot of chemicals including dyes. For this reason, the investigation of the effects of those compounds over the environment and human health has become a great interest. This review outlines the chemical synonyms, molecular structure and the toxicological effects of 85 textile dyes. The potential fate and effect of those substances on aquatic, human health and ecosystem are discussed in this article.

**Keywords:** Textile industry; Synthetic dyes; Toxicity; Toxicological effects

## Introduction

Since the discovery of the brilliant fuchsia color, or mauve in 1856, thousands of synthetic dyes have been manufactured all over the world [1]. Actually, there are approximately 10,000 different synthetic dyes available in the market [2] with a global annual production of almost 800,000 tons [3]. Such dyes may be defined as colored matters and when applied they are to substrates may provide them with a permanent color that by any means will not be affected by sun rays, soap and water [1,4]. Specifically, every dye stuff consists of a group of atoms, called 'chromophore' that is responsible for the substrates' coloration by absorbing certain wavelengths of light from the nearby ultraviolet region. It also contains an 'auxochrome' which helps the chromophore attach to the fiber by means of stable chemical bonds. The most important chromophores are: N=O, -NO<sub>2</sub>, -N=N-, -C=O, C=S, -C=N and (CH-CH)<sub>n</sub> and the compounds that bear them are known as chromogens [4].

These organic chemicals are usually classified as azo, anthraquinone, vat, phtalocyanine, indigo, polymethylene, carbonium and nitro dyes [5-7]. Azo dyes which have an azo bond (R<sub>1</sub>-N=N-R<sub>2</sub>), where R<sub>1</sub> and R<sub>2</sub> are aromatic groups, can be substituted by sulphonated groups. R<sub>1</sub> and R<sub>2</sub> represents the biggest and most versatile group and composes about one-half of all dyes produced [8,9]. However, anthraquinone dyes constitute the second most important category of textile dyes and are often used for dyeing cellulosic fabric (such as cotton), wool and polyamide fibers. It is to be noted that a large diversity of chemical structures of anthraquinone colorants exist [10]. Concerning the nitro dyes, it was the first to be manufactured and rarely used. In terms of its atomic structure, the nitroso dyes consist on an NO<sub>2</sub> group in ortho-position to an electron-donating substituent such as usually NH<sub>2</sub> and an OH group [11].

Each year, nearly 140 000 tons of synthetic dyes are lost into the environment because of the dyeing process [11,12]. The discharge of dye-containing effluents has obvious negative effects. Those effluents are characterized by strong colors, high pH variations, high chemical oxygen demand (COD) and increased biotoxicity against bacteria [13]. Even at very low concentration (10-50 mg/L) water-soluble dyes may, intensively, affect the aquatic organisms [14-16] and interfere with

the transmission of sun beams into streams and, therefore, reduce photosynthetic activity [17]. It is worth noting that these chemicals show high neutrality to light, temperature and microbial attacks [18]. They are also known to be persistent in the environment [15].

There has been increasing concern in recent years the occurrence, fate and toxicity of textile dyes products in the environment. This paper is a state of the art on the toxicological effects of those chemical substances.

## Harmful Effects of Textile Dyes and their Metabolite

Textile dyes extensively used in several manufacturing process have been proved to be harmful to the human health as well as to the environment. Moreover, these chemicals, especially the azo dyes, could raise potential environmental concerns considering their toxic, mutagenic and carcinogenic effects [19-22].

As the discharge of azo dyes into water bodies presents human and ecological risks, a few synthetic dyes have been tested in order to evaluate their potential toxicity. The results have shown that these dyes have toxic effects on a variety of organisms such as aquatic animals [23]. Appendix1 displays about 85 toxic textile dyes.

## Textile dyes and its metabolite carcinogenic effect, mutagenic effect and DNA damages

It has been reported that dyes toxicity may happen due to either the direct action of the original compound or its intermediate metabolites such as naphthalene, benzidine and other aromatic amines

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[24,25]. Those compounds are by-products of cleavage of azo bond by microorganisms, and reported to be carcinogenic and mutagenic [24,26]. They were proved to be more dangerous than the parent compound [27].

In this context, the benzidine-based azo Direct Red 28 intermediate metabolites, the benzidine and 4-aminobiphenyl were reported to be the real causes of its toxicity [25]. The reduction of textile azo dyes may breed DNA binding motifs [28,29] and may cause multiple toxic effects.

Along with the aforementioned problems, some dyes have been shown to have a propensity to bio accumulate in fish [15,30]. Moreover heavy-metal ions that are originally present in textile effluents have been detected to be higher in algae and plants which are exposed to such effluents [15]. Some experiments have revealed that wastewater generated by textile industry has high amount of Total Organic Carbon (TOC), high salt content and extremes in pH [31,32]. It was reported that high pH values are registered in reactive dye bathes and low ones in acid dye baths. Lastly, it was observed that colored effluents decrease soil fertility and inhibit several plants (Appendix 1).

## Conclusion

Environmental textile dyes hazards are associated to alarming human and animal's health side effects. Through this study we tried to highlight the fact that textile dyes discharged into the environment have alarming effects as both parent compound of dyes and their breaking-down products. They induce various cytotoxic, genotoxic, mutagenic and carcinogenic effects. Even at low concentration, these substances are proved to be responsible for harmful effects. Therefore, textile dyes treatment before eventual release in the environment has become a serious preoccupation. Several physical, chemical and biological processes are nowadays used in order to remove those compounds. However, their efficiency discussed as the danger associated to those compounds as well as to their degradation products which are generated through those treatment and unknown is of real concern.

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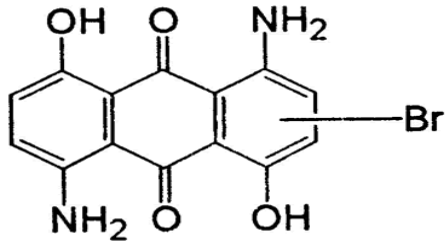
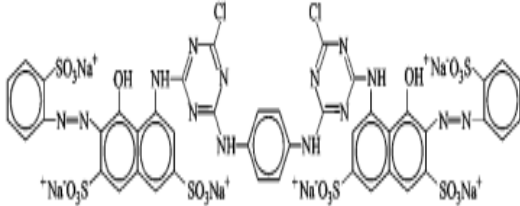
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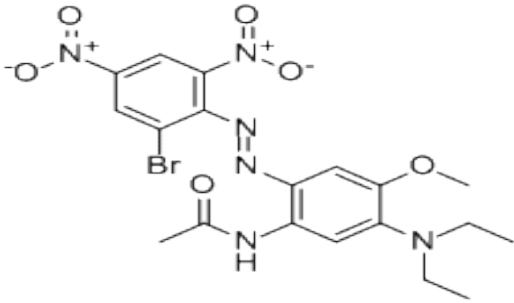
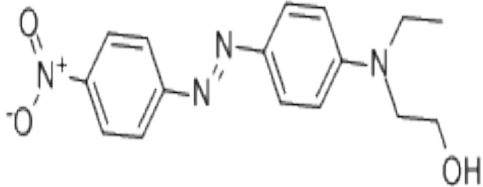
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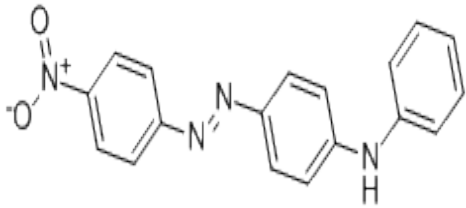
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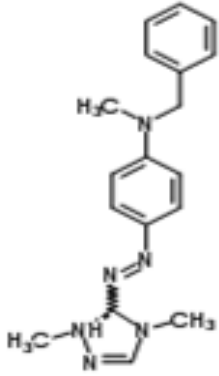
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**Appendix 1:** Effects of different groups of Textile dyes, their synonyms and chemical structures: review of studies reported in the literature<sup>A</sup>.

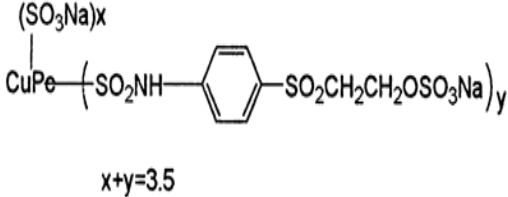
No.	Chemical Name of Textile dye	Molecular structure	Toxicological effects
<b>Divers toxicological effects</b>			
1	<p><b>Disperse Blue 56</b></p> <p><b>Class :</b> Anthraquinone</p> <p><b>CAS No.</b> 12217-79-7</p> <p><b>Synonyms:</b> C. I. Disperse Blue 56; C. I. 63285; Blue 2BLN; Latyl Blue BCN; Resolin Blue FBL; Samaron Blue FBL; Serilene Blue RL; Terasil Blue 3RL; Disperse Blue 2BLN</p> <p><b>CB Number:</b> CB7447884</p> <p><b>Molecular Formula:</b> C<sub>14</sub>H<sub>9</sub>BrN<sub>2</sub>O<sub>4</sub></p> <p><b>Formula Weight:</b> 349.14</p> <p><b>MOL File:</b> 12217-79-7 mol</p>	 <p>The structure shows a central anthraquinone core. The left ring has a hydroxyl group (OH) at the 1-position and an amino group (NH<sub>2</sub>) at the 8-position. The right ring has an amino group (NH<sub>2</sub>) at the 4-position and a hydroxyl group (OH) at the 5-position. A bromine atom (Br) is attached to the 6-position of the right ring.</p>	<p>Disperse Blue 56 is suggested to be a new class of xenobiotic AhR ligands which pose a danger to aquatic biota and human health. [33].</p>
2	<p><b>Chlorotriazine Reactive Azo Red 120</b></p> <p><b>Class :</b> Azo</p> <p><b>CAS No.</b> NA</p> <p><b>Synonyms:</b> NA</p> <p><b>CB Number:</b> CB11428606</p> <p><b>Molecular Formula:</b> NA</p> <p><b>Formula Weight:</b> NA</p> <p><b>MOL File:</b> Mol file</p>	 <p>The structure is a complex azo dye consisting of two anthraquinone units linked by an azo group (-N=N-). Each anthraquinone unit has a hydroxyl group (OH) and a sulfonate group (-SO<sub>3</sub>Na<sup>+</sup>). The central azo group is connected to a benzene ring, which is further linked to a triazine ring containing a chlorine atom (Cl). The triazine ring is also connected to another benzene ring, which is linked to another anthraquinone unit with a hydroxyl group (OH) and a sulfonate group (-SO<sub>3</sub>Na<sup>+</sup>).</p>	<p>Study proved the genotoxicity of this dye by induction of micronuclei in erythrocytes of Prussian carp <i>Carassius auratus gibelio</i> for three low doses of 1, 5, and 10 mg/L and time dependent manner [34].</p>

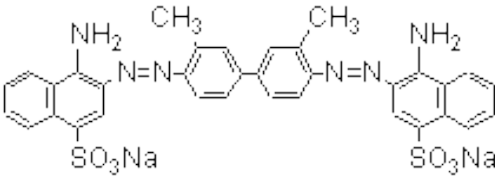
3	<p><b>Disperse Blue 291</b></p> <p><b>Class :</b> Single azo</p> <p><b>CAS No.</b> 56548-64-2</p> <p><b>Synonyms:</b> C. I. 113395; Balicron Blue 6G; Hisperse Navy C-6G; Viosperse Blue 5G; Ambicron Blue SEGBL; Disperse Navy Blue 5G; Terenix Navy Blue F3GL; Kiwalon Polyester Blue 5G; Disperse Navy Blue S-BGF300</p> <p><b>CB Number:</b> CB4798923</p> <p><b>Molecular Formula:</b> C<sub>19</sub>H<sub>21</sub>BrN<sub>6</sub>O<sub>6</sub></p> <p><b>Formula Weight:</b> 509.31064</p> <p><b>MOL File:</b> 56548-64-2 mol</p>	 <p>The chemical structure of Disperse Blue 291 is a diazo dye. It consists of two benzene rings connected by a diazo group (-N=N-). The left benzene ring has a nitro group (-NO<sub>2</sub>) at the para position and a bromine atom (-Br) at the meta position. The right benzene ring has a methoxy group (-OCH<sub>3</sub>) at the para position and a diethylamino group (-N(CH<sub>2</sub>CH<sub>3</sub>)<sub>2</sub>) at the meta position. Additionally, there is an acetamido group (-NHCOCH<sub>3</sub>) attached to the right ring at the ortho position relative to the diazo group.</p>	<p>Induction of DNA breakage, induction of micronuclei, increase of apoptosis in human hepatoma cells HepG2 [35]. Mutagenic activity in the Salmonella assay [36,37].</p>
4	<p><b>Disperse Red 1</b></p> <p><b>Class :</b> Single azo</p> <p><b>CAS No.</b> 2872-52-8</p> <p><b>Synonyms:</b> C. I. 11110; C.I. 11015; WO 4; Disperse Red ZH; Celliton Red B; Solvent Red 14; 2-(Ethyl{4-[(E)-(4-nitrophenyl) diazenyl phenyl] amino) ethanol</p> <p><b>CB Number:</b> CB8135175</p> <p><b>Molecular Formula:</b> C<sub>16</sub>H<sub>18</sub>N<sub>4</sub>O<sub>3</sub></p> <p><b>Formula Weight:</b> 314.34</p> <p><b>MOL File:</b> 2872-52-8 mol</p>	 <p>The chemical structure of Disperse Red 1 is a diazo dye. It consists of two benzene rings connected by a diazo group (-N=N-). The left benzene ring has a nitro group (-NO<sub>2</sub>) at the para position. The right benzene ring has a diethylamino group (-N(CH<sub>2</sub>CH<sub>3</sub>)<sub>2</sub>) at the para position and a 2-hydroxyethyl group (-CH<sub>2</sub>CH<sub>2</sub>OH) at the meta position.</p>	<p>DNA damage caused by Disperse Red 1 was demonstrated by the increase of the number of the micronuclei in human lymphocytes and in HepG2 cells at higher dose levels [38].</p>

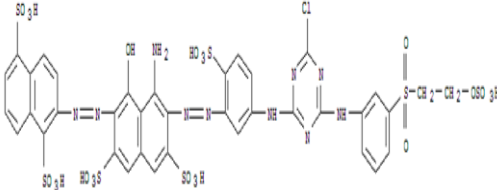
5	<p><b>Disperse Orange 1</b></p> <p><b>Class:</b> Single azo</p> <p><b>CAS No.</b> 2581-69-3</p> <p><b>Synonyms:</b> C.I. 11080; C.I. Disperse Orange 1 (6CI,7CI,8CI); Vonteryl Red 4G; Acetate Orange 5R; Palanil Orange 5R; Reliton Orange 5R; Resolin Orange 5R; Serisol Orange 5R; Disperse Orange 5R; Dispersol Orange A; Navilene Orange 5R; Acetate Orange 5R; Acetoquinone Light Orange 4RL; Celliton Discharge Orange 5RL; Celliton Fast Orange 5R; Cilla Fast Orange 5R; Diacelliton Fast Orange R; Diacelliton Fast Orange RM/D; Disperse Orange 5R; Dispersol Fast Orange A; Dispersol Orange A; Dispersol Orange B-A; Dispersol Printing Orange A; Miketon Fast Orange 5R; Miketon Polyester Orange 5R; Navilene Orange 5R; Palanil Orange 5R; Reliton Orange 5R; Resolin Orange 5R; Serilene Orange 5R; Serilene Orange; Benzenamine,4-[(4-nitrophenyl)azo]-N-phenyl- (9CI); 4-(4-Nitrophenylazo)diphenylamine; 4-(p-Nitrophenylazo)diphenylamine;4-Anilino-4'-nitroazobenzene; 4-Nitro-4'-(phenylamino) azobenzene;</p> <p><b>CB Number:</b> CB3144969</p> <p><b>Molecular Formula:</b> C<sub>18</sub>H<sub>14</sub>N<sub>4</sub>O<sub>2</sub></p> <p><b>Formula Weight:</b> 318.33</p> <p><b>MOL File:</b> 2581-69-3 mol</p>		<p>Increase the micronuclei frequencies in human lymphocytes and in HepG2 cells causing DNA damage at higher dose levels of this dye [38]. The dye showed genotoxic effects with respect to HepG2 cells at concentrations of 0.2, 0.4, 1.0, 2.0 and 4.0 µg/mL and induces DNA damage and cytotoxic effects but does not cause ecotoxic effects in <i>Daphnia similis</i> and <i>Vibrio fischeri</i> [39].</p>
6	<p><b>Astrazon Blue FGRL</b></p> <p><b>Class :</b> NA</p>	NA	Alterations of selected enzyme activities in practically, increase

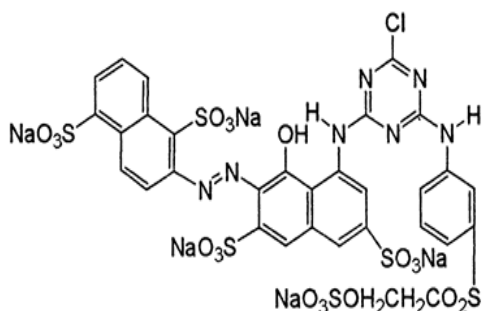
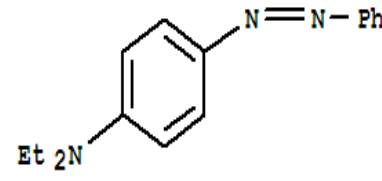
	<p><b>CAS No.</b> 105953-73-9</p> <p><b>Synonyms:</b> NA</p> <p><b>CB Number:</b> CB11447524</p> <p><b>Molecular Formula:</b> NA</p> <p><b>Formula Weight:</b> NA</p> <p><b>MOL File:</b> Mol file</p>		<p>of glutathione reductase (GR) and glutathione s-transferase (GST) in <i>xenopus leavis</i> tadpoles at concentration 0.13 mg/L [40].</p>
7	<p><b>Astrazon Red FBL</b></p> <p><b>Class :</b> Azo</p> <p><b>CAS No.</b> 12221-69-1</p> <p><b>Synonyms:</b> NA</p> <p><b>CB Number:</b> CB9129319</p> <p><b>Molecular Formula:</b> NA</p> <p><b>Formula Weight:</b> 403.3194</p> <p><b>MOL File:</b> Mol file</p>		<p>Important decrease of catalase, glutathione reductase, glutathione s-transferase activities and glutathione levels in <i>Phanerochaete chrysosporium</i> [16]. Increase of Carboxylesterase (CaE), Lactate dehydrogenase (LDH) and glutathione s-transferase (GST) activities in <i>xenopus leaves</i> were determined at concentration 0.35 mg/L [40].</p>
8	<p><b>Remazol Red RR</b></p> <p><b>Class :</b> Azo</p> <p><b>CAS No.</b> NA</p> <p><b>Synonyms:</b> NA</p> <p><b>CB Number:</b> CB21409093</p> <p><b>Molecular Formula:</b> NA</p> <p><b>Formula Weight:</b> NA</p> <p><b>MOL File:</b> Mol file</p>	NA	<p>Clear increase of glutathione s-transferase (GST) activity at low concentrations 7.5, 16.9, 38.0 mg/L, and increase of Carboxylesterase (CaE) activity at higher concentrations 85.5, 192.3, 432.7, 973.5 mg/L in <i>Xenopus leavis</i> tadpoles [40].</p>

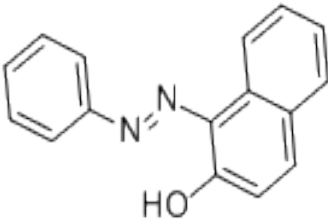


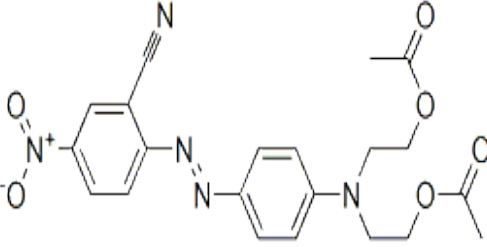
9	<p><b>Remazol Turquoise Blue G-A</b>  <b>Class :</b> Phthalocyanine  <b>CAS No.</b> 12236-86-1/73049-92-0  <b>Synonyms:</b> C.I. Reactive Blue 21; Reactive Turquoise Blue KN-G; Reactive Blue KN-G  <b>CB Number:</b> CB01434912  <b>Molecular Formula:</b> C<sub>18</sub>H<sub>15</sub>N<sub>7</sub>OS  <b>Formula Weight:</b> 377.43  <b>MOL File:</b> Mol file</p>	 <p style="text-align: center;"><math>x+y=3.5</math></p>	<p>Increase of glutathione s-transferase activity in <i>xenopus leavis</i> tadpoles determined at concentration 7 mg/L [40].</p>
10	<p><b>Cibacron Blue FN-R</b>  <b>Class :</b> NA  <b>CAS No.</b> NA  <b>Synonyms:</b> NA  <b>CB Number:</b> CB41433670  <b>Molecular Formula:</b> NA  <b>Formula Weight:</b> NA  <b>MOL File:</b> Mol file</p>	NA	<p>Inhibition of glutathione s-transferase and an increase of carboxylesterase (CaE) activities in <i>xenopus leavis</i> tadpoles at concentration 15.8 mg/L [40].</p>
11	<p><b>Cibacron Red FN-3G</b>  <b>Class :</b> NA  <b>CAS No.</b> NA  <b>Synonyms:</b> NA  <b>CB Number:</b> CB41413795  <b>Molecular Formula:</b> NA  <b>Formula Weight:</b> NA  <b>MOL File:</b> Mol file</p>	NA	<p>Inhibition of glutathione s-transferase activities in <i>xenopus leavis</i> tadpoles at higher concentration 359 mg/L [40].</p>
12	<b>Blue HFRL</b>	NA	<p>Estrogenic potencies of the dye</p>

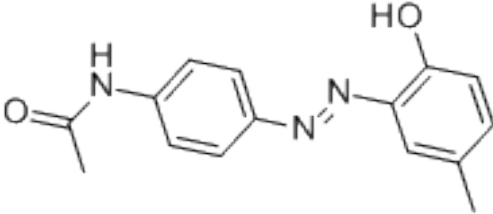
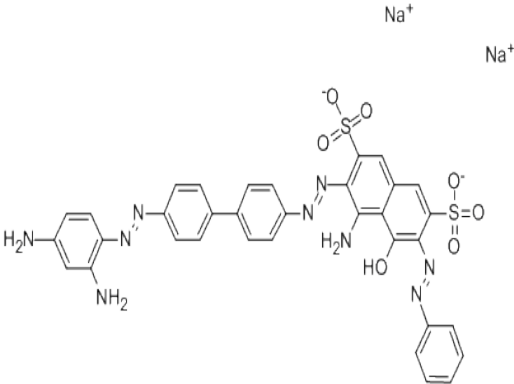
	<p><b>Class :</b> NA  <b>CAS No.</b> NA  <b>Synonyms:</b> NA  <b>CB Number:</b> NA  <b>Molecular Formula:</b> NA  <b>Formula Weight:</b> NA  <b>MOL File:</b> Mol file</p>		<p>was evaluated by dose-response curves and compared to the dose-response curve of 17β-estradiol (E2), the reference compound. E2/dye competitive binding assays show activity of this dye indicating a mechanism of action common to E2. This result indicates that Blue HFRL is potential endocrine disrupting agents. The presence of some of this dye in textile industry wastewater may thus impact the aquatic ecosystem [2].</p>
13	<p><b>Benzopurpurine 4B</b>  <b>Class :</b> Azo  <b>CAS No.</b> 992-59-6  <b>Synonyms:</b> Red 4B; C.I. 23500; Azamin 4B; Sultan 4B; Erie red 4B; Eclipse Red; Paper Red 4B; Purpurin 4B; Cotton Red 4B  <b>CB Number:</b> CB4710130  <b>Molecular Formula:</b> C<sub>34</sub>H<sub>26</sub>N<sub>6</sub>Na<sub>2</sub>O<sub>6</sub>S<sub>2</sub>  <b>Formula Weight:</b> 724.72  <b>MOL File:</b> 992-59-6.mol</p>	 <p>The chemical structure of Benzopurpurine 4B is shown. It consists of two benzene rings connected by a central biphenyl core. Each benzene ring has an amino group (-NH<sub>2</sub>) and a sodium sulfonate group (-SO<sub>3</sub>Na) at the 4-position. The central biphenyl core has two methyl groups (-CH<sub>3</sub>) at the 2 and 6 positions. The two azo groups (-N=N-) connect the central biphenyl core to the two benzene rings.</p>	<p>Estrogenic potencies of the dye was evaluated by dose-response curves and compared to the dose-response curve of 17β-estradiol (E2), the reference compound. E2/dye competitive binding assays show activity of Benzopurpurine 4B indicating a mechanism of action common to E2. This result indicates that Blue HFRL is potential endocrine disrupting agents. The presence of some of this dye in textile</p>

			industry wastewater may thus impact the aquatic ecosystem [2].
14	<p><b>Everzol Navy Blue FBN</b></p> <p><b>Class :</b> azo</p> <p><b>CAS No.</b> 93912-64-2</p> <p><b>Synonyms:</b> NA</p> <p><b>CB Number:</b> NA</p> <p><b>Molecular Formula:</b> C<sub>37</sub>H<sub>29</sub>ClN<sub>10</sub>O<sub>22</sub>S<sub>7</sub>Na<sub>6</sub></p> <p><b>Formula Weight:</b> NA</p> <p><b>MOL File:</b> Mol file</p>		<p>Estrogenic potencies of the dye was evaluated by dose-response curves and compared to the dose-response curve of 17β-estradiol (E2), the reference compound. E2/dye competitive binding assays show activity of Everzol Navy Blue FBN indicating a mechanism of action common to E2. This result indicates that Blue HFRL is potential endocrine disrupting agents. The presence of some of this dye in textile industry wastewater may thus impact the aquatic ecosystem [2].</p>
15	<p><b>Yellow Favina CXL</b></p> <p><b>Class :</b> NA</p> <p><b>CAS No.</b> NA</p> <p><b>Synonyms:</b> NA</p> <p><b>CB Number:</b> NA</p> <p><b>Molecular Formula:</b> NA</p>	NA	<p>Estrogenic potencies of the dye was evaluated by dose-response curves and compared to the dose-response curve of 17β-estradiol (E2), the reference compound. A weak estrogen agonist activity</p>

	<p><b>Formula Weight:</b> NA</p> <p><b>MOL File:</b> NA</p>		was determined [2].
16	<p><b>Reactive Dyes Red 3BS</b></p> <p><b>Class :</b> Single azo</p> <p><b>CAS No.</b> 93050-79-4</p> <p><b>Synonyms:</b> Reactive Red 195; C.I. Reactive Red 195; Reactive Red M-3BE; Reactive Red SP-3B; Reactive Brilliant Red ME-3BS; CINO.RED.195; Red F3B; Reactive Brilliant Red M-3BE</p> <p><b>CB Number:</b> CB4241898</p> <p><b>Molecular Formula:</b> C<sub>31</sub>H<sub>19</sub>ClN<sub>7</sub>O<sub>19</sub>S<sub>6</sub></p> <p><b>Formula Weight:</b> 1136.31</p> <p><b>MOL File:</b> 93050-79-4.mol</p>		<p>Induction of estrogenic activity was evaluated by dose-response curves and compared to the dose-response curve of 17β-estradiol (E2), the reference compound [2]. Liver and gill tissues of <i>Oreochromis niloticus</i> showed several antioxidant activities of catalase (CAT), glutathione reductase (GR) and glutathione S-transferase (GST), and histopathological changes [41].</p>
17	<p><b>Solvent Yellow 56</b></p> <p><b>Class :</b> Single azo</p> <p><b>CAS No.</b> 2481-94-9</p> <p><b>Synonyms:</b> C-299; C.I. Solvent Yellow 56; DEAB ; C.I. 11021; Yellow DE; Oil Yellow GA; Fat Yellow GGN; Oil Yellow DEA; Fat Yellow P; Solvent Yellow 2G; Solvent Golden Yellow R; Transparent Yellow 3R; Transparent Yellow; 5RTransparent plastic yellow 103; Oil Yellow 201; Ceres Yellow GGN; Fast Oil Yellow 64403; NSC 102374; Oil Yellow DE; Oil Yellow ENC; Oil Yellow NB; Oil sol Yellow DEA; Orient Oil Yellow GGS; Sico Fat Yellow P; Sudan Yellow GGN; Diethyl Yellow, Oil Yellow DE, 2481-94-9, Oil Yellow GA, Oil Yellow NB,</p>		<p>Estrogenic potencies of the dye was evaluated by dose-response curves and compared to the dose-response curve of 17β-estradiol (E2), the reference compound. A weak estrogen agonist activity was determined [2].</p>

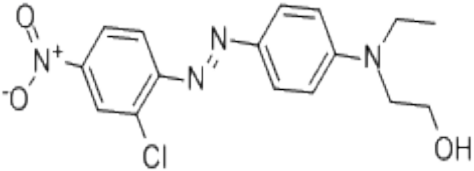
	<p>Oil Yellow DEA; 4-diethylaminoazobenzene ; p-(Diethylamino)azobenzene; N,N-Diethyl-4-(phenylazo)aniline; N,N-diethyl-4-aminoazobenzene; Aniline,N,N-diethyl-p-(phenylazo)- (6CI,7CI);4-(N,N-Diethylamino)azobenzene;4-(Phenylazo)-N,N-diethylaniline</p> <p><b>CB Number:</b> CB1688526</p> <p><b>Molecular Formula:</b> C<sub>16</sub>H<sub>19</sub>N<sub>3</sub></p> <p><b>Formula Weight:</b> 253.34</p> <p><b>MOL File:</b> 2481-94-9.mol</p>		
<b>Mutagenic and carcinogenic effect</b>			
18	<p><b>Sudan I</b></p> <p><b>Class :</b> Azo</p> <p><b>CAS No.</b> 842-07-9</p> <p><b>Synonyms:</b> C.I. 12055; 1-Phenylazo-2-naphthol, Solvent Yellow 14 ; Sudan J; Soudan I; Carminaph; Scarlet B; NSC 11227 ; 1-Phenylazo-2-naphthol; Solvent Yellow 14; Grasal Orange; Spirit Orange; Sudan Yellow ; Fast Orange; 1-phenylazo-2-hydroxynaphthalene ; 1-phenylazo-2-naphthol ; 1-phenylazo-2-naphthol, (E)-isomer; 1-phenylazo-2-naphthol, (Z)-isomer; 1-phenylazo-2-naphthol, 1-(15)N-labelled; 1-phenylazo-2-naphthol, 2-(15)N-labeled; 1-phenylazo-2-naphthol, ion(1-); 1-phenylazo-2-naphthol, sodium salt</p> <p><b>CB Number:</b> CB9489556</p> <p><b>Molecular Formula:</b> C<sub>16</sub>H<sub>12</sub>N<sub>2</sub>O</p>		<p>Mutagenicity to <i>salmonella typhimurium</i> [42]. Urinary bladder and liver carcinogen in mammals [43]. Dose-dependent increase of DNA migration and of micronuclei frequencies in human hepatoma HepG2 cells [44]. Carcinogenic in male and female F344/N rates: induction of liver neoplastic nodules [45]. Weak mutagenic activity in the mammalian mouse lymphoma assay [46].</p>

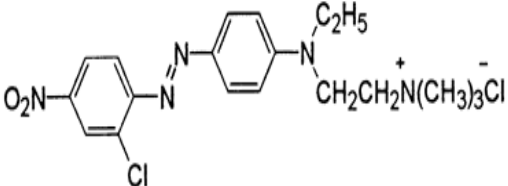
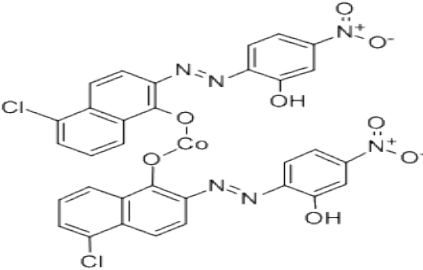
	<p><b>Formula Weight:</b> 248.28</p> <p><b>MOL File:</b> 842-07-9.mol</p>		
19	<p><b>Disperse red 82</b></p> <p><b>Class :</b> Single azo</p> <p><b>CAS No.</b> 30124-94-8</p> <p><b>Synonyms:</b> C.I. 11140; Terasil Red 3BL; Begacron Red 3B; Disperse Red C3B; Balicron Red C-3B; C.I. Disperse Red 82; Tulaspeck Red 3B-PE.; Disperse Rubine SE-BBL; C.I. Disperse Red 82 press cake; C.I. Disperse Red 82; Cibacet Red 3BL; Resolin Red BBL; Samaron Red BL; Serilene Red 3B-LS; Terasil Red 3BL; Benzonitrile,2-[[4-[bis[2-(acetyloxy)ethyl]amino]phenyl]azo]-5-nitro-(9CI);2-[[4-[Bis[2-(acetyloxy)ethyl]amino]phenyl]azo]-5-nitrobenzonitrile;2-[[4-[[Bis(2-hydroxyethyl)]amino]phenyl]azo]-5-nitrobenzonitrile diacetate(ester);3-Nitro-6-[4-(N,N-diacetoxyethylamino)phenyl]azo]benzonitrile); N,N-Bis[2-(acetyloxy)ethyl]-4-[(2-cyano-4-nitrophenyl)azo]benzeneamine; 2-[[4-[Bis[2-(acetyloxy)ethyl]amino]phenyl]azo]-5-nitrobenzonitrile; 2-[2-acetoxyethyl-[4-(2-cyano-3-nitro-phenyl)azo]-3-methyl-phenyl]amino]ethyl acetate</p> <p><b>CB Number:</b> CB1237447</p>	 <p>The chemical structure of Disperse red 82 is shown. It features a central azo group (-N=N-) connecting two phenyl rings. The left phenyl ring is substituted with a cyano group (-C≡N) at the 3-position and a nitro group (-NO<sub>2</sub>) at the 5-position. The right phenyl ring is substituted with a bis[2-(acetyloxy)ethyl]amino group (-N(CH<sub>2</sub>CH<sub>2</sub>OC(=O)CH<sub>3</sub>)<sub>2</sub>) at the 4-position.</p>	<p>Disperse red 82 caused ambiguous increases in lymph node weight and cell number in the sensitisation protocol which were not reproduced in the sensitisation-challenge protocol, ruling out a relevant sensitising potential for this dye in NMRI mice [47].</p>

	<p><b>Molecular Formula:</b> C<sub>21</sub>H<sub>21</sub>N<sub>5</sub>O<sub>6</sub></p> <p><b>Formula Weight:</b> 439.42134</p> <p><b>MOL File:</b> 30124-94-8.mol</p>		
20	<p><b>Disperse yellow 3</b></p> <p><b>Class :</b> Single azo</p> <p><b>CAS No.</b> 2832-40-8</p> <p><b>Synonyms:</b> C.I.11855 ; NCI-C53781; Disperse Dye Yellow G ; Zlut di; Yellow Z; Artisil yellow G; Estone Yellow GN; Fenacet Yellow G ; 4-(2-Hydroxy-5-methylphenylazo)acetanilide, N-[4-(2-Hydroxy-5-methylphenylazo)phenyl]acetamide</p> <p><b>CB Number:</b> CB9679814</p> <p><b>Molecular Formula:</b> C<sub>15</sub>H<sub>15</sub>N<sub>3</sub>O<sub>2</sub></p> <p><b>Formula Weight:</b> 269.3</p> <p><b>MOL File:</b> 2832-40-8.mol</p>		<p>Disperse yellow 3 caused ambiguous increases in lymph node weight and cell number in the sensitisation protocol which were not reproduced in the sensitisation-challenge protocol, ruling out a relevant sensitising potential for this dye in NMRI mice [47]. Caused a carcinogenic activity by increase of hepatocellular tumours and malignant lymphomas frequencies in female mice [48,49].</p>
21	<p><b>Direct black 38</b></p> <p><b>Class :</b> Trisazo</p> <p><b>CAS No.</b> 1937-37-7</p> <p><b>Synonyms:</b> nsc 8679; nsc 47756; C.I. 30235; nci-c54557; Meta Black; AZO Black; Erie Black B; Erie Black ; Black 2EMBL; Black 4EMBL ; Direct Black BN; Direct Black BRN ; Direct Black BX ; Direct Black EX; Direct Black RN</p> <p><b>CB Number:</b> CB0745257</p> <p><b>Molecular Formula:</b> C<sub>34</sub>H<sub>25</sub>N<sub>9</sub>Na<sub>2</sub>O<sub>7</sub>S<sub>2</sub></p> <p><b>Formula Weight:</b> 781.73</p>		<p>Induction of hepatocellular carcinomas and mammary carcinomas in mice, mutagenicity activity to <i>salmonella typhimurium</i> with metabolic activation [50]. High incidence of urinary bladder cancer among exposed workers [51]. Liver carcinogen [52]. Mutagenic activity [53].</p>

	<b>MOL File:</b> 1937-37-7.mol		
22	<p><b>Reactive red 120</b></p> <p><b>Class :</b> Double azo</p> <p><b>CAS No.</b> 61951-82-4</p> <p><b>Synonyms:</b> C.I. 292775; Procion Red HEB; Reactive red 120; Procion Red H-E3B; Cibacron Red 4G-E; C.I. Reactive Red 120; Kayacion Red E-S3B; Adiaactive Red HE-3B; Chemictive Red HE3B; Reactive Brilliant Red KE-4B; Reactive Red KE-3B; Reactive Brilliant Red KE-3B; Basacid Red NB 510; Basilen Red E-B; Brilliant Red HE 3B; C.I. Reactive Red 120; Cibacron Brilliant Red 4G-E; Cibacron Red 4G-E; CibacronRed 4G-E01; Drimarene Brilliant Red A 4G; Evercion Red H-E 3B; Fastusol Red 53L; Helaktyn Red DE-BN; Intracron Brilliant Red 4G-E; Intracron Brilliant Red E3B; Kayacion Red E-S 3B; Procion Brilliant Red H-E 3B; Procion Red H-E 3B; Procion Red MX 3B; Reactive Red HE 3B; Red A; Red HE 3B; Suncion Red H-E/EL 3R; Sunfix Red HE 3B; Taifix Red HE3BT; AC1OB94O; AGN-PC-0CT42X; CTK8G2911; AG-G-26692; (3E)-5-[[4-chloro-6-[4-[[4-chloro-6-[[[(7Z)-8-oxo-3,6-disulfo-7-[(2-sulfophenyl)hydrazinylidene]naphthalen-1-yl]amino]-1,3,5-triazin-2-yl]amino]anilino]-1,3,5-triazin-2-yl]amino]-4-oxo-3-[(2-sulfophenyl)hydrazinylidene]naphthalene-2,7-disulfonic acid; 5-[[4-chloro-6-[4-[[4-chloro-6-[[8-oxo-3,6-disulfo-7-[(2-sulfophenyl)hydrazinylidene]naphthalen-1-yl]amino]-1,3,5-triazin-2-yl]amino]anilino]-1,3,5-triazin-2-</p>		<p>Toxicity to <i>Allium cepa</i> signifies that dye Red 120 exerts oxidative stress and subsequently toxic effect on the root cells whereas biodegradation metabolites of the dye are relatively less toxic in nature. Phytotoxicity studies also indicated that microbial treatment favors detoxification of Red 120 [54].</p>



	<p>yl]amino]-4-oxo-3-[(2-sulfo-phenyl)hydrazinylidene]naphthalene-2,7-disulfonic acid;  1-Naphthol-3,6-disulfonic acid, 8,8'-[p-phenylenebis[imino(6-chloro-s-triazine-4,2-diyl)imino]]bis[2-(o-sulfo-phenylazo)-(6Cl); 2,7-Naphthalenedisulfonic acid, 4,4'-[1,4-phenylenebis[imino(6-chloro-1,3,5-triazine-4,2-diyl)imino]]bis[5-hydroxy-6-[(2-sulfo-phenyl)azo]-(9Cl)]</p> <p><b>CB Number:</b> CB0402020  <b>Molecular Formula:</b> C<sub>44</sub>Cl<sub>2</sub>H<sub>24</sub>N<sub>14</sub>Na<sub>6</sub>O<sub>20</sub>S<sub>6</sub>  <b>Formula Weight:</b> 1469.98  <b>MOL File:</b> Mol file</p>		
23	<p><b>Disperse red 13</b>  <b>Class :</b> Single azo  <b>CAS No.</b> 3180-81-2  <b>Synonyms:</b> C.I. 11115; C.I. Disperse Red 13; Rubine B; Setacyl Red 2B; Disperse Red 2B; Disperse Red BD; Disperse Rubine B; Disperse Rubine BD; Celliton Fast Rubine B ; Amacel Rubine B; Celliton Ruby B; Cibacet Rubine R; Celliton Rubine B  <b>CB Number:</b> CB4358703  <b>Molecular Formula:</b> C<sub>16</sub>H<sub>17</sub>ClN<sub>4</sub>O<sub>3</sub>  <b>Formula Weight:</b> 348.78  <b>MOL File:</b> 3180-81-2.mol</p>		<p>Induction of DNA damages in human hepatoma cells HepG2 in a dose dependent manner [55]. Dye tested positive in the Salmonella assay, and the suggestion was made that the compound induce mainly frame-shift mutations and that the enzymes nitroreductase and O-acetyl transferase play an important role in the observed effect. In addition, it was shown that the presence of the chlorine substituent in Disperse Red 13 decreased the mutagenicity, which shows the same structure as</p>

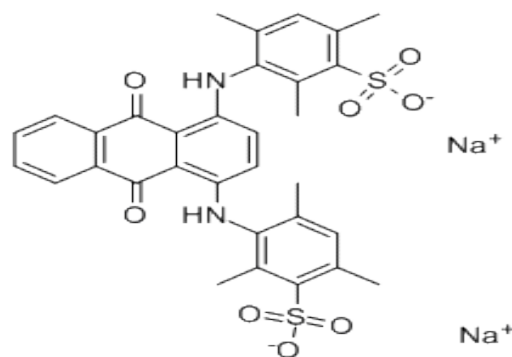
			Disperse Red 13, but without the chlorine substituent[56].
24	<p><b>C.I. Basic red 18</b></p> <p><b>Class :</b> Single azo</p> <p><b>CAS No.</b> 14097-03-1</p> <p><b>Synonyms:</b> C.I.11085</p> <p><b>CB Number:</b> NA</p> <p><b>Molecular Formula:</b> C<sub>19</sub>H<sub>25</sub>Cl<sub>2</sub>N<sub>5</sub>O<sub>2</sub></p> <p><b>Formula Weight:</b> 426.34</p> <p><b>MOL File:</b> Mol file</p>		Dye tested for their mutagenicity on Ames strains of <i>salmonella typhimurium</i> . C.I. Basic red 18 induced frame shift mutations [57].
25	<p><b>Orasol Navy blue 2RB</b></p> <p><b>Class :</b> Azo</p> <p><b>CAS No.</b> 61969-42-4</p> <p><b>Synonyms:</b> Orasol Navy Blue 2RB; C.I. Solvent Blue 53; cobalt (2+) bis{2-[(E)-2-(5-chloro-1-oxonaphthalen-2(1H)-ylidene)hydrazinyl]-5-nitrophenolate}</p> <p><b>CB Number:</b> CB71332857</p> <p><b>Molecular Formula:</b> C<sub>32</sub>H<sub>18</sub>Cl<sub>2</sub>CoN<sub>6</sub>O<sub>8</sub></p> <p><b>Formula Weight:</b> 744.367</p> <p><b>MOL File:</b> 61969-42-4.mol</p>		Orasol Navy blue 2RB induced frame shift mutations without metabolic activation[57].
26	<p><b>Acid blue 80</b></p> <p><b>Class :</b> Anthraquinone</p> <p><b>CAS No.</b> 4474-24-2</p> <p><b>Synonyms:</b> C.I. 61585; c -wr Blue 10; Endanil Blue B; Acid Blue 80; C.I. Acid Blue 80; Coomassie Blue B; Leather Blue RAW; Nylosan Blue C -I; Vicoacid Blue 80;</p>		Induction of apoptosis in rainbow trout epithelial cell lines RTL - W1, RTgill -W1 and RTgutGC. Acid blue 80 appears to have the potential to be toxic at only very high concentrations [58]

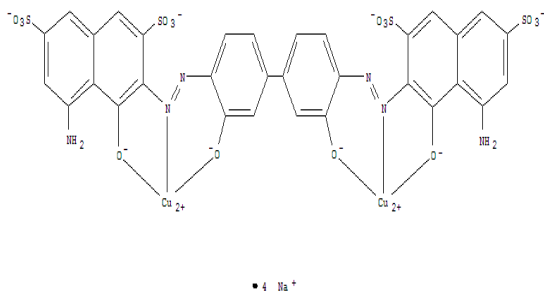
Milling Fast Blue SBL; Alizarin E (PICCS); Benzenesulfonic acid, 3,3'-[(9,10-dihydro-9,10-dioxo-1,4-anthracenediyl) diimino]bis[2,4,6-trimethyl-, disodium salt; 2-Mesitylenesulfonic acid, 4,4'-(1,4-anthraquinonylenediimino)di-, disodium salt; Acid Anthraquinone Brilliant Blue; Acid Brilliant Blue Anthraquinone; Acid Brilliant Blue RAWL; Alizarine Blue BL; Alizarine Fast Blue R; Alizarine Milling Blue R; Atlantic Alizarine; Milling Blue RB; Brilliant Alizarine Milling Blue BL; C-WR Blue 10; C.I. 61585; C.I. Acid Blue 80; Coomassie Blue B; Endanil Blue B; Nylosan Blue C-L; Nylosan Blue F-L; Nylosan Blue F-L 150; Polar Brilliant Blue RAW; Polar Brilliant Blue RAWL; Sandolan Milling Blue N-BL; Sandolan Milling N-BL; Stenolana Brilliant Blue BL; Weak Acid Brilliant Blue RAW; Lanasyn Blue F-L 150; Benzenesulfonic acid, 3,3'-[(9,10-dihydro-9,10-dioxo-1,4-anthracenediyl)diimino]bis[2,4,6-trimethyl-, disodium salt (TSCA, PICCS, ASIA-PAC) ; Sodium 3,3'-(9,10-dioxoanthracene-1,4-diyldiimino)bis(2,4,6-trimethylbenzenesulphonate (EINECS) ; Acid Blue 80 (ENCS,); Benzenesulfonic acid, 3,3'-[(9,10-dihydro-9,10-dioxo-1,4-anthracenediyl)diimino]bis[2,4,6-trimethyl-, disodium salt (AICS)

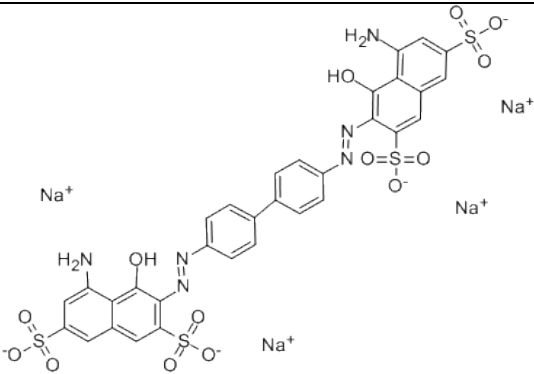
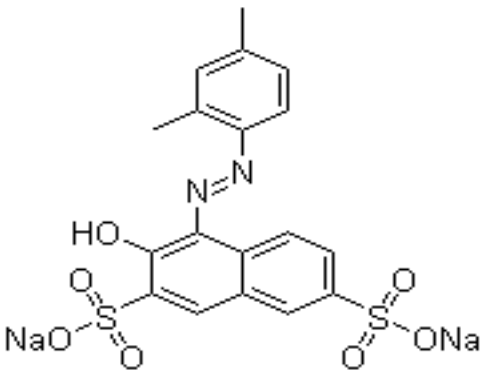
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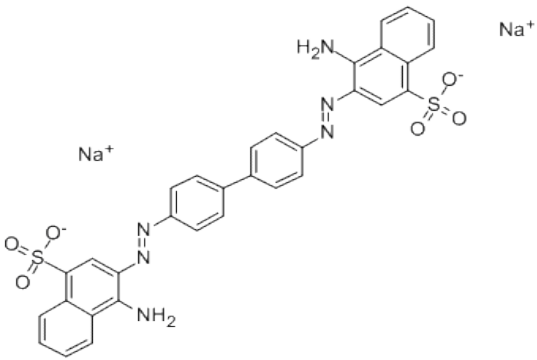
**Molecular Formula:** C<sub>32</sub>H<sub>28</sub>N<sub>2</sub>Na<sub>2</sub>O<sub>8</sub>S<sub>2</sub>

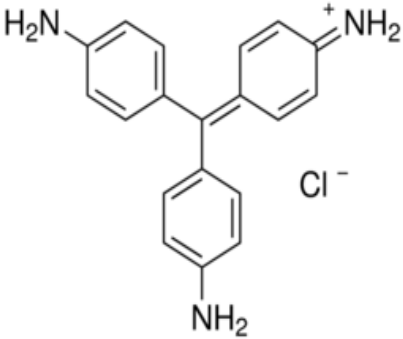
**Formula Weight:** 678.68

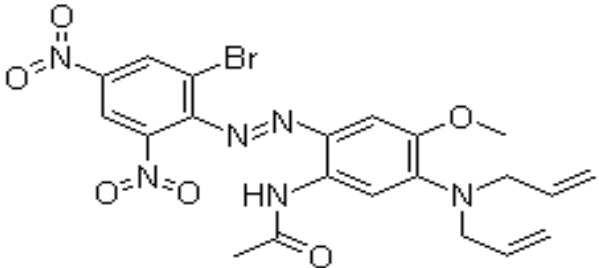


	<b>MOL File:</b> 4474-24-2.mol		
27	<p><b>C.I. Direct Blue 218</b></p> <p><b>Class :</b> Double azo, Metal Complexes</p> <p><b>CAS No.</b> 28407-37-6</p> <p><b>Synonyms:</b> Amanil Supra Blue 9GL; C.I. 24401; Carta Blue VP; Direct Blue 218; Fastusol Blue 9GLP; Intralite Blue 8GLL; Pontamine Bond Blue B; Pontamine Fast Blue 7GLN; Direct Blue 218; Direct Fast Blue 8GLL; Direct Blue 3GLST; Direct Blue 8GL; 1-Naphthol-3,6-disulfonicacid, 2,2'-(3,3'-dihydroxy-4,4'-biphenylenebisazo)bis[8-amino-, dicopperderiv., tetra sodium salt (6CI);C.I. Direct Blue 218 (8CI);Copper,[tetrahydrogen-3,3'-[(3,3'-dihydroxy-4,4'-biphenylene)bis(azo)]bis[5-amino-4-hydroxy-2,7-naphthalenedisulfonato](4-)]di-,tetrasodium salt (7CI); Cuprate (4-), [m-[[3,3'-[(3,3'-dihydroxy[1,1'-biphenyl]-4,4'-diyl)bis(azo)]bis[5-amino-4-hydroxy-2,7-naphthalenedisulfonato]](8-)]di-,tetrasodium;Cuprate(4-), [m-[[3,3'-[[3,3'-di(hydroxy-kO)[1,1'-biphenyl]-4,4'-diyl]bis(azo-kN1)]bis[5-amino-4-(hydroxy-kO)-2,7-naphthalenedisulfonato]](8-)]di-, tetrasodium (9CI)</p> <p><b>CB Number:</b> NA</p> <p><b>Molecular Formula:</b> C<sub>32</sub>H<sub>16</sub> Cu<sub>2</sub> N<sub>6</sub> Na<sub>4</sub>O<sub>16</sub>S<sub>4</sub></p> <p><b>Formula Weight:</b> 1087.82</p> <p><b>MOL File:</b> NA</p>		High toxicity to <i>daphnia magna</i> with a 48-h with LC50 range between 1.0 and 10.0 mg/L [59].
28	<p><b>Direct blue 6</b></p> <p><b>Class</b> Double azo</p>		Induction of hepatocellular carcinomas in rats, teratogenic

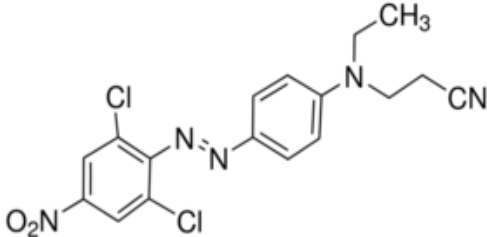
	<p><b>CAS No.</b> 2602-46-2</p> <p><b>Synonyms:</b> C.I.22610 ; Direct Blue 2B; Direct Blue 2BA</p> <p><b>CB Number:</b> CB3243835</p> <p><b>Molecular Formula:</b> C<sub>32</sub>H<sub>20</sub>N<sub>6</sub>Na<sub>4</sub>O<sub>14</sub>S<sub>4</sub></p> <p><b>Formula Weight:</b> 932.763</p> <p><b>MOL File:</b> Mol file</p>		<p>activity in rats when administered during the first half of pregnancy [50].</p>
29	<p><b>Acid Red 26</b></p> <p><b>Class :</b> Single azo</p> <p><b>CAS No.</b> 3761-53-3</p> <p><b>Synonyms:</b> C.I. 16150; Scarlet 2R; Ponceau R; Acid Scarlet; Ponceaux RH; Ponceau 2R ; C.I. Acid Red 26 (7CI); C.I. Acid Red 26, disodium salt (8CI); Ponceau Xylidine (6CI); Acid Leather Red KPR; Acid Leather Red P 2R; Acid Leather Scarlet IRW; Acid Ponceau 2RL; Acid Ponceau Special; Acid Scarlet; Acid Scarlet 2R; Acid Scarlet 2RL; Ahcocid Fast Scarlet R; Am acid Lake Scarlet 2R; Borunil Ponceau A 2R;Calcolake Scarlet 2R;Certicol Ponceau MXS; Colorosacid Scarlet; D and C Red No. 5; Disodium salt of 1-(2,4-xylylazo)-2-naphthol-3,6-disulfonic acid; Edicol Supra Ponceau R; Food Red 5; Hexacol Ponceau 2R; Hexacol Ponceau MX; Hidacid Scarlet 2R; Japan Red No. 503; Kiton Ponceau R; Naphthalene Lake Scarlet R; Naphthalene Scarlet R; Naphthazine Scarlet 2RN; Neklacid Red RR; Pigment Ponceau R; Ponceau 2R;</p>		<p>Acid Red 26 caused a carcinogenic effects proved by liquid chromatography/electrospray ionization mass spectrometry via negative/positive ion switching mode [60].</p>

	<p>Ponceau 2RL; Ponceau 2RX; Ponceau BNA; Ponceau G; Ponceau PXM; Ponceau R; Ponceau RR; Ponceau RS; Ponceau Red R; Red No.503; Scarlet 2R; Scarlet 2RLBluish; Scarlet R; Tertracid Ponceau 2R; Xylidine Ponceau; Xylidine Red; 1695 Red; 1-(2,4-Xylylazo)-2-naphthol-3,6-disulfonic acid disodium salt; 2,7-Naphthalenedisulfonicacid,4-[(2,4-dimethylphenyl)azo]-3-hydroxy-,disodiumsalt; 3-hydroxy-4-(2,4-xylylazo)-2,7-naphthalenedisulfonicacid,disodiumsalt; 3-hydroxy-4-(2,4-xylylazo)-3,7-naphthalenedisulfonicacid,disodiumsalt; 2,7-Naphthalenedisulfonicacid, 4-[(2,4-dimethylphenyl)azo]-3-hydroxy-, disodium salt (9CI)</p> <p><b>CB Number:</b> CB6198594</p> <p><b>Molecular Formula:</b> C<sub>18</sub>H<sub>14</sub>N<sub>2</sub>Na<sub>2</sub>O<sub>7</sub>S<sub>2</sub></p> <p><b>Formula Weight:</b> 480.42</p> <p><b>MOL File:</b> 3761-53-3.mol</p>		
30	<p><b>Direct Red 28</b></p> <p><b>Class :</b> Double azo</p> <p><b>CAS No.</b> 573-58-0</p> <p><b>Synonyms:</b> C.I. 22120; C.I. Direct Red 28, disodium salt (8CI); Direct Red C; Direct Red R; Atlantic Congo Red; Atul Congo Red; Azocard Red Congo; Benzo Congo Red; Brasilamina Congo 4B; C.I. 22120; C.I. Direct Red 28; Congo Red 4B; Congo Red 4BX; Congo Red CR; Congo Red H; Congo Red N; Congo Red R; Congo Red RS; Congo Red TS; Congo Red W; Congo Red WS; Congo Red sodium salt; Congo Red ; Direct Scarlet 4B ; Direct</p>		<p>Direct Red 28 caused a carcinogenic effects proved by liquid chromatography/electrospray ionization mass spectrometry via negative/positive ion switching mode [60].</p>

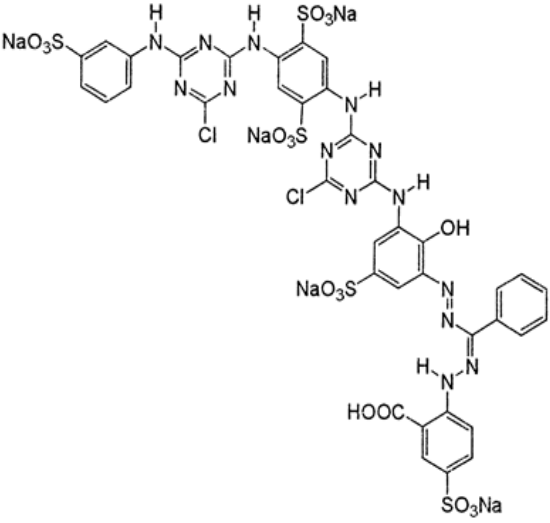
	<p>Scarlet 4BE; Haemomedical ; Hemorrhagyl; Sodium diphenyldiazo-bis(alpha-naphthylaminesulfonate); Direct Red Y; Natrium-salz der diphenyl-bis-azo-bis-naphthylamin-4-sulfonsaeure; Congo Red 4B; Cosmos Red; Cotton Red B; 3,3'-(4,4'-Biphenylenebis(azo))bis(4-amino-1-naphthalenesulfonic acid) disodium salt; Cotton Red C; Disodium 3,3'-((1,1'-biphenyl)-4,4'-diylbis(azo))bis(4-aminonaphthalene-1-sulphonate) ; 1-Naphthalenesulfonicacid, 3,3'-[[1,1'-biphenyl]-4,4'-diylbis(azo)]bis[4-amino-, disodium salt(9Cl)</p> <p><b>CB Number:</b> CB1261000</p> <p><b>Molecular Formula:</b> C<sub>32</sub>H<sub>22</sub>N<sub>6</sub>Na<sub>2</sub>O<sub>6</sub>S<sub>2</sub></p> <p><b>Formula Weight:</b> 696.66</p> <p><b>MOL File:</b> 573-58-0.mol</p>		
31	<p><b>Basic Red 9</b></p> <p><b>Class :</b> Triarylmethane</p> <p><b>CAS No.</b> 569-61-9</p> <p><b>Synonyms:</b> C.I. Basic Red 9; C.I. 42500; C.L. 42510; Basic Fuchsin; Basic Parafuchsin; Basic Red 9; Magenta™ O; Parafuchsin hydrochloride; Paramagenta hydrochloride; Pararosaniline chloride; Pararosaniline hydrochloride; Fuchsin; Magenta; AFB Stain; Magenta 1; Fuchsinp; Rosaniline; Pararosaniline hydrochloride; Parafuchsin; 569-61-9; Parafuchsine; Parafuksin; Hexazonium pararosaniline ; Pararosaniline ; Pararosaniline monoacetate ; Pararosaniline monohydrochloride ; Pararosaniline monohydroiodide ;</p>		DNA damage in bacteria, hypertrophy of thyroid in rats and mice [50].

	<p>Pararosaniline mononitrate; 4-((4-aminophenyl)(4-imino-2,5-cyclohexadien-1-ylidene)methyl)benzeneamine monohydrochloride ; alpha-(4-aminophenyl)-alpha-(4-imino-2,5-cyclohexadien-1-ylidene)-4-toluidine monohydrochloride</p> <p><b>CB Number:</b> CB1737503</p> <p><b>Molecular Formula:</b> C<sub>19</sub>H<sub>17</sub>N<sub>3</sub>.ClH</p> <p><b>Formula Weight:</b> 323.82</p> <p><b>MOL File:</b> 569-61-9.mol</p>		
32	<p><b>C.I. Disperse Blue 373</b></p> <p><b>Class :</b> Azo</p> <p><b>CAS No.</b> 51868-46-3</p> <p><b>Synonyms:</b> Disperse Blue 291G; Ccris 9042; Einecs 257-486-4; C.I. Disperse Blue 291G press cake; 2-Acetylamino-2'-bromo-4-diallylamino-5-methoxy-4',6'-dinitroazobenzene; 2'-(2-Bromo-4,6-dinitrophenylazo)-5'-diallylamino-4'-methoxyacetanilide;2'-(2-Bromo-4,6-dinitrophenylazo)-4'-methoxy-5'-(diallylamino)acetanilide;2-(Acetylamino)-2'-bromo-4-(diallylamino)-4',6'-dinitro-5-methoxyazobenzene;N-[2-[(2-bromo-4,6-dinitrophenyl)azo]-5-(diallylamino)-4-methoxyphenyl]acetamide; C.I. Disperse Blue 373 ; CCRIS 9042 ; EINECS 257-486-4 ; 51868-46-3 ; n-{2-[(e)-(2-bromo-4,6-dinitrophenyl)diazenyl]-5-(diprop-2-en-1-ylamino)-4-methoxyphenyl}acetamide ; Acetamide, N-(2-((2-bromo-4,6-dinitrophenyl)azo)-5-(di-2-propenylamino)-4-methoxyphenyl)- ; N-(2-((2-Bromo-4,6-</p>		<p>Mutagenic effects: 6300 revertants/μg for YG1041 with S9, responsibility for 55% of the mutagenic effects of the Drinking Water Treatment Plant sludge [37,61].</p>

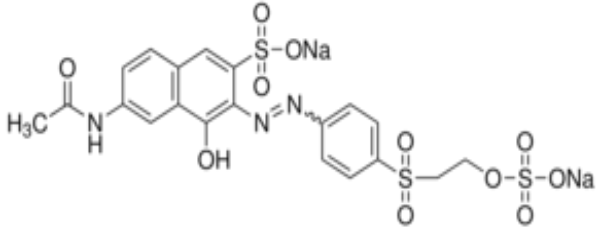
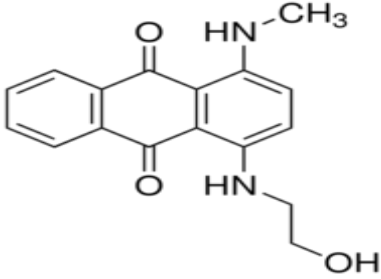


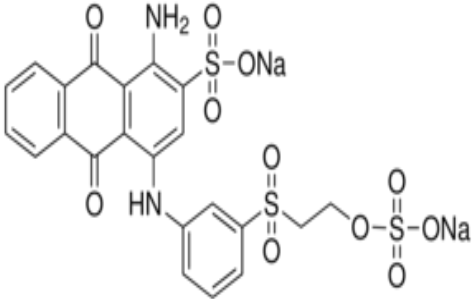
	<p>dinitrophenyl)azo)-5-(diallylamino)-4-methoxyphenyl]acetamide ; N-[5-[bis(prop-2-enyl)amino]-2-[(2-bromo-4,6-dinitrophenyl)diazenyl]-4-methoxyphenyl]acetamide ; Acetamide, N-[2-[(2-bromo-4,6-dinitrophenyl)azo]-5-(di-2-propenylamino)-4-methoxyphenyl]- ; DisperseBlue291G; 51868-46-3 ; Acetamide, N-(2-((2-bromo-4,6-dinitrophenyl)azo)-5-(di-2-propenylamino)-4-methoxyphenyl)- ; CCRIS 9042 ; EINECS 257-486-4 ; LS-167805 ; N-[2-(2-bromo-4,6-dinitro-phenyl)azo-5-(diallylamino)-4-methoxy-phenyl]acetamide; N-(2-((2-Bromo-4,6-dinitrophenyl)azo)-5-(diallylamino)-4-methoxyphenyl)acetamide ; N-[2-(2-bromo-4,6-dinitrophenyl)diazenyl-5-[di(prop-2-enyl)amino]-4-methoxyphenyl]acetamide ; N-[2-(2-bromo-4,6-dinitro-phenyl)diazenyl-5-[di(prop-2-enyl)amino]-4-methoxy-phenyl]ethanamide</p> <p><b>CB Number:</b> NA</p> <p><b>Molecular Formula:</b> C<sub>21</sub>H<sub>21</sub>BrN<sub>6</sub>O<sub>6</sub></p> <p><b>Formula Weight:</b> 533.332</p> <p><b>MOL File:</b> Mol file</p>		
33	<p><b>C.I. Disperse Orange 37</b></p> <p><b>Class :</b> Single azo</p> <p><b>CAS No.</b> 12223-33-5/13301-61-6</p> <p><b>Synonyms:</b> Disperse Orange 37; C.I. 11132; 3-[4-(2,6-Dichloro-4-nitrophenylazo)-N-ethylanilino]propionitrile</p> <p><b>CB Number:</b> CB5968848</p> <p><b>Molecular Formula:</b> C<sub>17</sub>H<sub>15</sub>Cl<sub>2</sub>N<sub>5</sub>O<sub>2</sub></p>		<p>Mutagenic response, 280 revertants/μg for YG1041 with S9 [37,61].</p>

	<p><b>Formula Weight:</b> 392.245</p> <p><b>MOL File:</b> 12223-33-5.mol</p>		
34	<p><b>Acid violet 7</b></p> <p><b>Class :</b> Single azo</p> <p><b>CAS No.</b> 4321-69-1/ 4197-09-5</p> <p><b>Synonyms:</b> C.I. Acid Violet 7; C.I. 18055; Acid Red 6B; Acid Violet 6B; Acid Fast Red E 6B; Acid Fuchsine 6B ; Pontacyl Carmine 6B; 1425 Red; 2,7-naphthalenedisulfonicacid,5-(acetlamino)-3-((4-(acetlamino)phenyl)azo);5-(acetlamino)-3-[[4-(acetlamino)phenyl]azo]-7-naphthalenedisulfonicacid; acetyl Red 6B; Acetyl Rose 5BL; Acetyl Rose 6BL; Acid Fast Red E6B; AC1NSFZG ; 210668 Aldrich ; 4321-69-1 ; 5-(Acetylamino)-3-[[4-(acetlamino) phenyl] azo]-4-hydroxy-2,7-naphthalenedisulfonic acid disodium salt ; dipotassium 5-acetamido-3-[2-(4-acetamidophenyl)diazene-1-yl]-4-hydroxynaphthalene-2,7-disulfonate ; disodium (3E)-5-acetamido-3-[(4-acetamidophenyl)hydrazinylidene]-4-oxonaphthalene-2,7-disulfonate</p> <p><b>CB Number:</b> CB0225054</p> <p><b>Molecular Formula:</b> C<sub>20</sub>H<sub>16</sub>N<sub>4</sub>Na<sub>2</sub>O<sub>9</sub>S<sub>2</sub></p>		<p>Mutagenic, genotoxic and anti-butyrylcholinesterasic effects [62,63]. Induce chromosome aberration, lipid peroxidation and cholinesterase inhibition in mouse bone marrow [64].</p>

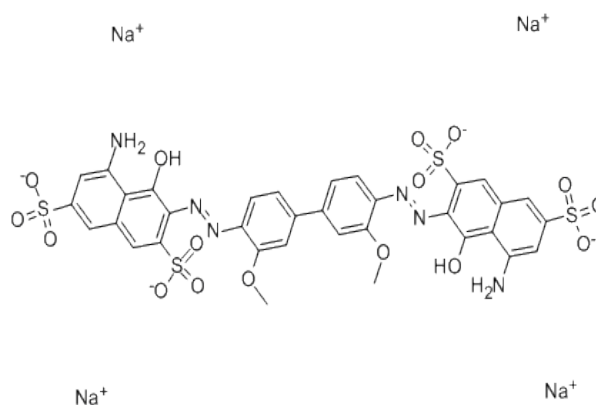
	<p><b>Formula Weight:</b> 566.47</p> <p><b>MOL File:</b> 4321-69-1.mol</p>		
<b>Eco toxicological effect</b>			
35	<p><b>Reactive blue 160</b></p> <p><b>Class :</b> Azo, Metal Complexes</p> <p><b>CAS No.</b> 71872-76-9</p> <p><b>Synonyms:</b> C.I. 137160; C.I. Reactive Blue 160; Reactive Navy Blue KE-4BD; Reactive Blue KE-2B; Reactive Blue KE-RD; Blue H-ERD; Evercion Blue H-ERD; Procion Blue H-ERD; Blue H-ERD; Reactive Navy Blue KE-4BD; Blue KE-2B; Reactive blue 160; Procion Blue H-ERD; Reactive Blue HERD; C.I. Reactive Black 160; Benzoic acid, 2-3-4-chloro-6-4-4-chloro-6-(3-sulfophenyl)amino-1,3,5-triazin-2-ylamino-2,5-disulfophenylamino-1,3,5-triazin-2-ylamino-2-hydroxy-5-sulfophenylazophenylmethylazo-5-sulfo-, pentasodium salt; 2-[2-[[2-[3-[[4-Chloro-6-[[4-[[4-chloro-6-[(3-sulfophenyl)amino]-1,3,5-triazin-2-yl]amino]-2,5-disulfophenyl]amino]-1,3,5-triazin-2-yl]amino]-2-hydroxy-5-sulfophenyl]diazenyl]phenylmethyl]diazenyl]-5-sulfobenzoic acid sodium salt; ;Benzoic acid, 2-[[[3-[[4-chloro-6-[[4-[[4-chloro-6-[(3-sulfophenyl)amino]-1,3,5-</p>		<p>Toxic effects were evaluated by bioluminescence test using bacteria <i>Vibrio fischeri</i> in LUMISTox 300 [65].</p>

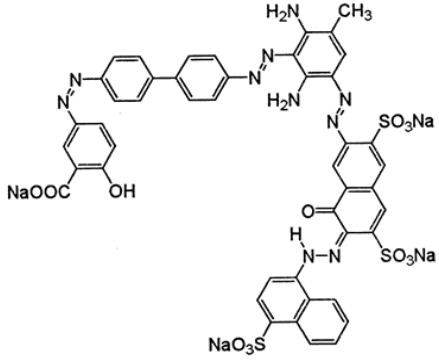
	<p>triazin-2-yl]amino]-2,5-disulfophenyl]amino]-1,3,5-triazin-2-yl]amino]-2-hydroxy-5-sulfophenyl]azo]phenylmethyl]azo]-5-sulfo-,pentasodium salt (9CI)</p> <p><b>CB Number:</b> CB1417515</p> <p><b>Molecular Formula:</b> C<sub>38</sub>H<sub>23</sub>Cl<sub>2</sub>N<sub>14</sub>Na<sub>5</sub>O<sub>18</sub>S<sub>5</sub></p> <p><b>Formula Weight:</b> 1309.84</p> <p><b>MOL File:</b> NA</p>		
36	<p><b>Ambifix yellow VRNL</b></p> <p><b>Class :</b> NA</p> <p><b>CAS No.</b> NA</p> <p><b>Synonyms:</b> NA</p> <p><b>CB Number:</b> NA</p> <p><b>Molecular Formula:</b> NA</p> <p><b>Formula Weight:</b> NA</p> <p><b>MOL File:</b> NA</p>	NA	Toxic effects were evaluated by bioluminescence test using bacteria <i>Vibrio fischeri</i> in LUMISTox 300, with EC <sub>50</sub> =22 mg/L [65].
37	<p><b>Lanasyn yellow S2GL</b></p> <p><b>Class :</b> NA</p> <p><b>CAS No.</b> NA</p> <p><b>Synonyms:</b> NA</p> <p><b>CB Number:</b> NA</p> <p><b>Molecular Formula:</b> NA</p> <p><b>Formula Weight:</b> NA</p> <p><b>MOL File:</b> NA</p>	NA	Toxic effects were evaluated by bioluminescence test using bacteria <i>Vibrio fischeri</i> in LUMISTox 300, with EC <sub>50</sub> =70 mgL <sup>-1</sup> [65].

<p>38</p>	<p><b>Reactive orange 16</b></p> <p><b>Class :</b> Single azo</p> <p><b>CAS No.</b> 12225-83-1</p> <p><b>Synonyms:</b> C.I. 17757; Ambifix Orange V3R; Orange KN-5R; Reactive Orange 3R; Remazol Brilliant Orange 3R; Reactive Brilliant Orange KN-5R; Reactive Orange KN-5R</p> <p><b>CB Number:</b> CB6108027</p> <p><b>Molecular Formula:</b> C<sub>20</sub>H<sub>17</sub>N<sub>3</sub>Na<sub>2</sub>O<sub>11</sub>S<sub>3</sub></p> <p><b>Formula Weight:</b> 617.54</p> <p><b>MOL File:</b> Mol file</p>	 <p>The chemical structure of Reactive orange 16 is a complex azo dye. It features a central benzene ring with a hydroxyl group (-OH) at the 4-position and an acetamido group (-NHCOCH<sub>3</sub>) at the 6-position. This ring is connected via an azo group (-N=N-) to another benzene ring. This second benzene ring has a sodium sulfonate group (-SO<sub>3</sub>Na) at the 4-position and a propylsulfonate group (-SO<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>OSO<sub>3</sub>Na) at the 2-position.</p>	<p>Mutagenic effects were determined in the presence or absence of S9 metabolic activation [66].</p>
<p>39</p>	<p><b>Disperse blue 3</b></p> <p><b>Class :</b> Anthraquinone</p> <p><b>CAS No.</b> 2475-46-9</p> <p><b>Synonyms:</b> C.I. Disperse Blue 3 ; C.I. 61505; Blue FFR; 1-ma-4oeaa; Abcol Blue BNG; Amacel Blue BNN; Disperse Blue K; Setacyl Blue BN; Setacyl Blue FG; Setacyl Blue RF; Artisil Blue BSG</p> <p><b>CB Number:</b> CB7372470</p> <p><b>Molecular Formula:</b> C<sub>17</sub>H<sub>16</sub>N<sub>2</sub>O<sub>3</sub></p> <p><b>Formula Weight:</b> 296.32</p> <p><b>MOL File:</b> 2475-46-9.mol</p>	 <p>The chemical structure of Disperse blue 3 is an anthraquinone derivative. It consists of two benzene rings fused to a central quinone ring. The left benzene ring is unsubstituted. The right benzene ring has a methylamino group (-NHCH<sub>3</sub>) at the 8-position and a 2-hydroxyethylamino group (-NHCH<sub>2</sub>CH<sub>2</sub>OH) at the 7-position.</p>	<p>Disperse blue 3 was toxic in the bacterial, algal and protozoan tests. This dye exhibited mutagenic effects after metabolic activation <i>in vitro</i> using Ames test with bacterium <i>Salmonella typhimurium</i> His(-) [66].</p>

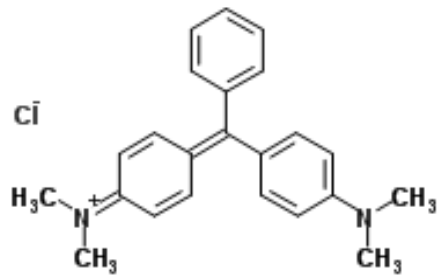
40	<p><b>Remazol Brilliant Blue R</b></p> <p><b>Class :</b> Anthraquinone</p> <p><b>CAS No.</b> 2580-78-1</p> <p><b>Synonyms:</b> C.I. 61200; C.I. Reactive Blue 19; Reactive Blue 19 ; Remazol Brilliant Blue R ; Remalzol Brilliant Blue R salt; 2580-78-1 ; Sure CN29532 ; AGN-PC-0D6XTR ; UNII-L51IMM9UP9 ; Remalan Brilliant Blue R ; Cavalite Brilliant Blue R ; CCRIS 3736; C.I. 61200 ; HSDB 5534 ; EINECS 219-949-9 ; C.I. Reactive Blue 19, disodium salt ; disodium 1-amino-9,10-dioxo-4-[3-(2-sulfonatoxyethylsulfonyl)anilino]anthracene-2-sulfonate ; 122392-55-6 ; 2-(3-((4-Amino-9,10-dihydro-3-sulpho-9,10-dioxoanthracen-4-yl)amino)benzenesulphonyl)vinyl disodium sulphate ; 2-Anthracenesulfonic acid, 1-amino-9,10-dihydro-4-(m-((2-hydroxyethyl)sulfonyl)anilino)-9,10-dioxo-, hydrogen sulfate (ester), disodium salt</p> <p><b>CB Number:</b></p> <p><b>Molecular Formula:</b> C<sub>22</sub>H<sub>16</sub>N<sub>2</sub>Na<sub>2</sub>O<sub>11</sub>S<sub>3</sub></p> <p><b>Formula Weight:</b> 626.54</p> <p><b>MOL File:</b> NA</p>		<p>Low toxicity was determined <i>in vitro</i> using Ames test with bacterium <i>Selenastrum capricornutum</i> [66].</p>
41	<p><b>Direct Blue 15</b></p> <p><b>Class :</b> Double azo</p> <p><b>CAS No.</b> 2429-74-5</p> <p><b>Synonyms:</b> C.I. 24400; ncic 61290; Sky Blue 4B; Sky Blue 5B; Paper Blue S; LIGHT BLUE; Direct Blue HH; Airedale Blue D; AIREDALE BLUE D ; AIZEN DIRECT SKY BLUE 5B; AIZEN DIRECT SKY BLUE 5BH ;</p>		<p>Direct Blue 15 caused mutagenic effects for TA1538 without exogenous activation [67].</p>

AMANIL SKY BLUE; ATLANTIC SKY BLUE A; ATUL  
 DIRECT SKY BLUE; AZINE SKY BLUE 5B;  
 BELAMINE SKY BLUE A; BENZANIL SKY BLUE;  
 BENZO SKY BLUE A-CF; BENZO SKY BLUE S;  
 BIS(AZO))BIS(5-AMINO-4-HYDROXY-,  
 TETRASODIUM SALT; C.I. 24400; C.I. DIRECT BLUE  
 15; C.I. DIRECT BLUE 15, TETRASODIUM SALT;  
 CARTASOL BLUE 2GF; CHLORAMINE SKY BLUE  
 4B; CHLORAMINE SKY BLUE A; CHROME  
 LEATHER PURE BLUE; CRESOTINE PURE BLUE ;  
 DIACOTTON SKY BLUE 5B; DIAMINE BLUE 6B;  
 DIAMINE SKY BLUE; DIAMINE SKY BLUE CI;  
 DIAPHTAMINE PURE BLUE; DIAZOL PURE BLUE  
 4B; 3,3'-((3,3'-DIMETHOXY-4,4'-  
 BIPHENYLYLENE)BIS(AZO))BIS(5-AMINO-4-  
 HYDROXY-2,7-NAPHTHALENEDISULFONIC ACID),  
 TETRASODIUM SALT; DIPHENYL BRILLIANT  
 BLUE; DIPHENYL SKY BLUE 6B; DIRECT BLUE 10G;  
 DIRECT BLUE 15; DIRECT BLUE FFN; DIRECT BLUE  
 HH; DIRECT LAKE BLUE 5B; DIRECT PURE BLUE;  
 DIRECT PURE BLUE M; DIRECT SKY BLUE; DIRECT  
 SKY BLUE 5B; DIRECT SKY BLUE A; ENIANIL PURE  
 BLUE AN; FENAMIN SKY BLUE; HISPAMIN SKY  
 BLUE 3B; KAYAFECT BLUE Y; KAYAKU DIRECT  
 SKY BLUE 5B; MITSUI DIRECT SKY BLUE 5B;  
 NAPHTAMINE BLUE 10G; 2,7-  
 NAPHTHALENEDISULFONIC ACID, 3,3'-((3,3'-

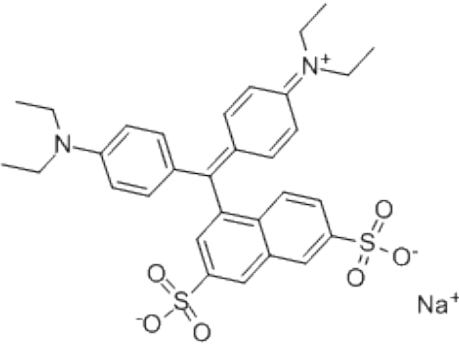


	<p>DIMETHOXY-4,4'-BIPHENYLYLENE)-; NCI-C61290; NIAGARA BLUE 4B; NIAGARA SKY BLUE; NIPPON DIRECT SKY BLUE; NIPPON SKY BLUE; NITTO DIRECT SKY BLUE 5B; OXAMINE SKY BLUE 5B; PAPER BLUE S; PHENAMINE SKY BLUE A; PONTACYL SKY BLUE 4BX; PONTAMINE SKY BLUE 5BX; SHIKISO DIRECT SKY BLUE 5B; SKY BLUE 4B; SKY BLUE 5B; TERTRODIRECT BLUE F; VONDACEL BLUE HH</p> <p><b>CB Number:</b> CB6152242</p> <p><b>Molecular Formula:</b> C<sub>34</sub>H<sub>24</sub>N<sub>6</sub>Na<sub>4</sub>O<sub>16</sub>S<sub>4</sub></p> <p><b>Formula Weight:</b> 992.8</p> <p><b>MOL File:</b> 2429-74-5.mol</p>		
42	<p><b>Direct brown 31</b></p> <p><b>Class:</b> Multi-azo</p> <p><b>CAS No.</b> 2429-81-4</p> <p><b>Synonyms:</b> C.I. 35660; C.I. Direct Brown 31 (7CI); C.I. Direct Brown 31,tetrasodium salt (8CI); Airedale Brown BSD; Amanil Fast Brown HP; Amanil Rayon Brown B; Atlantic Brown BCW; Atlantic Brown BP; Belamine Fast Brown BP; Benzanil Brown BS; Benzo Deep Brown NZ; Calcomine Brown B; Calcomine Catechu 2B; Chlorazol Brown LF; Chocolate EMBL; Chrome Leather Brown BS; Cupranil Brown BCW; Cupranil Brown BCWR; Diaphtamine Fast Brown TB; Diazol Cutch F; Diazol Cutch FB; Diphenyl Brown BS; Diphenyl Brown TB; Diphenyl Fast Brown F; Direct Brown 31; Direct Brown</p>		<p>Direct brown 31 caused mutagenic response for TA98 without exogenous activation [67].</p>



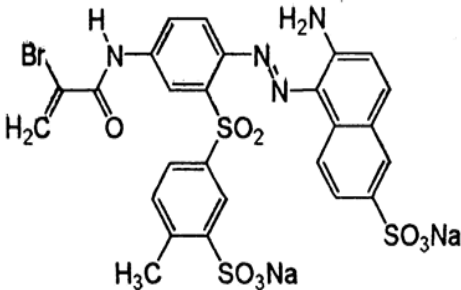
	<p>3B; Direct Brown B; Direct Brown BS; Direct Brown BSB; Direct Brown FS; Direct Brown TRB; Direct Fast Brown BP; Direct Fast Brown TSN; Direct Fast Brown TWC; Erie Fast Brown B; Fenamin Brown PBL; Fixanol Brown LF; Hispamin Fast Brown NZ; Phenamine Fast Brown T; Phenamine Fast Brown TWC; Pontamine Brown BCW; Pontamine Brown BT; Tetro direct Brown TB; Triazol Brown B; Trisulphone Brown B; Vegentine Fast Brown B; Vondacel Brown S; Vondacel Brown SP; Benzoicacid,5-[[4'-[[2,6-diamino-3-[[8-hydroxy-3,6-disulfo-7-(4-sulfo-1-naphthalenyl)azo]-2-naphthalenyl]azo]-5-methylphenyl]azo][1,1'-biphenyl]-4-yl]azo]-2-hydroxy-,tetrasodium salt (9Cl)</p> <p><b>CB Number:</b></p> <p><b>Molecular Formula:</b> C<sub>46</sub>H<sub>30</sub>N<sub>10</sub>Na<sub>4</sub>O<sub>13</sub>S<sub>3</sub></p> <p><b>Formula Weight:</b> 1118.95</p> <p><b>MOL File:</b> NA</p>		
43	<p><b>Malachite Green</b></p> <p><b>Class:</b> Azo</p> <p><b>CAS No.</b> 569-64-2</p> <p><b>Synonyms:</b> Basic green 4; C.I. 42000; Malachite Green benzoate; Malachite Green chloride; Malachite Green, acetate salt; Malachite Green, hydrogen sulfate; Malachite Green, oxalate (1:1); Malachite Green, oxalate (2:1); (4-(4-(dimethylamino) alpha-phenylbenzylidene)-2,5-cyclohexadien-1-ylidene) dimethylammonium chloride;</p> <p><b>CB Number:</b> NA</p>		<p>Sinusoidal congestion and focal necrosis in rainbow trout liver increase of nuclear alterations and mitochondrial damage [68]. Anaemic response in <i>Claris gariepinus</i> (Burchell) in dose and time dependent manner, reduction in the <i>Claris gariepinus neutrophils</i> [69,70].</p>

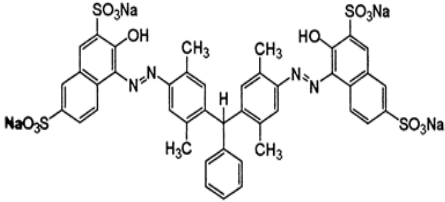
	<p><b>Molecular Formula:</b> C<sub>23</sub>H<sub>25</sub>ClN<sub>2</sub></p> <p><b>Formula Weight:</b> 364.91</p> <p><b>MOL File:</b> NA</p>		
44	<p><b>C.I. Disperse Violet 93</b></p> <p><b>Class:</b> Single azo</p> <p><b>CAS No.</b> 52697-38-8</p> <p><b>Synonyms:</b> Violet 5BS; Einecs 258-110-1; Disperse Violet 93; C.I. Disperse Violet 93 press cake; 2-(2,4-dinitro-6-bromophenylazo)-5-N,N-diethylamino-Acetanilide; 2'-[(2-Bromo-4,6-dinitrophenyl)azo]-5'-diethylamino]acetanilide; 2'-(Acetylamino)-6-bromo-4'-(diethylamino)-2,4-dinitroazobenzene; 2-(Acetylamino)-2'-bromo-4-(diethylamino)-4',6'-dinitroazobenzene; Acetanilide, 2-(2,4-dinitro-6-bromophenylazo)-5-N,N-diethylamino-; Acetamide, N-2-(2-bromo-4,6-dinitrophenyl)azo-5-(diethylamino)phenyl-</p> <p><b>CB Number:</b> CB1935921</p> <p><b>Molecular Formula:</b> C<sub>18</sub>H<sub>19</sub>BrN<sub>6</sub>O<sub>5</sub></p> <p><b>Formula Weight:</b> 479.28466</p> <p><b>MOL File:</b> 52697-38-8.mol</p>		<p>Mutagenic response was confirmed in the <i>Salmonella</i>/microsome assay with the strains TA98 and YG1041 (4600 revertants/μg with the metabolic activation system S9) [61].</p>
45	<p><b>Acid orange 52</b></p> <p><b>Class:</b> Single azo</p> <p><b>CAS No.</b> 547-58-0</p> <p><b>Synonyms:</b> C.I. 13025; Methyl Orange; Orange 3; Methyl Orange B; 4-Dimethylaminoazobenzene-4'-sulphonic acid sodium salt; Helianthin; Other CAS RN 1342-24-1; 66777-17-1</p>		<p>Mutagenic effects were confirmed with the use of <i>Salmonella Typhimurium</i>: 755 revertants / plates for TA104 with S9, 639 revertants/ plates for TA102 with the metabolic activation system (S9), induction DNA damage in</p>

	<p>Sodium 4-{{4-(dimethylamino)phenyl}diazanyl}benzenesulfonate;  Sodium 4-(4-dimethylaminophenylazo)benzenesulphonate; Tropaeolin D; p-((p-(Dimethylamino)phenyl)azo) benzenesulfonic acid sodium salt; Sodium 4-(Dimethylamino)azobenzene-4'-sulfonate; Sodium p-dimethylaminoazobenzenesulfonate</p> <p><b>CB Number:</b> CB2264381</p> <p><b>Molecular Formula:</b> C<sub>14</sub>H<sub>14</sub>N<sub>3</sub>NaO<sub>3</sub>S</p> <p><b>Formula Weight:</b> 327.33</p> <p><b>MOL File:</b> NA</p>		<p><i>vitro</i> using DNA strand scission assay [71].</p>
46	<p><b>Acid green 16</b></p> <p><b>Class:</b> Triarylmethane</p> <p><b>CAS No.</b> 12768-78-4</p> <p><b>Synonyms:</b> C.I. 44025; Erio Green B; Erio Green; Green V; Acid Green ZH; Amido Green V; Alkali Green; C.I. Acid Green 16; Acid Green 16; C.I. Acid Green 16; Acid Green VS; Acid Green V; Acid Green V Naphthaline; Borunil Green A-FG; Covalene Brilliant Green G; Daiwa Green 70; Dinacid Green V; Duasyn Acid Green V; Dyacid Green B; Dycosacid Green VS; Erio Green B; Everlan GreenEV; Hispacid Brilliant Green SA 2G; Ichoacid Green V; Lecotan Green J; Libacid Green LV; Merantine Green V; Naphthalene Green V; Naphthalene Green Y; Pacid Green V; Ratna Acid Green V; Sandolan Brilliant Green E-B; Simacid Acid Green; sodium 4-{{4-(diethylamino)phenyl}[4-(diethyliminio)cyclohexa-2,5-</p>		<p>Mutagenicity testing using <i>Salmonella typhimurium</i>, strains TA98 and TA100 with metabolic activation (S9), revealed a mutagenic response of Acid green 16. Upon further testing with the mouse lymphoma assay (L5178Y/TK (+/-)) 67% (6 out of 9) of Ames-positive this dye proved to be mutagenic in this mammalian cell test [72].</p>

	<p>dien-1-ylidene]methyl}naphthalene-2,7-disulfonate</p> <p><b>CB Number:</b> CB4117605</p> <p><b>Molecular Formula:</b> C<sub>31</sub>H<sub>33</sub>N<sub>2</sub>NaO<sub>6</sub>S<sub>2</sub></p> <p><b>Formula Weight:</b> 616.72</p> <p><b>MOL File:</b> 12768-78-4.mol</p>		
47	<p><b>Bemaplex Schwarz C-2B</b></p> <p><b>Class:</b> NA</p> <p><b>CAS No.</b> NA</p> <p><b>Synonyms:</b> NA</p> <p><b>CB Number:</b> NA</p> <p><b>Molecular Formula:</b> NA</p> <p><b>Formula Weight:</b> NA</p> <p><b>MOL File:</b>NA</p>	NA	Mutagenic response in <i>salmonella typhimurium</i> TA98 (Ames test) without metabolic activation (S9-mix), IR=111 with 5000 µg/plate [73].
48	<p><b>Bleu Terasil 3R-02</b></p> <p><b>Class:</b> NA</p> <p><b>CAS No.</b> NA</p> <p><b>Synonyms:</b> NA</p> <p><b>CB Number:</b> CB21403475</p> <p><b>Molecular Formula:</b> NA</p> <p><b>Formula Weight:</b> NA</p> <p><b>MOL File:</b>NA</p>	NA	Mutagenic activity in <i>salmonella typhimurium</i> TA98 (Ames test) without metabolic activation (S9-mix), IR =35.5. Mutagenicity of Bleu Terasil 3R-02 Ames-positive was confirmed in the mouse lymphoma assay (MLA) (OECD 476), IR 15.2 with 2,500 µg/mL without S9 [73].
49	<p><b>Brun Cibanone 2RMP</b></p> <p><b>Class:</b> NA</p> <p><b>CAS No.</b> NA</p> <p><b>Synonyms:</b> NA</p>	NA	Mutagenic effects in <i>salmonella typhimurium</i> TA98 (Ames test) without metabolic activation (S9-mix), IR=4.3 [73].

	<b>CB Number:</b> CB81440504 <b>Molecular Formula:</b> NA <b>Formula Weight:</b> NA <b>MOL File:</b> NA		
50	<b>Brun Cibanone BR MD liq. 40%</b> <b>Class:</b> NA <b>CAS No.</b> NA <b>Synonyms:</b> NA <b>CB Number:</b> CB71421588 <b>Molecular Formula:</b> NA <b>Formula Weight:</b> NA <b>MOL File:</b> NA	NA	Mutagenic effects in <i>salmonella typhimurium</i> TA98 (Ames test) without metabolic activation (S9-mix), IR=6.6 [73].
51	<b>Evercion Navy Blue H-ER</b> <b>Class:</b> NA <b>CAS No.</b> NA <b>Synonyms:</b> NA <b>CB Number:</b> CB11434171 <b>Molecular Formula:</b> NA <b>Formula Weight:</b> NA <b>MOL File:</b> NA	NA	Mutagenic effects in <i>salmonella typhimurium</i> TA98 (Ames test) without metabolic activation (S9-mix), IR >132 [73].

52	<p><b>Lanasol Red 6G</b></p> <p><b>Class:</b> Single azo</p> <p><b>CAS No.</b> 85187-33-3/61969-27-5</p> <p><b>Synonyms:</b> C.I. 13429; Reactive Red PW-6G; C.I. Reactive Red 84; Reactive Red 84; AGN-PC-0JPMK0 ; AC1L4N0W; CTK5F4446; EINECS 286-122-7; AG-K-39996; LS-54327; 2-Naphthalenesulfonic acid, 6-amino-5-((4-((2-bromo-1-oxo-2-propenyl)amino)-2-((4-methyl-3-sulfofenyl)sulfonyl)phenyl)azo)-, disodium salt; 2-Naphthalenesulfonic acid, 6-amino-5-(2-(4-((2-bromo-1-oxo-2-propen-1-yl)amino)-2-((4-methyl-3-sulfofenyl)sulfonyl)phenyl)diazenyl)-, sodium salt (1:2); 2-Naphthalenesulfonic acid, 6-amino-5-[2-[4-[(2-bromo-1-oxo-2-propen-1-yl)amino]-2-[(4-methyl-3-sulfofenyl)sulfonyl]phenyl]diazenyl]-, sodium salt (1:2); 61969-27-5; Disodium 6-amino-5-((4-((2-bromo-1-oxoallyl)amino)-2-((4-methyl-3-sulphonatophenyl)sulphonyl)phenyl)azo)naphthalene-2-sulphonate; disodium 6-amino-5-[[4-(2-bromoprop-2-enoylamino)-2-(4-methyl-3-sulphonatophenyl)sulfonylphenyl]diazenyl]naphthalene-2-sulfonate; disodium; 6-amino-5-[[4-(2-bromoprop-2-enoylamino)-2-(4-methyl-3-sulphonatophenyl)sulfonylphenyl]diazenyl]naphthalene-2-sulfonate</p> <p><b>CB Number:</b> CB1967621</p> <p><b>Molecular Formula:</b> C<sub>26</sub>H<sub>19</sub>BrN<sub>4</sub>Na<sub>2</sub>O<sub>9</sub>S<sub>3</sub></p>		<p>Mutagenicity testing using <i>Salmonella typhimurium</i>, strains TA100 (Ames test) without metabolic activation, revealed a mutagenic response of Lanasol Red 6G, IR =5.8 [73].</p>
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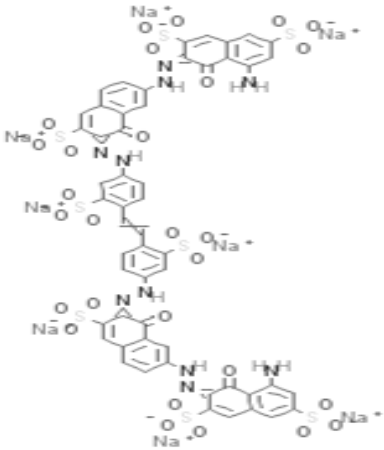
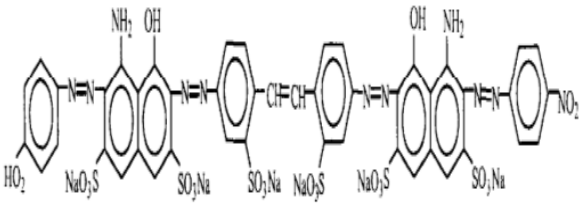
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53	<p><b>Lanasol Rot B</b></p> <p><b>Class:</b> Double azo</p> <p><b>CAS No.</b> 6459-71-8</p> <p><b>Synonyms:</b> Cotton Ponceau ; C.I. Acid Red 65; C.I.24830</p> <p><b>CBNumber:</b> CB71440552</p> <p><b>Molecular Formula:</b> C<sub>43</sub>H<sub>32</sub>N<sub>4</sub>Na<sub>4</sub>O<sub>14</sub>S<sub>4</sub></p> <p><b>Formula Weight:</b> 1048.96</p> <p><b>MOL File:</b> NA</p>		<p>Mutagenicity testing using <i>Salmonella typhimurium</i>, strains TA100 (Ames test) without metabolic activation, revealed a mutagenic response of Lanasol Rot B, IR= 3.6 [73].</p>
54	<p><b>Lumacron Black SEF 300%</b></p> <p><b>Class:</b> NA</p> <p><b>CAS No.</b> 776331-50-1</p> <p><b>Synonyms:</b> NA</p> <p><b>CB Number:</b> CB71416287</p> <p><b>Molecular Formula:</b> NA</p> <p><b>Formula Weight:</b> NA</p> <p><b>MOL File:</b>NA</p>	NA	<p>Mutagenicity testing using <i>Salmonella typhimurium</i>, strains TA98 (Ames test) in the presence of metabolic activation confirmed a mutagenic response of this dye, IR= 41.8 [73].</p>
55	<p><b>Olive Cibanone 2R MD</b></p> <p><b>Class:</b> NA</p> <p><b>CAS No.</b> 776331-77-2</p> <p><b>Synonyms:</b> NA</p> <p><b>CB Number:</b> CB31447018</p> <p><b>Molecular Formula:</b> NA</p> <p><b>Formula Weight:</b> NA</p> <p><b>MOL File:</b>NA</p>	NA	<p>Mutagenic effects in <i>salmonella typhimurium</i> TA98 (Ames test) without metabolic activation (S9-mix), IR=2.4 [73].</p>

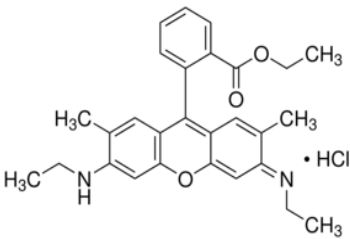
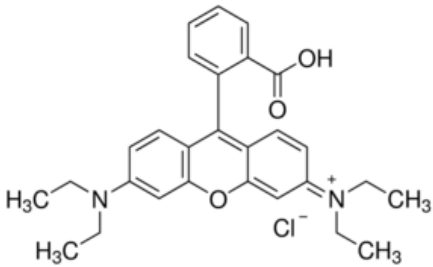
56	<b>Orange Minerprint 3RL</b> <b>Class:</b> NA <b>CAS No.</b> NA <b>Synonyms:</b> NA <b>CB Number:</b> CB21434820 <b>Molecular Formula:</b> NA <b>Formula Weight:</b> NA <b>MOL File:</b> NA	NA	Orange Minerprint 3RL caused a mutagenic against effect in the bacterial strain TA98 (Ames test) without of metabolic activation (S9-mix), IR=10.7 [73].
57	<b>Lumacron Red PGA</b> <b>Class:</b> NA <b>CAS No.</b> 776331-72-7 <b>Synonyms:</b> NA <b>CB Number:</b> CB11441461 <b>Molecular Formula:</b> NA <b>Formula Weight:</b> NA <b>MOL File:</b> NA	NA	Mutagenic effects in <i>salmonella typhimurium</i> strain TA98 (Ames test) with metabolic activation (S9-mix), IR=5.9 [73].
58	<b>Rouge Imperon K-B</b> <b>Class:</b> NA <b>CAS No.</b> NA <b>Synonyms:</b> NA <b>CB Number:</b> CB61415016 <b>Molecular Formula:</b> NA <b>Formula Weight:</b> NA <b>MOL File:</b> NA	NA	Mutagenic effects in <i>salmonella typhimurium</i> strain TA98 (Ames test) with metabolic activation (S9-mix), IR=9.0 [73].
59	<b>Rouge Terasil P3G</b> <b>Class:</b> NA	NA	Mutagenic effects in <i>salmonella typhimurium</i> strain TA98 (Ames

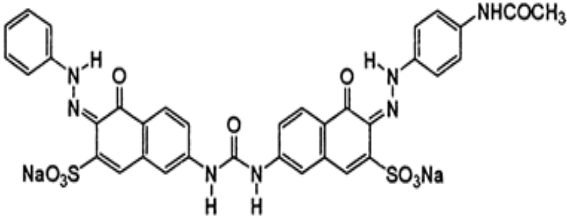


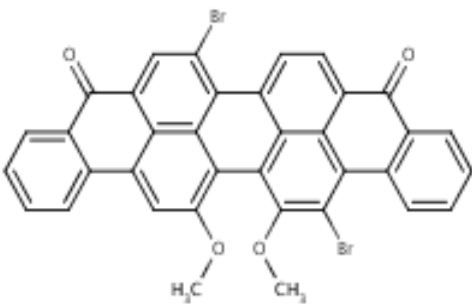
	<b>CAS No.</b> NA <b>Synonyms:</b> NA <b>CB Number:</b> CB91445405 <b>Molecular Formula:</b> NA <b>Formula Weight:</b> NA <b>MOL File:</b> NA		test) without metabolic activation (S9-mix), IR=77.7 [73].
60	<b>Sirius Grau K-CGL</b> <b>Class:</b> NA <b>CAS No.</b> NA <b>Synonyms:</b> NA <b>CB Number:</b> CB01446621 <b>Molecular Formula:</b> NA <b>Formula Weight:</b> NA <b>MOL File:</b> NA	NA	Mutagenic against effects in <i>salmonella typhimurium</i> strain TA98 (Ames test) without metabolic activation (S9-mix), IR= 6.0 [73].
61	<b>Turquoise Cibacrone P-GR Liq. 50%</b> <b>Class:</b> Phthalocyanine <b>CAS No.</b> 61968-93-2 <b>Synonyms:</b> C.I. Reactive Blue 72 <b>CB Number:</b> CB51406462 <b>Molecular Formula:</b> NA <b>Formula Weight:</b> NA <b>MOL File:</b> NA	NA	Mutagenic effects in <i>salmonella typhimurium</i> TA98 (Ames test) with metabolic activation (S9-mix), IR =2.6. Positive mutagenicity of Turquoise Cibacrone P-GR Liq. 50% Ames-positive was confirmed in the mouse lymphoma assay (MLA) (OECD 476), IR= 15.2 with 5,000 µg/mL with S9 [73].
62	<b>Erionyl Bordeaux A-5B</b>	NA	Positive mutagenicity of Erionyl

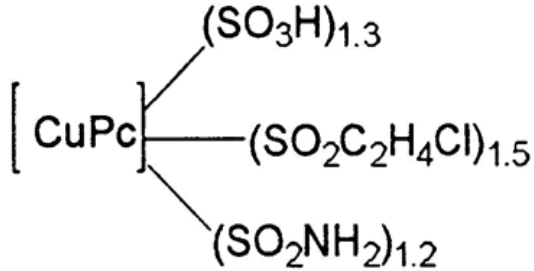
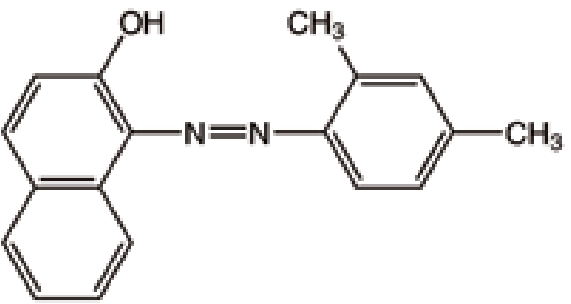
	<b>Class:</b> NA <b>CAS No.</b> NA <b>Synonyms:</b> NA <b>CB Number:</b> CB41423415 <b>Molecular Formula:</b> NA <b>Formula Weight:</b> NA <b>MOL File:</b> NA		Bordeaux A-5B Ames-positive was confirmed in the mouse lymphoma assay (MLA) (OECD 476), IR= 9.5 with 625 µg/mL with S9 [73].
63	<b>Bemaplex Black C-2B</b> <b>Class:</b> NA <b>CAS No.</b> 776334-28-2 <b>Synonyms:</b> NA <b>CBNumber:</b> CB91432870 <b>Molecular Formula:</b> NA <b>Formula Weight:</b> NA <b>MOL File:</b> NA	NA	Positive mutagenicity of Bemaplex Black C-2B Ames-positive was confirmed in the mouse lymphoma assay (MLA) (OECD 476), IR= 4.1 with 313 µg/mL without S9 [73].
64	<b>Astrazon Blue FGRL 200%</b> <b>Class:</b> NA <b>CAS No.</b> NA <b>Synonyms:</b> NA <b>CBNumber:</b> CB71406976 <b>Molecular Formula:</b> NA <b>Formula Weight:</b> NA <b>MOL File:</b> NA	NA	Positive mutagenicity of Astrazon Blue FGRL 200% Ames-positive was confirmed in the mouse lymphoma assay (MLA) (OECD 476), IR= 2.2 with 50 µg/mL without S9 [73].
65	<b>Astrazon Blue BG 200%01</b> <b>Class:</b> NA <b>CAS No.</b> NA	NA	Positive mutagenicity of Astrazon Blue BG 200%01 Ames-positive was confirmed in

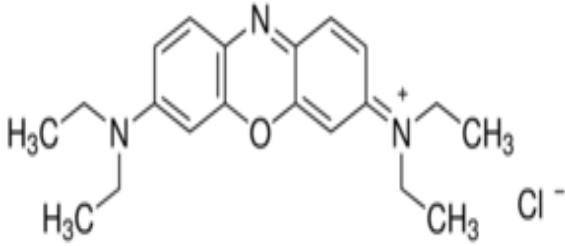
	<p><b>Synonyms:</b> NA</p> <p><b>CBNumber:</b> CB41420393</p> <p><b>Molecular Formula:</b> NA</p> <p><b>Formula Weight:</b> NA</p> <p><b>MOL File:</b> NA</p>		<p>the mouse lymphoma assay (MLA) (OECD 476), IR= 7.4 with 40 µg/mL without S9 [73].</p>
66	<p><b>Direct Blue 297</b></p> <p><b>Class:</b> Double azo</p> <p><b>CAS No.</b> 100358-00-7</p> <p><b>Synonyms:</b> C.I. Disperse Blue 297 ; 130640-96-9</p> <p><b>CB Number:</b> NA</p> <p><b>Molecular Formula:</b> C<sub>54</sub>H<sub>30</sub>N<sub>10</sub>Na<sub>8</sub>O<sub>28</sub>S<sub>8</sub></p> <p><b>Formula Weight:</b> 1707.304354</p> <p><b>MOL File:</b> NA</p>		<p>Direct Blue 297 at doses 40% and 80% LD<sub>50</sub>/kg body weight, cause a significant decrease in the ratio of polychromatic to normochromatic erythrocytes in bone marrow of mice, which means that at the doses specified above they can affect the proliferation of the blood cells [74].</p>
67	<p><b>Direct Green 98</b></p> <p><b>Class:</b> Azo</p> <p><b>CAS No.</b> 101507-77-1</p> <p><b>Synonyms:</b> 2,7-Naphthalenedisulfonic acid,3,3'-[1,2-ethenediylbis[(3-sulfo-4,1-phenylene)azo]]bis[5-amino-4-hydroxy-6-[(4-nitrophenyl)azo]-, hexasodium salt</p> <p><b>CB Number:</b> NA</p> <p><b>Molecular Formula:</b> NA</p> <p><b>Formula Weight:</b> NA</p> <p><b>MOL File:</b> NA</p>		<p>Direct Green 98 at dose 80% LD<sub>50</sub>/kg body weight, cause a significant decrease in the ratio of polychromatic to normochromatic erythrocytes in bone marrow of mice, which means that at the doses specified above they can affect the proliferation of the blood cells [74].</p>

68	<p><b>Rhodamine 6G</b></p> <p><b>Class:</b> Azo</p> <p><b>CAS No.</b> 989-38-8</p> <p><b>Synonyms:</b> Basic Red 1</p> <p><b>CB Number:</b> NA</p> <p><b>Molecular Formula:</b> C<sub>28</sub>H<sub>31</sub>N<sub>2</sub>O<sub>3</sub>Cl</p> <p><b>Formula Weight:</b> 479,01</p> <p><b>MOL File:</b> NA</p>		<p>Caused mutagenic effects in <i>Salmonella typhimurium</i> strains TA1538, TA98, TA1537 and TA100 with metabolic activation S9, and single-strand breaks in Chinese hamster ovary cells at concentration of <math>9 \times 10^{-5}</math> M, as detected by alkaline sucrose sedimentation [75].</p>
69	<p><b>Rhodamine B</b></p> <p><b>Class:</b> Azo</p> <p><b>CAS No.</b> 81-88-9</p> <p><b>Synonyms:</b> Basic Violet 10; Brilliant Pink B; Tetraethylrhodamine; Rhodamine O; Rhodamine; Rheonine B; Rhodamine B; Rhodamine B acetate; Rhodamine B chloride; Rhodamine B dihydride; Basic Violet 10; Brilliant Pink B; 9-(2-Carboxyphenyl)-6-(diethylamino)-N,N-diethyl-3H-xanthen-3-iminium chloride;</p> <p><b>CB Number:</b> CB7485569</p> <p><b>Molecular Formula:</b> C<sub>28</sub>H<sub>31</sub>ClN<sub>2</sub>O<sub>3</sub></p> <p><b>Formula Weight:</b> 479.01034</p> <p><b>MOL File:</b> NA</p>		<p>Rhodamine B induce His* reversion mutations in Salmonella strains TA1538 and TA98 with doses ranging from 0.25 to 2.0 mg/plate and single-strand breaks in Chinese hamster ovary cells, as detected by alkaline sucrose sedimentation [75].</p>
70	<p><b>Sulphur Red Brown 360</b></p>	NA	Mutagenic effects for dose ranges

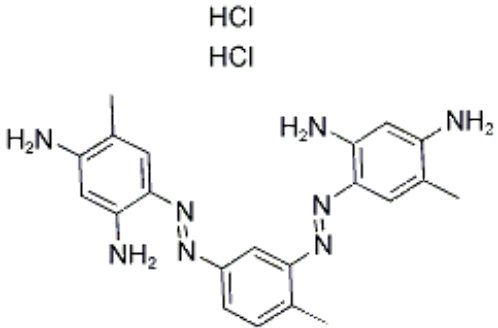
	<p><b>Class:</b> NA  <b>CAS No.</b> NA  <b>Synonyms:</b> NA  <b>CB Number:</b> NA  <b>Molecular Formula:</b> NA  <b>Formula Weight:</b> NA  <b>MOL File:</b> NA</p>		<p>of 50–250 µg/zone without metabolic activation (S9-mix) and 25–50 µg/zone with metabolic activation (S9-mix). Genotoxic effects were determined by <i>Bacillus subtilis</i> spore Rec assay in the presence and absence of metabolizing activation mixture (S9-mix) [76].</p>
71	<p><b>Direct Scarlet 4BS</b>  <b>Class:</b> Double azo  <b>CAS No.</b> 3441-14-3  <b>Synonyms:</b> C.I.29160; Direct Red 23; Polycor Red SE; Scarlet 4BS; Direct Scarlet SE; Wogenal Scarlet CB; Benzo Scarlet 4BS; Fast scarlet 4BSA; Direct Fast Scarlet 4BS; disodium; 4-oxo-3-[[4-(2-oxoethylamino)phenyl]hydrazinylidene]-6-[[[(6E)-5-oxo-6-(phenylhydrazinylidene)-7-sulfonatophthalen-2-yl]carbamoylamino]naphthalene-2-sulfonate];  <b>CB Number:</b> CB7307601  <b>Molecular Formula:</b> C<sub>35</sub>H<sub>25</sub>N<sub>7</sub>Na<sub>2</sub>O<sub>10</sub>S<sub>2</sub>  <b>Formula Weight:</b> 813.72  <b>MOL File:</b> NA</p>		<p>Genotoxic effects were determined by <i>Bacillus subtilis</i> spore Rec assay with and without of metabolizing activation mixture (S9-mix) [76].</p>

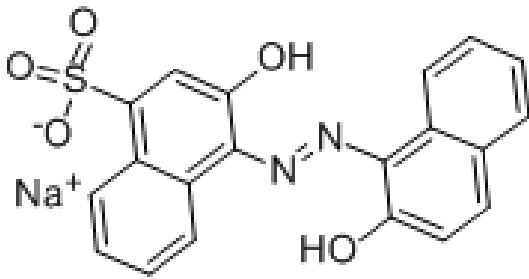
72	<p><b>Jade Green 2G</b></p> <p><b>Class:</b> NA</p> <p><b>CAS No.</b> 25704-81-8</p> <p><b>Synonyms:</b> Ahcovat Jade Green 2G ; Amanthrene Brilliant Green GG ; Anthraquinone Brilliant Green Concentrate ZH; Atic Vat Jade Green 2G; Benzadone Jade Green 2G; Brilliant Green ZH; Caledon Jade Green 2G; Caledon Printing Jade Green 2G; Cibanone Brilliant Green F2GF; EINECS 247-192-4; Helanthrene Green 2G; Indanthren Brilliant Green 3GF; Indanthren Brilliant Green GG; Mikethrene Brilliant Green GG; Navinon Jade Green 2G; Nihonthrene Brilliant Green GG ; Palanthrene Brilliant Green 3GF; Paradone Jade Green 2G; Pigment Anthraquinone Brilliant Green Conc. ZH ; Pigment Brilliant Green Anthraquinone Conc. ZH ; Ponsol Brilliant Green 2G ; Romantrene Brilliant Green 2G ; Romantrene Brilliant Green F2G ; Sandothrene Brilliant Green N2GF; Solanthrene Brilliant Green J; Tinon Brilliant Green 2GF; Tyrian Brilliant Green I-2G; Vat Brilliant Green ZH; Zelen kypova 2; Zelen kypova 2 [Czech]; Zelen ostanthrenova brilantni 2 G; Zelen ostanthrenova brilantni 2 G [Czech]; Anthra(9,1,2-cde)benzo(rst)pentaphene-5,10-dione, dibromo-16,17-dimethoxy-; Dibromo-16,17-dimethoxyanthra(9,1,2-cde)benzo(rst)pentaphene-5,10-dione; Dinaphtho(1,2,3-cd:3',2',1'-lm)perylene-5,10-dione, dibromo-16,17-dimethoxy</p> <p><b>CB Number:</b> CB0875174</p>	 <p>The image shows the chemical structure of Jade Green 2G, which is a perylene derivative. It consists of a central perylene core with two bromine atoms (Br) at positions 16 and 17, and two methoxy groups (OCH<sub>3</sub>) at positions 5 and 10.</p>	<p>Genotoxic effects were determined by <i>Bacillus subtilis</i> spore Rec assay. Jade Green 2G was less genotoxic in the absence of metabolizing activation mixture (S9-mix) mix, however, its genotoxic potential increased in the presence of S9 [76].</p>
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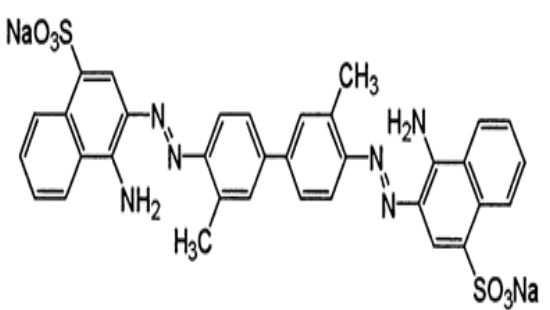
	<p><b>Molecular Formula:</b> C<sub>36</sub>H<sub>18</sub>Br<sub>2</sub>O<sub>4</sub></p> <p><b>Formula Weight:</b> 674.3422</p> <p><b>MOL File:</b> NA</p>		
73	<p><b>Reactofix Turquoise Blue 5GFL</b></p> <p><b>Class:</b> Phthalocyanine</p> <p><b>CAS No.</b> 12236-87-2</p> <p><b>Synonyms:</b> C.I. Reactive Blue 25; Reactive Blue 25; Chemictive Turquoise Blue 5GH; Procion Brilliant Blue H 5G; Procion Turquoise H 5G; Reactive Turquoise Blue H 5G</p> <p><b>CB Number:</b> CB31212425</p> <p><b>Molecular Formula:</b> NA</p> <p><b>Formula Weight:</b> NA</p> <p><b>MOL File:</b> NA</p>		<p>Genotoxic effects in the <i>Bacillus subtilis</i> in the absence and presence of metabolizing activation mixture (S9-mix) at higher dose levels. Reactofix Turquoise Blue 5GFL was more genotoxic in the absence of S9 mixture [76].</p>
74	<p><b>C.I. Solvent orange 7</b></p> <p><b>Class:</b> Single azo</p> <p><b>CAS No.</b> 3118-97-6</p> <p><b>Synonyms:</b> C.I. 12140 ; Sudan II; Transparent Orange BL; Oil Scarlet ; Oil Scarlet 6G; Sudan Orange RR; Oil Scarlet 203 (PSC); Akasol Scarlet 2G (CD); Calco Oil Scarlet BL (PYL); C.I. Solvent Orange 7 (8CI); 1-(2,4-Dimethylphenylazo)-2-naphthol; Solvent Orange 7; sudan ii (C.I. 12140); 1-(2,4-xylyldylazo)-2-naphthol; 1-[2,4-xylylazo]-2-naphthol; Fat Ponceau; Calco Oil Scarlet ZBL; 1-[(2,4-dimethylphenyl)hydrazono]naphthalen-2(1H)-one; (1E)-1-[(2,4-dimethylphenyl)hydrazono]naphthalen-2(1H)-one; Solvent Orange 7</p>		<p>Mutagenic effects in <i>Salmonella typhimurium</i> Strains TA98, TA1537 and TA1538, and in TA98 upon microsomal activation in a FMN-modified assay [77].</p>

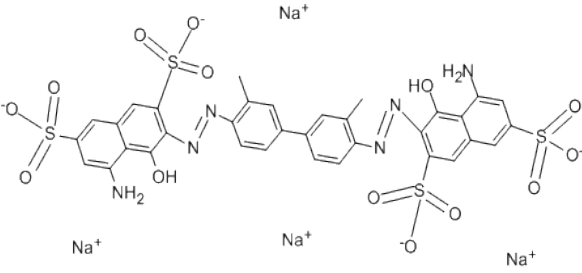
	<p><b>CB Number:</b> CB0451952</p> <p><b>Molecular Formula:</b> C<sub>18</sub>H<sub>16</sub>N<sub>2</sub>O</p> <p><b>Formula Weight:</b> 276.3324</p> <p><b>MOL File:</b> NA</p>		
75	<p><b>C.I. Basic Blue 3</b></p> <p><b>Class:</b> Oxazine</p> <p><b>CAS No.</b> 33203-82-6</p> <p><b>Synonyms:</b> Cationic Turquoise 2Z ; C.I. 51004 ; C.I. 42775; CI Basic blue BG; Basic Blue 3 ; BB 3 dye ; C.I. 51004 Basic Blue 3 ; C.I. Basic Blue 3; Blue de Lyon; Bleu Lumiere; Solvent Blue 3; 33203-82-6; Phenoxazin-5-ium, 3,7-bis(diethylamino)-, chloride; C20-H26-N3-O.Cl ; ammonium, [7-(diethylamino)-3Hphenoxazine-3-ylidene]diethyl, chloride ; ethanaminium ; N-(7-(diethylamino)-3H-phenoxazin-3-ylidene]-N-ethyl-, chloride ; 7-(N, N-diethylamino)phenoxazine-3-N, N-diethyliminium chloride ; CCRIS 2449; EINECS 251-403-5; NSC 409100</p> <p><b>CB Number:</b> CB2273983</p> <p><b>Molecular Formula:</b> C<sub>20</sub>H<sub>26</sub>ClN<sub>3</sub>O</p> <p><b>Formula Weight:</b> 359.9</p> <p><b>MOL File:</b> 33203-82-6.mol</p>	 <p>The chemical structure shows a phenoxazine ring system. At the 7-position, there is a diethylamino group (-N(CH<sub>2</sub>CH<sub>3</sub>)<sub>2</sub>). At the 3-position, there is an ethyliminium group (=N<sup>+</sup>CH<sub>2</sub>CH<sub>3</sub>). A chloride ion (Cl<sup>-</sup>) is shown as the counterion.</p>	<p>Toxic effects in aquatic environment at both concentrations 20 and 30 mg/L [78].</p>



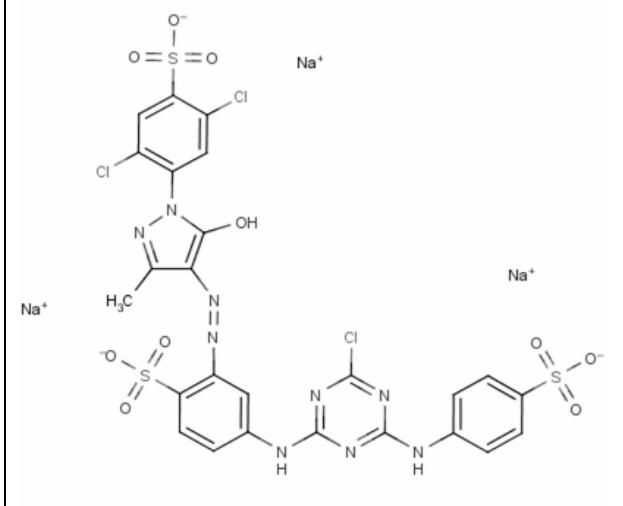
76	<p><b>C.I. Basic Brown 4</b></p> <p><b>Class:</b> Double azo</p> <p><b>CAS No.</b> 8005-78-5 / 5421-66-9 / 104744-50-5/68425-18-3</p> <p><b>Synonyms:</b> C.I. 21010; C.I. Basic Brown 4; Basic Brown RC; Bismarck Brown R; 2,4-Bis(2,4-diamino-5-methyl-1-benzenazo)toluene dihydrochloride; Basic Brown4; Basic Brown RC; Bismarck Brown; Bismarck Brown R; Bismarck Brown RLNS; Bismarck Brown TSS; Nitrous acid, reaction products with 4-methyl-1,3-benzenediamine hydrochloride; 1,3-Benzenediamine, 4,4'-[(4-methyl-1,3-phenylene)di(E)-2,1-diazenediyl]bis[6-methyl-, hydrochloride (1:2) ; 4,4'-[(4-Methyl-1,3-phenylene)bis(azo)]bis[6-methyl-1,3-benzenediamine] dihydrochloride ; 4,4'-[(4-Methylbenzene-1,3-diyl)di(E)diazene-2,1-diyl]bis(6-methylbenzene-1,3-diamine) dihydrochloride ; Bismarck Brown 53 ; C.I. Basic Brown 4 (8CI) ; Vesuvine ; 2,4-Bis(2,4-diamino-5-methyl-1-benzenazo)toluene ; 4,4'-[(4-methyl-1,3-phenylene)di(E)-diazene-2,1-diyl]bis(6-methylbenzene-1,3-diamine) dihydrochloride .</p> <p><b>CB Number:</b> NA</p> <p><b>Molecular Formula:</b> C<sub>21</sub>H<sub>26</sub>Cl<sub>2</sub>N<sub>8</sub></p> <p><b>Formula Weight:</b> 461.39</p> <p><b>MOL File:</b> NA</p>		<p>Toxicity in aquatic environment at both concentrations 20 and 30 mg/L [78].</p>
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77	<p><b>Mordant Black 17</b></p> <p><b>Class:</b> Single azo</p> <p><b>CAS No.</b> 2538-85-4</p> <p><b>Synonyms:</b> Palatine Chrome Black 6BN ; C.I. 15705; Eriochrome Blue Black R; Zinchrome R; Palatine Chrome Black 6BN; Sodium 3-hydroxy-4-(2-hydroxy-1-naphthylazo)-1-naphthalenesulphonate; C.I. Mordant Black 17; Mordant Black 6BR; Mordant Black R; Acid Chrome Black R; Eriochrom Navy RN; RSS; Blue; F-240; Calcon; Calcone; Calcontm; Black R; Zinchrome R; C.I. Mordant Black 17, monosodium salt (8CI); Calcon; 1-(2-Hydroxy-1-naphthylazo)-2-naphthol-4-sulfonic acid zinc salt; 3-Hydroxy-4-(2-hydroxy-1-naphthylazo)-1-naphthalenesulfonic acid, sodium salt; Eriochrome blue-black R; Mordant Black 17; Zinchrome R; calcon(R); 1(2-hydroxy-1-naphthylazo)2-*naphthol-4-sulfonic; sodium 3-hydroxy-4-(2-hydroxy-1-naphthylazo)-1-naphthalenesulphonate; Mordant Black 17 (15705); CALCONE; Mordantblack; sodium (4E)-4-[(2-hydroxynaphthalen-1-yl)hydrazono]-3-oxo-3,4-dihydronaphthalene-1-sulfonate; sodium 3-hydroxy-4-[(E)-(2-hydroxynaphthalen-1-yl)diazenyl]naphthalene-1-sulfonate; sodium 3-hydroxy-4-[(2-hydroxy-1-naphthyl)azo]naphthalene-1-sulfonate;</p> <p><b>CB Number:</b> CB2853385</p> <p><b>Molecular Formula:</b> C<sub>20</sub>H<sub>13</sub>N<sub>2</sub>NaO<sub>5</sub>S</p> <p><b>Formula Weight:</b> 416.39</p>		<p>Toxicity was investigated to freshwater shrimp (<i>Desmocariss trispinosa</i>) exposed to various concentrations (0.1 mg/L-1000 mg/L) of Mordant Black 17. The 96h LC<sub>50</sub> for this dye obtained from the concentration-mortality probit graphs was 2.48 mg/L. The 96h LT<sub>50</sub> of the dyes were also determined from the time-mortality probit graphs. The toxicity of the dyes was ranked as: Mordant Black 17&gt;Direct Red 2&gt;Direct Blue 14&gt;Reactive Red 4&gt;Reactive Yellow 2 [79].</p>
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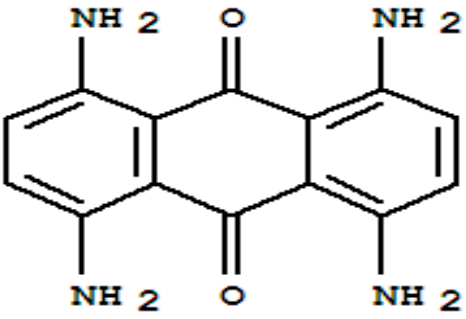
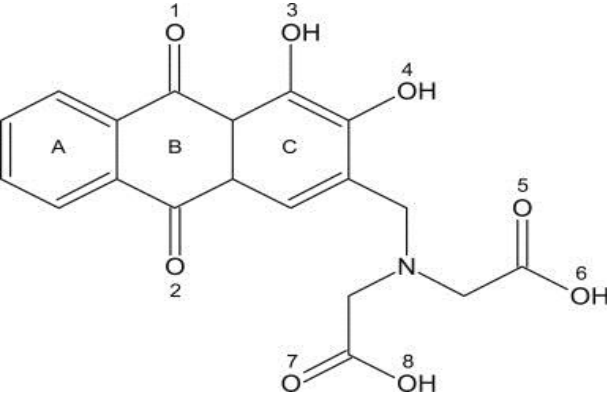
	<b>MOL File:</b> 2538-85-4.mol		
78	<p><b>Direct Red 2</b></p> <p><b>Class:</b> Double azo</p> <p><b>CAS No.</b> 992-59-6</p> <p><b>Synonyms:</b> C.I.23500; Acidi Purpurine 4B; Benzopurpurine 4B; Paper Red 4BS; AMANIL PURPURINE 4B ; ATUL DIRECT RED 4B ; AZAMIN 4B; AZOCARD RED 4B; BENCIDAL PURPLE 4B; BENZANIL PURPURINE 4B; BENZOPURPURIN 4B; BENZOPURPURINE 4B; BENZOPURPURINE 4BKX ; BENZOPURPURINE 4BX ; BRASILAMINA RED 4B ; C.I. 23500 ; C.I. DIRECT RED 2 ; C.I. DIRECT RED 2, DISODIUM SALT ; CALCOMINE RED 4BX ; CHROME LEATHER RED 4B ; COTTON RED 4B ; DIACOTTON BENZOPURPURINE 4B ; DIAMINE PURPURINE 4B ; DIAPHTAMINE PURPURINE ; DIAPHTAMINE PURPURINE 4B ; DIAZAMINE PURPURINE 4B ; DIAZINE RED 4B ; DIAZOL PURPURINE 4B ; 3,3'-((3,3'-DIMETHYL(1,1'-BIPHENYL)-4,4'-DIYL)BIS(AZO))BIS(4-AMINO-1-NAPHTHALENESULFONIC ACID) DISODIUM SALT ; DIPHENYL RED 4B ; DIPHENYL RED 4BS ; DIRECT PURPURINE 4B ; DIRECT PURPURINE M 4B ; DIRECT PURPURINE M4B ; DIRECT RED 2 ; DIRECT RED 4A ; DIRECT RED 4B ; DIRECT RED DCB ; DISODIUM O-TOLIDINEDIAZOBIS(1-NAPHTHYLAMINE-4-SULFONATE) ;</p>		<p>Toxicity was investigated to freshwater shrimp (<i>Desmocariss trispinosa</i>) exposed to various concentrations (0.1 mg/L-1000 mg/L) of Direct Red 2. The 96h LC<sub>50</sub> for this dye obtained from the concentration-mortality probit graphs was 4.96 mg/L. The 96h LT<sub>50</sub> of the dyes were also determined from the time-mortality probit graphs. The toxicity of the dyes was ranked as: Mordant Black 17&gt;Direct Red 2&gt;Direct Blue 14&gt;Reactive Red 4&gt;Reactive Yellow 2 [79].</p>

	<p>DITOLYLBIS(AZONAPHTHIONIC ACID); ECLIPSE RED; ERIE BENZO 4BP; ERIE RED 4B; FAST SCARLET; HISPAMIN RED 4B; KAYAKU BENZOPURPURINE 4B; MITSUI BENZOPURPURINE 4BX; PAPER RED 4B; PAPER RED 4BS; PHENAMINE PURPURINE 4B; PURPURIN 4B; PURPURINE 4B; RED 4B; TERTRODIRECT RED 4B;3,3'-((3,3'-dimethyl(1,1'-biphenyl)-4,4'-diyl)bis(azo))bis(4-amino-1-naphthalenesulfonic acid) disodium salt</p> <p><b>CB Number:</b> CB4710130</p> <p><b>Molecular Formula:</b> C<sub>34</sub>H<sub>26</sub>N<sub>6</sub>Na<sub>2</sub>O<sub>6</sub>S<sub>2</sub></p> <p><b>Formula Weight:</b> 724.72</p> <p><b>MOL File:</b> Mol file</p>		
79	<p><b>Direct Blue 14</b></p> <p><b>Class:</b> Double azo</p> <p><b>CAS No.</b> 72-57-1</p> <p><b>Synonyms:</b> C.I. 23850; Blue 3B; Trypan; Blue EMB; Parkipan; Benzo.Blue; Congo Blue; ncic 61289; Parki Bleu; True Blue; Trypan Blue; 72-57-1; UNII-I2ZWO3LS3M; Vision Blue; Trypan Blue solution; Dianil blue; Blue Diamine; Blue Niagara; Blue Trypan; D.O.R.C. International Brand of; Trypan Blue; Diamine Blue; Niagara Blue; Trypan Blue; VisionBlue; Direct Blue NB-2BG</p> <p><b>CB Number:</b> CB8315001</p> <p><b>Molecular Formula:</b> C<sub>34</sub>H<sub>24</sub>N<sub>6</sub>Na<sub>4</sub>O<sub>14</sub>S<sub>4</sub></p>		<p>Toxicity was investigated to freshwater shrimp (<i>Desmocariss trispinosa</i>) exposed to various concentrations (0.1 mg/L-1000 mg/L) of Direct Blue 14. The 96h LC<sub>50</sub> for this dye obtained from the concentration-mortality probit graphs was 11.33 mg/L. The 96h LT<sub>50</sub> of the dyes were also determined from the time-mortality probit graphs. The toxicity of the dyes was ranked as: Mordant Black 17&gt;Direct Red</p>

	<p><b>Formula Weight:</b> 960.81</p> <p><b>MOL File:</b> 72-57-1.mol</p>		<p>2&gt;Direct Blue 14&gt;Reactive Red 4&gt;Reactive Yellow 2 [79].</p>
80	<p><b>Reactive Red 4</b></p> <p><b>Family:</b> Single azo</p> <p><b>CAS No.</b> 17681-50-4</p> <p><b>Synonyms:</b> C.I. 18105; Tulactiv Red H-7B; Cibacron Brilliant Red 3B-A; Cibacron Red 3BA; Reactive Red K-7B; C.I. Reactive Red 4; Cibacron Brilliant Red; Reactive Red 4; Chemictive Brilliant Red 7BH.; 3,5-triazin-2-yl]amino]-2-sulfophenyl]azo]-4-hydroxy-enyl)amino]-tetrasodiu</p> <p><b>CB Number:</b> CB7371938</p> <p><b>Molecular Formula:</b> C<sub>32</sub>H<sub>19</sub>ClN<sub>8</sub>Na<sub>4</sub>O<sub>14</sub>S<sub>4</sub></p> <p><b>Formula Weight:</b> 995.21</p> <p><b>MOL File:</b> 17681-50-4.mol</p>		<p>Toxicity was investigated to freshwater shrimp (<i>Desmocariss trispinosa</i>) exposed to various concentrations (0.1 mg/L-1000 mg/L) of Reactive Red 4. The 96h LC<sub>50</sub> for this dye obtained from the concentration-mortality probit graphs was 11.47 mg/L. The 96 h LT<sub>50</sub> of the dyes were also determined from the time-mortality probit graphs. The toxicity of the dyes was ranked as: Mordant Black 17&gt;Direct Red 2&gt;Direct Blue 14&gt;Reactive Red 4&gt;Reactive Yellow 2 [79].</p>

81	<p><b>Reactive Yellow 2</b></p> <p><b>Class:</b> Single azo</p> <p><b>CAS No.</b> 50662-99-2</p> <p><b>Synonyms:</b> C.I.18972; C.I. Reactive Yellow 2; Reactive Brilliant Yellow K-4GL; Reactive Yellow P-5G; Reactive Brilliant Yellow K-6G; Cibacron Brilliant Yellow 3G-P; Benzenesulfonic acid, 4-((4-chloro-6-((4-sulfophenyl)amino)-1,3,5-triazin-2-yl)amino)-2-(2-(1-(2,5-dichloro-4-sulfophenyl)-4,5-dihydro-3-methyl-5-oxo-1H-pyrazol-4-yl)diazonyl)-, sodium salt (1:3); Benzenesulfonic acid, 4-((4-chloro-6-((4-sulfophenyl)amino)-1,3,5-triazin-2-yl)amino)-2-((1-(2,5-dichloro-4-sulfophenyl)-4,5-dihydro-3-methyl-5-oxo-1H-pyrazol-4-yl)azo), trisodium salt; Benzenesulfonic acid, 4-((4-chloro-6-((4-sulfophenyl)amino)-1,3,5-triazin-2-yl)amino)-2-((1-(2,5-dichloro-4-sulfophenyl)-4,5-dihydro-3-methyl-5-oxo-1H-pyrazol-4-yl)azo)-, trisodium salt; Trisodium 4-((4-chloro-6-((4-sulphonatophenyl)amino)-1,3,5-triazin-2-yl)amino)-2-((1-(2,5-dichloro-4-sulphonatophenyl)-4,5-dihydro-3-methyl-5-oxo-1H-pyrazol-4-yl)azo)benzenesulphonate; trisodium 2,5-dichloro-4-[(4Z)-4-{[5-(4-chloro-6-[(4-sulfonatophenyl)amino]-1,3,5-triazin-2-yl)amino]-2-sulfonatophenyl}hydrazono]-3-methyl-5-oxo-4,5-dihydro-1H-pyrazol-1-yl]benzenesulfonate; trisodium 2,5-dichloro-4-[(4E)-4-{[5-(4-chloro-6-[(4-sulfonatophenyl)amino]-1,3,5-triazin-2-yl)amino]-2-sulfonatophenyl}hydrazono]-3-methyl-5-oxo-</p>		<p>Toxicity was investigated to freshwater shrimp (<i>Desmocariss trispinosa</i>) exposed to various concentrations (0.1 mg/L-1000 mg/L) of Reactive Yellow 2. The 96h LC<sub>50</sub> for this dye obtained from the concentration-mortality probit graphs was low and range 732.75 mg/L. The 96 h LT<sub>50</sub> of the dyes were also determined from the time-mortality probit graphs. The toxicity of the dyes was ranked as: Mordant Black 17&gt;Direct Red 2&gt;Direct Blue 14&gt;Reactive Red 4&gt;Reactive Yellow 2 [79].</p>
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	<p>4,5-dihydro-1H-pyrazol-1-yl]benzenesulfonate</p> <p><b>CB Number:</b> CB2383501</p> <p><b>Molecular Formula:</b> C<sub>25</sub>H<sub>15</sub>Cl<sub>3</sub>N<sub>9</sub>Na<sub>3</sub>O<sub>10</sub>S<sub>3</sub></p> <p><b>Formula Weight:</b> 872.9642</p> <p><b>MOL File:</b> Mol file</p>		
82	<p><b>Remazol Parrot Green</b></p> <p><b>Class:</b> Azo</p> <p><b>CAS No.</b> NA</p> <p><b>Synonyms:</b> NA</p> <p><b>CB Number:</b> NA</p> <p><b>Molecular Formula:</b> NA</p> <p><b>Formula Weight:</b> NA</p> <p><b>MOL File:</b> NA</p>	NA	<p>Aquatic toxicity of Remazol Parrot Green was evaluated in an acute toxicity study using <i>Daphnia magna</i> as an aquatic experimental animal model. The 48 h EC<sub>50</sub> value for this azo dye was 55.32 mg/L. The general criteria of toxicity classification showed that dye was minor acutely toxic having 48 h EC<sub>50</sub> in between 10 and 100 mg/L [80].</p>
83	<p><b>Remazol Golden Yellow</b></p> <p><b>Class:</b> Azo</p> <p><b>CAS No.</b> NA</p> <p><b>Synonyms:</b> NA</p> <p><b>CB Number:</b> NA</p> <p><b>Molecular Formula:</b> NA</p> <p><b>Formula Weight:</b> NA</p> <p><b>MOL File:</b> NA</p>	NA	<p>Aquatic toxicity of Remazol Golden Yellow was evaluated in an acute toxicity study using <i>Daphnia magna</i> as an aquatic experimental animal model. The 48h EC<sub>50</sub> value for this azo dye was 46.84 mg/L. The general criteria of toxicity classification showed that dye was minor acutely toxic having 48 h EC<sub>50</sub> in between 10 and 100 mg/L [80].</p>

<p>84</p>	<p><b>Disperse blue 1</b></p> <p><b>Class:</b> Anthraquinone</p> <p><b>CAS No.</b> 2475-45-8</p> <p><b>Synonyms:</b> C.I. 64500; NCI-C54900; Oracet Blue; Acetate Blue G; Acetate Blue 6; Amacel Blue GG; Fenacet Blue G; Nacelan Blue G; Celliton Blue G; Grasol Blue 2GS; 1,4,5,8-Tetraaminoanthraquinone</p> <p><b>CB Number:</b> CB9133956</p> <p><b>Molecular Formula:</b> C<sub>14</sub>H<sub>12</sub>N<sub>4</sub>O<sub>2</sub></p> <p><b>Formula Weight:</b> 268.30</p> <p><b>MOL File:</b> 2475-45-8.mol</p>		<p>Disperse Blue 1, produces bladder tumors in rats. This compound is also a bacterial mutagen and thus a potential genotoxic [81].</p>
<p>85</p>	<p><b>Alizarin Complex one</b></p> <p><b>Class:</b> Anthraquinone</p> <p><b>CAS No.</b> 3952-78-1</p> <p><b>Synonyms:</b> Alizarin Fluorine Blue; Alizarin complexon; Alizarine complexon; Alizarine complexone; Alizarinkomplexon; Alizarine Fluorine Blue; 3-Aminomethylalizarin-N,N-diacetic acid; ((3,4-Dihydroxy-2-anthraquinonyl)methyl)imino)diacetic acid dihydrate; 1,2-Dihydroxy-anthrachinon-3-methylen-iminodiessigsaeure; Alizarin complexon; Alizarinkomplexon; 3-Aminomethylalizarin-N,N-diacetic acid; Alizarin Fluorine Blue dihydrate; N-(Carboxymethyl)-N-((9,10-dihydro-3,4-dihydroxy-9, 10-dioxo-2-anthracenyl) methyl)glycine; 2-[Carboxymethyl-[(3,4-dihydroxy-9,10-dioxoanthracen-2-yl) methyl]amino] acetic acid</p>		<p>Complication with human serum albumin (HAS) was unmasked by means of circular dichroism (CD), molecular modeling, steady state and time-resolved fluorescence, and UV/vis absorption measurements in aqueous solution at physiological at pH=7.4 [82,83].</p>



<b>CB Number:</b> CB9321290 <b>Molecular Formula:</b> C <sub>19</sub> H <sub>15</sub> NO <sub>8</sub> <b>Formula Weight:</b> 385.32 <b>MOL File:</b> Mol file		
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<sup>A</sup>Dyes and information's obtained by Sigma-Aldrich; Ever light Chemical SA; Chemical Book; dye World dye variety; Lookchem; Chemicallyland21; Chemical compound - Molbase; ChemNet ; ChemSpider ; PubChem; ChemBlink; ChemSpider; Santa Cruz Biotechnology; CAMEO Chemicals | NOAA; ChemID*plus*; CSST; Textile Chemicals: Environmental Data and Facts; Xcolorpigment; Alfa aesar. <sup>a</sup>IR: Induction Rate (mutant frequency sample/mutant frequency control); NA: Not Available.