

Mycotoxin Sample Medical Concerns From Small Sample of Literature

Symptoms of Ochratoxin Mycotoxin Exposure

With Bibliography

Compiled by Deborah Cazden, July 9, 2001

Sources: Aerotech Laboratories

Mycotoxin Prevention and Control in Foodgrains

PubMed

Symptoms of Ochratoxin exposure

NAME, SYMPTOM (description) (references)

1. Anemia (low red blood cell count) (Chernozemsky et al, 1977; Huff et. al., 1979)
2. Anorexia (loss of appetite, refusal to eat) (Chernozemsky et al, 1977)
3. Apoptosis (cell death) (Gekle, 2000; Schwerdt et. al., 1999; Schwerdt et. al. 2000)
4. Carcinogenic (causes cancer) (Burge and Ammann, 1999; Jakobsen, et al., 1993)
5. Copper colored skin (Chernozemsky et al, 1977)
6. Decreased Hemoglobin (Gupta et. al. 1979)
7. Decreased lymphocytes (immune cells) (Muller, 1999; Verma and Mathew, 1998))
8. Endemic Nephropathy (Peraica and Domijan; 2000, Krough, 1972)
9. Fatigue (Chernozemsky et al, 1977)
10. Headache (Chernozemsky et al, 1977)
11. Increased apoptotic phagocytes (death of neutrophils and macrophages) (Muller, 1999)
12. Increased clotting time (Gupta et. al. 1979)
13. Increased eosinophils (cells that can trigger asthma attacks and immune response) (Muller, 1999)
14. Increased leukocytes (white blood cells) (Muller, 1999)
15. Increased Neutrophils (a type of white blood cell) (Muller, 1999)
16. Increased reactive oxygen radicals (very powerful oxidizing agents that cause structural damage to proteins and nucleic acids) (Muller, 1999)

17. Induces DNA adducts (may cause mutations in DNA) (leads to nucleotide substitutions, deletions, and chromosome rearrangements) (Burge and Ammann, 1999; Jakobsen, et al., 1993)
18. Inhibition of protein synthesis (Burge and Ammann, 1999; Jakobsen, et al., 1993)
19. Inhibits Phenylalanine hydroxylase (Zanic-Grubisic T, et al., 2000)
20. Intermittent hematuria (blood in the urine) (Chernozemsky et al, 1977)
21. Lassitude (fatigue) (Chernozemsky et al, 1977)
22. Nephrotoxic (causes kidney damage) (Burge and Ammann, 1999; Jakobsen, et al., 1993)
23. Neurotoxin (damages parts of the brain) (esp. ventral mesencephalon and the cerebellum) (Belmadani A, et. al. 1999)
24. Reduced phagocytosis (cells have a reduced ability to kill microorganisms in the body) (Muller, 1999)
25. Suppresses the immune system (Baudrimont, et al., 1994)
26. Teratogenic (causes birth defects) (Zanic-Grubisic T, et al., 2000)
27. Urinary tract tumors (Chernozemsky et al, 1977)
28. Yellow palms (Chernozemsky et al, 1977)

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Gekle, M., G. Schwerdt, R. Freudinger, S. Mildenerger, D. Wilflingseder, V. Pollack, M. Dander and H. Schramek. "Ochratoxin A induces JNK activation and apoptosis in MDCK-C7 cells at nanomolar concentrations." J. Pharmacol. Exp. Ther. 293, 837-844, 2000

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Symptoms of Aflatoxin Mycotoxin Exposure

with Bibliography

Compiled by Deborah Cazden July 9, 2001

Sources:

<http://www.rand.org/publications/MR/MR1018.5/index.html>

<http://www.doh.wa.gov/ehp/oehas/mold.html>

Symptoms of aflatoxin exposure

NAME, SYMPTOM (description) (references)

1. Abdominal pain (Chao et al., 1991; Lye et al., 1995; Chao, 1992; Harrison and Garner, 1991)
2. Alveolar injury (Injury to the air sacs in the lungs) (Coulombe et al., 1991; Coulombe, 1993; Jakab et al., 1994)
3. Bile duct hyperplasia (pre-cancerous increase in the number of cells of the bile duct) (Bourgeois et al., 1971a)
4. Bile duct metaplasia (change in the cell structure of the cells in the bile duct) (Chao et al., 1991)
5. Brain injury (Schafer and Sorrel, 1997)
6. Cancer (Steyn, 1995; Coulombe et al., 1991, McLean and Dutton, 1995; Tutelyan and Kravchenko, 1981)
7. Carbohydrate metabolism impaired (McLean and Dutton, 1995; Tutelyan and Kravchenko, 1981; Verma and Choudhary, 1995)
8. Catecholamine levels decrease (such as epinephrine, adrenaline, norepinephrine, and dopamine) (Kimbrough, Llewellyn, and Weekley, 1992)

9. Centrilobular coagulative necrosis (cell death in the central region of the kidney)
(Chao et al., 1991)
10. Cerebral edema (swelling of the brain) (Chao et al., 1991; Chao, 1992)
11. Coma (Chao et al., 1991; Chao, 1992; Bourgeois et al., 1971a; Northup et al., 1995;
Jakab et al., 1994; Smith and Moss, 1985)
12. Convulsions (Chao et al., 1991; Chao, 1992; Smith and Moss, 1985)
13. Corrhachia (as related to Reyes syndrome) (Reye et al. 1951, 1962)
14. Cough (Bourgeois et al., 1971a)
15. Dark Urine
16. Death (Chao et al., 1991; Chao, 1992; Northup et al., 1995; Jakab et al., 1994;
Bourgeois, 1971a, 1971b)
17. Diarrhea (Bourgeois et al., 1971a; Chao et al., 1991; Lye et al., 1995; Chao, 1992;
Harrison and Garner, 1991)
18. Fatty degeneration of heart muscle (especially atrial and conduction systems)
(Bourgeois, Olson, et al., 1971)
19. Fatty degeneration of the liver (Bourgeois et al., 1971a)
20. Fatty infiltrations heart (Chao et al., 1991; Chao, 1992)
21. Fatty infiltrations kidney (Chao et al., 1991; Chao, 1992)
22. Fatty infiltrations of liver (Chao et al., 1991; Chao, 1992)
23. Fever (Chao et al., 1991; Lye et al., 1995; Chao, 1992; Harrison and Garner, 1991;
Smith and Moss, 1985)
24. Hematemesis (throwing up blood) (Chao et al., 1991; Lye et al., 1995; Chao, 1992;
Harrison and Garner, 1991)
25. Hepatic glycogen stores are depleted (reduced amounts of glycogen in the liver)
(McLean and Dutton, 1995; Tutelyan and Kravchenko, 1981; Verma and Choudhary,
1995)
26. Hepatocellular carcinoma (liver cancer) (Nigam et al., 1994, Groopman et al., 1996)
27. High blood sugar (McLean and Dutton, 1995; Tutelyan and Kravchenko, 1981;
Verma and Choudhary, 1995)
28. Hypoglycemia (as related to Reyes syndrome) (Reye et al. 1951, 1962)
29. Immunosuppression (Griffiths et al., 1996; Jakab et al., 1994; Raisuddin et al., 1993;
Cysewski et al., 1978; Dimitri and Gabal, 1996)
30. Impaired child development (Groopman et al., 1996)
31. Impaired child health (Groopman et al., 1996)
32. Impaired nutritional intake (Guengerich et al., 1996)

33. Impairs cell-mediated immunity (Griffiths et al., 1996; Raisuddin et al., 1993; Cysewski et al., 1978; Dimitri and Gabal, 1996)
34. Impairs humoral immunity (Griffiths et al., 1996; Raisuddin et al., 1993; Cysewski et al., 1978; Dimitri and Gabal, 1996)
35. Increased infections (Groopman et al., 1996)
36. Jaundice
37. Lipid metabolism impaired (McLean and Dutton, 1995; Tutelyan and Kravchenko, 1981; Verma and Choudhary, 1995)
38. Liver cancer (Massey, 1996; Autrup et al., 1993; Coulombe, 1993)
39. Liver encephalopathy (damage to the brain and nervous system as a complication of liver disorders) (Bourgeois et al., 1971a)
40. Liver failure (Chao et al., 1991; Northup et al., 1995; Jakab et al., 1994; Bourgeois, 1971a, 1971b; Lye et al., 1995; Chao, 1992; Harrison and Garner, 1991)
41. Liver failure and associated disorders (e.g., Reyes syndrome) (Schafer and Sorrel, 1997)
42. Liver injury (Fernandez, Ramos, et al., 1995; Fernandez, Verde, et al., 1995)
43. Low blood sugar (Chao et al., 1991; Chao, 1992)
44. Lung cancer (Massey, 1996; Autrup et al., 1993; Coulombe, 1993)
45. Lysis of lymphatic tissues (rupture of the cells in the blood stream) (Chao et al., 1991; Chao, 1992)
46. Macrovesicular steatosis (fatty degeneration of _____) (Chao et al., 1991)
47. Mitogenic (causes cells to divide) (Griffiths, Rea, et al., 1996).
48. Nausea (Chao et al., 1991; Northup et al., 1995; Jakab et al., 1994; Bourgeois, 1971a, 1971b)
49. Neuronolysis (rupture of nerve cells) (Chao et al., 1991; Chao, 1992)
50. Prolonged prothrombin times (Chao et al., 1991; Chao, 1992)
51. Pulmonary hemorrhage (bleeding in the lungs) (Coulombe et al., 1991; Coulombe, 1993; Jakab et al., 1994)
52. Renal failure (kidney failure) (Chao et al., 1991; Lye et al., 1995; Chao, 1992; Harrison and Garner, 1991)
53. Reoccurring infections (Jakab et al., 1994; Raisuddin et al., 1993)
54. Reproductive problems (Coulombe, 1993; Aulerich et al., 1993; Bonomi et al., 1995)
55. Respiratory distress (difficulty breathing) (Chao et al., 1991; Chao, 1992)
56. Respiratory failure (Chao et al., 1991; Lye et al., 1995; Chao, 1992; Harrison and Garner, 1991)

57. Respiratory injury (Chao et al., 1991; Northup et al., 1995; Jakab et al., 1994; Bourgeois, 1971a, 1971b)
58. Seizures (Chao et al., 1991; Chao, 1992; Northup et al., 1995; Jakab et al., 1994; Bourgeois, 1971a, 1971b; Lye et al., 1995; Harrison and Garner, 1991)
59. Serotonin levels decrease (Kimbrough, Llewellyn, and Weekley, 1992)
60. Serum transaminases elevated (elevated transaminases in the blood) (Chao et al., 1991; Chao, 1992)
61. Teratogen (causes birth defects) (Raisuddin et al., 1993)
62. Tracheal epithelial damage (damage to the lining of the trachea) (Coulombe et al., 1991; Coulombe, 1993; Jakab et al., 1994)
63. Tremorogenic (causes tremors) (Land et al. 1984)
64. Vomiting (Chao et al. 1991; Chao, 1992; Northup et al., 1995; Jakab et al., 1994; Bourgeois, 1971a, 1971b; Smith and Moss, 1985)

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Symptoms of Trichothecene Mycotoxin Exposure

(T-2 toxin, and other Trichothecenes) with Bibliography

Compiled by Deborah Cazden April 22, 2001

Sources:

<http://www.rand.org/publications/MR/MR1018.5/index.html>

<http://www.doh.wa.gov/ehp/oehas/mold.html>

Symptoms of Trichothecene exposure

NAME, SYMPTOM (description) (references)

1. Abdominal pain (Haig, 1982; Schultz, 1982; Watson, Mirocha, and Hayes, 1984; Stahl et al., 1985; Crossland and Townsend, 1984).
2. Acute myocarditis (inflammation of the heart muscle) (Stahl, Green, and Farnum, 1985).

3. Acute renal tubular necrosis (damage to the renal tubule cells) (Stahl, Green, and Farnum, 1985).
4. Adrenal cortical necrosis (death of the outer level of the adrenal gland) (Thurman et al., 1986).
5. Affects hydroxyindoleacetic acid levels (Wang, Wilson, and Fitzpatrick, 1992).
6. Affects serotonin levels (Wang, Wilson, and Fitzpatrick, 1992).
7. Alimentary toxic aleukia (Ueno et al., 1984). Mayer 1953a, 1953 b; Lutsky et al., 1978).
8. Alopecia (hair loss) (Croft et al., 1986; Jarvis, 1985)
9. Alterations in hemostasis (clotting) (Cosgriff et al., 1986).
10. Anarix (anaphylaxia, anoxic?) coma (allergic or lack of oxygen) (Stahl, Green, and Farnum, 1985).
11. Anorexia (Creasia et al., 1987; Bonomi et al., 1995; Wannemacher et al., 1993; Schiefer and Hancock, 1984)
12. Anxiety (Yap et al., 1979; Thigpen et al., 1981; Bukowski et al., 1982).
13. Aphonia (loss of hearing) (Rukmini, Prasad, and Rao, 1980; Lutsky et al., 1978; Bunner, 1983; Bunner et al. 1985).
14. Arrhythmias (abnormal heart rhythm) (Ueno et al., 1984; Stahl et al., 1985),
15. Bleeding gums (Watson, Mirocha, and Hayes, 1984).
16. Bleeding tendency (Creasia et al., 1987; Bonomi et al., 1995; Wannemacher et al., 1993; Schiefer and Hancock, 1984)
17. Blisters (Haig, 1982; Schultz, 1982; Crossland and Townsend, 1984).
18. Blurred vision (Bunner, 1983).
19. Bone marrow aplasia (bone marrow stops producing blood cells) (Mayer 1953a, 1953b)
20. Bone marrow injury (Mayer 1953a, 1953b; Ueno et al., 1984).
21. Breath holding (Otto et al., 1989)
22. Breathlessness (Kempainen et al., 1986b; Hendy and Cole, 1993; Jarvis, 1985).
23. Burning erythema (red skin with a burning sensation) (Belt et al., 1979; Murphy et al., 1978; Yap, et al., 1979; Diggs et al., 1978; Bukowski et al., 1982; Thigpen et al., 1981; Crossland and Townsend, 1984).
24. Burning of the skin (Watson, Mirocha, and Hayes, 1984).
25. Burning stomatitis (burning sensation of the mouth) (Schiefer and Hancock, 1984; Murphy et al., 1978; Bukowski et al., 1982; Diggs et al., 1978; Belt et al., 1979; Yap et al., 1979; Thigpen et al., 1981; Goodwin et al., 1981).
26. Cardiac injury (heart injury) (Bunner, 1983).

27. Cerebral hemorrhage (bleeding in the brain) (Coppock et al., 1985)
28. Chest pain (Watson, Mirocha, and Hayes, 1984).
29. Chills (Belt et al., 1979; Murphy et al., 1978; Yap, et al., 1979; Diggs et al., 1978; Bukowski et al., 1982; Thigpen et al., 1981; Crossland and Townsend, 1984).
30. CNS dysfunction (Wannemacher and Wiener, 1997).
31. CNS toxicity (Watson, Mirocha, and Hayes, 1984; Bunner et al., 1985; and Wannemacher and Wiener, 1997).
32. Cold and flu symptoms (Croft et al.,1986; Jarvis, 1985)
33. Confusion (Belt et al., 1979; Murphy et al., 1978; Yap, et al., 1979; Diggs et al., 1978; Bukowski et al., 1982; Thigpen et al., 1981; Crossland and Townsend, 1984).
34. Conjunctivitis (inflammation of the eye) (Bunner, 1983).
35. Corneal changes (changes in the cornea of the eye) (Bunner, 1983).
36. Corneal thinning (Bunner, 1983).
37. Cough (Croft et al.,1986; Jarvis, 1985)
38. Cramps (Bunner, 1983).
39. Cytolysis (rupturing of cell membranes) (Lee et al., 1984; Rukmini, Prasad, and Rao, 1980).
40. Death (Rukmini, Prasad, and Rao, 1980; Lutsky et al., 1978; Bunner, 1983; Bunner et al. 1985).
41. Decreased attention (Otto et al., 1989)
42. Decreased coagulation factors (blood does not clot properly) (Yarom et al., 1984).
43. Decreased learning (Umeuchi et al., 1996).
44. Decreased sperm production
45. Decreased vision (Watson, Mirocha, and Hayes, 1984).
46. Depressed immunoglobulin levels (immune system not functioning) (Jagadeesan et al., 1982; Schiefer, 1984; Ueno et al., 1984).
47. Depression (Thigpen et al., 1981; Yap et al., 1979; Croft et al., 1986; Watson, Mirocha, and Hayes, 1984; Crossland and Townsend, 1984)
48. Dermatitis (inflammation or irritation of the skin) (Kemppainen et al., 1986b; Hendy and Cole, 1993; Jarvis, 1985).
49. Diarrhea (Ueno et al., 1984).
50. Diffuse hepatitis (widespread inflammation of the liver) (Stahl, Green, and Farnum, 1985).
51. Dilation of surface blood vessels (causes reddening of the skin) (Otto et al., 1989)
52. Diminished reflex time (Otto et al., 1989)
53. Disorientation (Otto et al., 1989)

54. Dizziness (Haig, 1982; Schultz, 1982; Crossland and Townsend, 1984).
55. Drowsiness (Yap et al., 1979; Thigpen et al., 1981; Bukowski et al., 1982).
56. Dyspnea (shortness of breath) (Creasia et al., 1987; Bonomi et al., 1995; Wannemacher et al., 1993; Schiefer and Hancock, 1984)
57. ECG prolonged P-R intervals (Ueno et al., 1984; Stahl et al., 1985),
58. ECG prolonged QRS and QRT intervals (Ueno et al., 1984; Stahl et al., 1985),
59. Edema (swelling due to extra fluid in the body) (Rukmini, Prasad, and Rao, 1980; Lutsy et al., 1978; Bunner, 1983; Bunner et al. 1985).
60. Elevated serum creatine-kinase (too much creatine-kinase in the blood) (Bunner, 1983).
61. Epithelial necrosis (death of epithelial cells i.e. skin) (Wannemacher and Wiener, 1997).
62. Eye injury (Watson, Mirocha, and Hayes, 1984; Bunner et al., 1985; and Wannemacher and Wiener, 1997).
63. Eye pain (Watson, Mirocha, and Hayes, 1984).
64. Eyelid edema (swelling of the eyelid) (Bunner, 1983).
65. Fatigue (Haig, 1982; Schultz, 1982; Crossland and Townsend, 1984).
66. Fetal abnormalities (Haig, 1982; Schultz, 1982; Watson, Mirocha, and Hayes, 1984; Stahl et al., 1985; Crossland and Townsend, 1984).
67. Fever (Belt et al., 1979; Murphy et al., 1978; Yap, et al., 1979; Diggs et al., 1978; Bukowski et al., 1982; Thigpen et al., 1981; Crossland and Townsend, 1984).
68. Fibrinous exudate (fibrin escaping from the blood vessels) (Goodwin et al., 1981).
69. Gastroenteritis (acute inflammation of the lining of the stomach and intestines) (Wannemacher and Wiener, 1997).
70. Gastrointestinal toxicity (Watson, Mirocha, and Hayes, 1984; Bunner et al., 1985; and Wannemacher and Wiener, 1997).
71. Gastrointestinal tract necrosis (toxicity of the stomach and intestines) (Coppock et al., 1985)
72. Hallucinations (false perception of sight, hearing, smell, taste, or touch) (Belt et al., 1979; Murphy et al., 1978; Yap, et al., 1979; Diggs et al., 1978; Bukowski et al., 1982; Thigpen et al., 1981; Crossland and Townsend, 1984).
73. Headaches (Croft et al., 1986; Jarvis, 1985)
74. Hematemesis (throwing up blood) (Haig, 1982; Schultz, 1982; Crossland and Townsend, 1984).
75. Hematological toxicity (blood toxicity) (Watson, Mirocha, and Hayes, 1984; Bunner et al., 1985; and Wannemacher and Wiener, 1997).

76. Hemorrhagic bullae (large blisters that pop easily) (Wannemacher and Wiener, 1997).
77. Hemorrhagic diathesis (bleeding tendency) (Ueno et al., 1984).
78. Hemorrhagic foci (group of cells prone to hemorrhaging) (Ueno et al., 1984; Stahl et al., 1985),
79. Hemoptysis (spitting up blood) (Stahl, Green, and Farnum, 1985).
80. Hyperglycemia (too much sugar in the blood) (Coppock et al., 1985)
81. Hyperpigmentation (unusual skin darkening in a specific area) (Wannemacher and Wiener, 1997).
82. Hypotension (low blood pressure) (Haig, 1982; Schultz, 1982; Crossland and Townsend, 1984).
83. Hypothermia (low body temperature) (Wannemacher and Wiener, 1997).
84. Hypoxia (low oxygen in the arteries) (Rukmini, Prasad, and Rao, 1980; Lutsky et al., 1978; Bunner, 1983; Bunner et al. 1985).
85. Immunosuppression (immune system dysfunction) (Ueno, 1983; Yarom et al., 1984; Jagadeesan et al., 1982).
86. Impairment of ribosome function (NAS, 1983; Coulombe, 1993; Tutelyan and Kravchenko, 1981)
87. Impotence (inability to achieve erection or ejaculation) (Haig, 1982; Schultz, 1982; Watson, Mirocha, and Hayes, 1984; Stahl et al., 1985; Crossland and Townsend, 1984).
88. Increased partial thromboplastin times blood test (Yarom et al., 1984).
89. Increased prothrombin times (increased clotting time) (Yarom et al., 1984).
90. Increased vascular fragility (blood vessels are more fragile) (Smith and Moss, 1985).
91. Induction of repairable single strand DNA breaks
92. Inhibition of mitochondrial protein synthesis (Pace et al., 1985)
93. Inhibition of platelet aggregation (Yarom et al., 1984).
94. Inhibition of protein synthesis (Ueno, 1983; Ueno et al., 1984; Tutelyan and Kravchenko, 1981)
95. Inhibition of thiol enzymes (Tutelyan and Kravchenko, 1981; Ueno et al., 1984)
96. Inhibition on DNA synthesis (Thompson and Wannemacher, 1984)
97. Interstitial myocardial hemorrhage (hemorrhage in between the myocardium) (Stahl, Green, and Farnum, 1985).
98. Itching (Watson, Mirocha, and Hayes, 1984).
99. Jaundice (yellowing of the skin and eyes from excess bilirubin in the blood) (Stahl, Green, and Farnum, 1985).

100. Joint pain (Haig, 1982; Schultz, 1982; Crossland and Townsend, 1984).
101. Leukopenia (shortage of white blood cells) (Ueno et al., 1984).
102. Lymphatic changes (changes in the lymph system) (Schiefer, 1984; Wannemacher et al., 1983).
103. Malaise (vague feeling of discomfort, or that something is not right) (Thigpen et al., 1981; Yap et al., 1979; Croft et al., 1986; Watson, Mirocha, and Hayes, 1984; Crossland and Townsend, 1984)
104. Melena (blood in the stool) (Wannemacher and Wiener, 1997).
105. Memory loss (Belt et al., 1979; Murphy et al., 1978; Yap, et al., 1979; Diggs et al., 1978; Bukowski et al., 1982; Thigpen et al., 1981; Crossland and Townsend, 1984).
106. Memory problems (Haig, 1982; Schultz, 1982; Crossland and Townsend, 1984).
107. Meningeal bleeding (bleeding in the meninges of the brain) (Ueno et al., 1984).
108. Micronodular cirrhosis (complication of liver disease) (Stahl, Green, and Farnum, 1985).
109. Muscle injury (Bunner, 1983).
110. Myelosuppression (suppression of bone marrow activity) (Wannemacher and Wiener, 1997).
111. Nasal itching (Rukmini, Prasad, and Rao, 1980; Lutsky et al., 1978; Bunner, 1983; Bunner et al. 1985).
112. Nasal stuffiness (Bell, et al., 1993a; Bell et al., 1993b)
113. Nausea (Ueno et al., 1984).
114. Neuropsychiatric manifestations (neurobiological brain disorders) (Forgacs, 1972)
115. Neurotoxic (brain and nerve toxin) (Thigpen et al., 1981; Yap et al., 1979; Croft et al., 1986; Watson, Mirocha, and Hayes, 1984; Crossland and Townsend, 1984)
116. Numbness (Schiefer and Hancock, 1984; Murphy et al., 1978; Bukowski et al., 1982; Diggs et al., 1978; Belt et al., 1979; Yap et al., 1979; Thigpen et al., 1981; Goodwin et al., 1981).
117. Oral mucosal necrosis (death of tissue in the mouth) (Mayer 1953a, 1953b)
118. Orthostatic hypotension (low blood pressure when lying down) (Yap et al., 1979; Thigpen et al., 1981; Murphy et al., 1978; Bukowski et al., 1982).
119. Pain (Wannemacher and Wiener, 1997).

120. Pancreatic damage (Coppock et al., 1985)
121. Paresthesia (abnormal sensations, such as numbness, tingling, or burning)
(Otto et al., 1989)
122. Petechial rashes (rash caused by bleeding under the skin) (Ueno et al.,
1984).
123. Prolonged rashes (Schultz, 1982)
124. Pulmonary collapse (lung collapse) (Rukmini, Prasad, and Rao, 1980; Lutsky
et al., 1978; Bunner, 1983; Bunner et al. 1985).
125. Pulmonary consolidation (Rukmini, Prasad, and Rao, 1980; Lutsky et al.,
1978; Bunner, 1983; Bunner et al. 1985).
126. Pulmonary edema (swelling of the lung) (Stahl, Green, and Farnum, 1985).
127. Pulmonary fibrosis (Scarring throughout the lungs) (Goodwin et al., 1981).
128. Pulmonary hemorrhage (bleeding in the lungs) (Rukmini, Prasad, and Rao,
1980; Lutsky et al., 1978; Bunner, 1983; Bunner et al. 1985).
129. Rashes (Haig, 1982; Schultz, 1982; Crossland and Townsend, 1984).
130. Red eyes (Watson, Mirocha, and Hayes, 1984).
131. Reduced concentration (Haig, 1982; Schultz, 1982; Watson, Mirocha, and
Hayes, 1984; Stahl et al., 1985; Crossland and Townsend, 1984).
132. Regional norepinephrine increases (Wang, Wilson, and Fitzpatrick, 1992).
133. Reoccurant infections (Creasia et al., 1987; Bonomi et al., 1995;
Wannemacher et al., 1993; Schiefer and Hancock, 1984)
134. Respiratory distress (Haig, 1982; Schultz, 1982; Crossland and Townsend,
1984).
135. Respiratory illness (Croft et al., 1986; Jarvis, 1985)
136. Respiratory toxicity (Watson, Mirocha, and Hayes, 1984; Bunner et al., 1985;
and Wannemacher and Wiener, 1997).
137. Rhinorrhea (runny nose) (Rukmini, Prasad, and Rao, 1980; Lutsky et al.,
1978; Bunner, 1983; Bunner et al. 1985).
138. Scleral inflammation (inflammation of the sclera in the eye) (Bunner, 1983).
139. Seizures (Haig, 1982; Schultz, 1982; Crossland and Townsend, 1984).
140. Sepsis (infection of the blood stream) (Ueno et al., 1984).
141. Shock (Rukmini, Prasad, and Rao, 1980; Lutsky et al., 1978; Bunner, 1983;
Bunner et al. 1985).
142. Skin crawling (Otto et al., 1989)
143. Skin injury (Watson, Mirocha, and Hayes, 1984; Bunner et al., 1985; and
Wannemacher and Wiener, 1997).

144. Sloughing of gastric epithelium (shedding of the epithelium in the stomach) (Lee et al., 1984; Rukmini, Prasad, and Rao, 1980).
145. Sloughing of gastric villus tips (shedding of the villus tips in the stomach) (Lee et al., 1984; Rukmini, Prasad, and Rao, 1980).
146. Somnolence (feeling drowsy) (Belt et al., 1979; Murphy et al., 1978; Yap, et al., 1979; Diggs et al., 1978; Bukowski et al., 1982; Thigpen et al., 1981; Crossland and Townsend, 1984).
147. Sore throats (Croft et al., 1986; Jarvis, 1985)
148. Spontaneous abortion (Haig, 1982; Schultz, 1982; Watson, Mirocha, and Hayes, 1984; Stahl et al., 1985; Crossland and Townsend, 1984).
149. Suppressed cell-mediated immunity (Jagadeesan et al., 1982; Schiefer, 1984; Ueno et al., 1984).
150. Tachycardia (fast heart beat) (Watson, Mirocha, and Hayes, 1984).
151. Tearing (Bunner, 1983).
152. Thrombocytopenia (decreased number of platelets in the blood) (Creasia et al., 1987; Bonomi et al., 1995; Wannemacher et al., 1993; Schiefer and Hancock, 1984)
153. Thymus changes (Schiefer, 1984; Wannemacher et al., 1983).
154. Tingling (Wannemacher and Wiener, 1997).
155. Trembling (Watson, Mirocha, and Hayes, 1984).
156. Vasodilatation (widening of the blood vessels) (Ueno et al., 1984; Stahl et al., 1985),
157. Vomiting (Ueno et al., 1984).
158. Weakness (Creasia et al., 1987; Bonomi et al., 1995; Wannemacher et al., 1993; Schiefer and Hancock, 1984)
159. Weight loss (Creasia et al., 1987; Bonomi et al., 1995; Wannemacher et al., 1993; Schiefer and Hancock, 1984)
160. Wheezing (Kempainen et al., 1986b; Hendy and Cole, 1993; Jarvis, 1985).

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