

Index

- Acetonitrile, 51
- Acquired Immune Deficiency Syndrome (AIDS), 5,13, **50**
- Acquired immunity, 4-5,17-18
- Adaptive immunity. See Acquired immunity
- Aflatoxin, 53
- Agency for Toxic Substances and Disease Registry (ATSDR)
meeting on human exposure data sponsored by, 32
information programs of, 61,63
research by, 9,49,53
- Airborne pollutants
EPA studies on, 52
immunosuppression and, 7,37
- Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA), research by, 8,53
- Aldicarb oxime, 51
- Alkylating agents, 35
- Allergy
definition used in OTA background paper, 4,19,20
disability claims and, 69
genetic component of, 22
misperceptions about, 22
substances that induce, 38-39
see *also* Contact sensitivity; Delayed-type hypersensitivity; Hypersensitivity; Immediate-type hypersensitivity
- Allyl isovalerate, 51
- American Academy of Allergy and Immunology, 76
- American Conference of Governmental Industrial Hygienists (ACGIH), 54,61
- Anaphylaxis. See Immediate-type hypersensitivity; Hypersensitivity; Allergy
- Antibody
classes of (immunoglobulin), 14
humoral immunity and, 18-19
plaque forming cell response test, 28
production by B cells of, 4,14
role in immune responsiveness of, 4, 14-15
structure, 14
test to measure levels of, 5,29
- Antigen
acquired immunity and, 17
binding to antibody of, 13-14
definition of, 4,13
humoral immunity and, 18-19
processing of, 16
self, 20
- Antimetabolites, 35
- Arsine, 51
- Asthma, 8,22,39,69
- Autoimmune disease. See Autoimmunity
- Autoimmunity
as a response of the immune system, 4,20
difficulty in assessing, 20,40
disability claims and, 69
epidemiologic studies of humans for, 6,40
genetic role in, 40
Spanish Toxic Oil Syndrome and, 40
substances inducing, 40
- Azathioprine, immunosuppression and, 6,35,51
- Azidothymidine (AZT), 50
- B cells
humoral immunity and 18-19
quantitation of as a measure of immunotoxicity, 28
role in antibody production of, 4, 14, 18-19
suppression by glucocorticosteroids on, 35
test to assess antibody production capability of, 28
test to assess mitogen response of, 29
- Barth v. Firestone Tire and Rubber Co.*, 74
- Benzene, 6,36,57
- Benzidine, 51
- Benzo(a)pyrene, 51
- Benzo(e)pyrene, 51
- Benzothonium chloride, 52
- Benzyl-p-chlorophenol, 52
- o-benzyl-p-chlorophenol, 51
- Buehler test, 30
- t-butylhydroquinone, 51
- Cadmium, immunosuppression and, 7,38
- Cadmium chloride, 51

California

- legislation related to MCS, 9
 - workers' compensation, 72
- Captafol, 55
- Carcinogens
 - historical interest in, 3
- Cell-mediated immunity
 - description of, 5,19,23
 - immunotoxicological tests for, 5,27,29
 - importance to normal immune function of, 19-20
 - occupational dermatoses and, 38
 - potential adverse consequences due to, 19-20
 - see *also* Allergy; Contact sensitivity; Delayed-type hypersensitivity
- Cells, immune system, 14-17
- Cellularity, as a test for immune pathology, 28
- Center for Biologics Evaluation and Research (CBER)–FDA, 53
- Center for Drug Evaluation and Research (CDER) – FDA, 53,56
- Center for Environmental Health and Injury Control – CDC, 53
- Center for Food Safety and Nutrition (CFSAN) – FDA, 52-53
- Centers for Disease Control (CDC), research in immunotoxicology by, 8,53
- Chloral hydrate, 32
- Chlordimeform, 34
- 4-chloro-o-phenylenediamine, 51,52
- Cigarette smoke
 - as a confounding factor in immunotoxicity assessment, 22
 - immunosuppressive potential of, 7,37
- Clean Air Act (CAA), 8,37,52,54,56-57
- Clean Water Act (CWA), 54,56,57-58
- Cobalt, 55
- Cobaltous sulfate, 54
- Community Right-to-Know, 8,61-62,63
- Complement activation, 14
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 54,56,60,62
- Consumer Product Safety Act (CPSA), 54,60-61
- Consumer Product Safety Commission (CPSC), research or regulation by, 8,60-61
- Contact sensitivity
 - cosmetics and regulation by FDA of substances causing, 55-56
 - description of, 19
 - EPA research in, 52**
 - substances causing, 38
 - see *also* Cell-mediated immunity; Delayed-type hypersensitivity; Hypersensitivity
- Cosmetics
 - hypersensitivity and, 8,21,38
 - regulation of, 56
- Crotonaldehyde, 52
- Cyclophosphamide, immunosuppression and, 6,35,51
- Cyclosporin A, immunosuppression and, 6,36,56
- Cytokines, 4,16
- Cytotoxic T lymphocyte (CTL) assay, 29
- Dayron Corporation v. Morehead*, 72
- Definitions. See Terminology
- Delayed-type hypersensitivity (DTH)
 - description of, 19
 - EPA requirements to assess biochemical pesticides for, 58-59
 - substances inducing, 38-39
 - test to measure, 29
 - see *also* Cell-mediated immunity; Contact sensitivity; Hypersensitivity
- Department of Agriculture, research or regulation by, 8,53
- Department of Defense, research or regulation by, 8,53
- Department of Health and Human Services, research by, 8,49
- Department of Labor, research or regulation by, 8
- 2,4-diaminotoluene, 51,52
- Dichloroethane, 32
- Dideoxyadenosine, 51
- Diethylstilbestrol (DES), 34,51
- Dimethyl vinyl chloride, 51
- Dimethylbenz(a)anthracene (DMBA), 37,51
- Dimethylnitrosamine (DMN), 32
- Dinitrofluorobenzene, 52
- Dioxin
 - Department of Defense study of, 53
 - immunosuppression and, 7,32,36-37
 - see *also* TCDD

- Diphenylhydantoin, 51
- Disability, income replacement for immunotoxicity-related, 69-76
- Draize test, 30
- Drugs
- autoimmunity and, 40
 - hypersensitivity and, 8,38,39
 - immunotoxic effects of illegal, 35
 - immunosuppression and, 6,39,41
 - regulation of, 55-56
 - see *also* Therapeutic drugs
- Elam v. Alcolac*, 73-74
- Emergency Planning and Community Right-to-Know Act (EPCRA), 61-62
- Environmental Protection Agency (EPA)
- community right-to-know and, 8,61-62
 - coordination about TRI with NLM, 62
 - funding of study on multiple chemical sensitivity by, 9
 - immunotoxicity testing of biochemical pest control agents and, 58
 - regulation by, 56-60
 - regulation of oxidant gases based on health effects other than immunotoxicity by, 37
 - research in immunotoxicology by, 8,52,63
 - role in NTP of, 49
 - tier testing and, 52,58-59
- Epidemiology
- difficulties in obtaining human immunotoxicity data, 5-6,31-32
 - studies of autoimmunity in humans, 5-6, 40
 - studies of hypersensitivity in humans, 5-6,31-32
 - studies of immunosuppression in humans, 5-6,31-32
- Estradiol benzoate, 32
- Ethyl carbamate, 51
- Ethylene dibromide, 51
- Ethylene thiourea, 52
- Federal Hazardous Substances Act (FHSA), 54,60-61
- Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), 54,56,58-59
- Florida, workers' compensation, 72
- Food and Drug Administration (FDA)
- regulation by, 55-56
 - research in immunotoxicology by, 8,52-53,63
 - restriction of sulfites by, 8,55,63
 - role in NTP of, 49
 - view on tier testing, 31,53
- Food, Drug, and Cosmetic Act (FDCA), 55
- Foods, regulation of, 55
- Formaldehyde, 37,39,51
- Freund's complete adjuvant test, 30
- Funding
- levels for immunotoxicological research by CDC, 53
 - levels for immunotoxicological research by EPA, 52
 - levels for immunotoxicological research by NIEHS, 53
 - levels for immunotox.ecological research by NIH, 53
 - levels for immunotoxicological research by NIOSH, 53
 - levels for immunotoxicological research by NTP, 51
- Gallium arsenide, 51
- Genetics
- role in autoimmunity, 8,40
 - role in evaluating immunotoxicity of populations, 22
- Ginseng, 51
- Glucocorticosteroids, immunosuppression and, 35
- Glutaraldehyde, 52
- Grayson v. Gulf Oil Company*, 71-72
- Halogenated aromatic hydrocarbon (HAH)
- immunosuppression and, 6,36-37
 - see *also* Polybrominated biphenyls; Polychlorinated biphenyl; Dioxin
- Hazardous Substances Data Bank (HSDB) –NLM, 62
- Hematology, as a test for immune pathology, 28
- Hexachlorobenzo-p-dioxin, 51
- Higgins v. Aerojet-General Corp.*, 74-75
- Histology, as a test for immune pathology, 28
- Host resistance, immunotoxicological tests for, 5,30,50, 52
- Human leukocyte antigen (HLA), 22
- humoral immunity
- description of, 5,18-19,23
 - immunotoxicological tests for, 5,27,28-29
 - importance to normal immune function of, 18-19
 - potential adverse consequences due to, 19
 - see *also* Allergy; Antibody; Hypersensitivity
- Hypersensitivity
- definition, 4
 - EPA efforts in methods development for lung, 52

- epidemiologic studies of humans for, 6
- genetic component of, 22,23
- immunotoxicity and, 19-20
- immunotoxicological tests for, 5,30-31
- pesticides and, 8,39
- respiratory disorders and, 38-39
- substances causing contact sensitivity and skin disorders, 38
- substances tested by NTP for, 52
- see *also* Allergy; Contact sensitivity; Delayed-type hypersensitivity; Immediate-type hypersensitivity
- Immediate-type hypersensitivity
 - allergy and, 19
 - potential adverse consequences due to, 19
 - see *also* Allergy; humoral immunity; Hypersensitivity
- Immune suppression. See Immunosuppression
- Immune system, 13
 - cell surface receptors of, 14, 16
 - cells of, 4, 14-17
 - organs of, 4, 16-17
 - reserve capacity of, 5,40
 - responses of, 4, 17-20
 - tests to analyze effects of substances on 5,27-31
- Immunity. See Acquired immunity; Cell-mediated immunity; humoral immunity; Nonspecific immunity
- Immunoglobulin. See Antibody
- Immunosuppression
 - definition, 3-4
 - halogenated aromatic hydrocarbons and, 36-37
 - immunotoxicity and, 20
 - indoor air pollutants and, 37
 - lack of data on human studies, 34
 - metals and, 37-38
 - oxidant gases and, 37
 - pesticides and, 6,36
 - polycyclic aromatic hydrocarbons and, 7,37
 - substances tested by NTP for, 51
 - tests for, 5
 - therapeutic drugs and, 6,35-36
- immunotoxicant
 - examples of substances that are, 6-8,35-40
 - OTA definition of, 4,20
 - populations at risk to effects of, 22-23
 - see *also* immunotoxicity
- immunotoxicity
 - challenges in studying, 5,20-23,32-35,40-41
 - difficulties in proving claims for, 75-76
 - disability and, 69-76
 - epidemiologic evaluation of, 31-32
 - existing data on, 5,35-40
 - terminology used in OTA background paper, 3-4, 20-21
 - tests for, 27-31
 - tort claims and, 73-75
 - workers' compensation and, 71-72
 - see *also* immunotoxicant
- Indomethacin, 51
- Indoor air pollutants, 21,37
- Inhalants
 - EPA development of methods to assess, 52
 - hypersensitivity induced by, 8
- Innate immunity. See Nonspecific immunity
- Interferon-alpha, 51
- Isocyanates, hypersensitivity and, 8
- Isobutyraldehyde, 52
- Isophorone diisocyanate, 52,55
- Jewelry, hypersensitivity to, 8,38
- Kyles v. Workers' Compensation Appeals Board*, 72
- Lead, 7,37,57
- Lithium carbonate, 51
- Lowe v. Norfolk & Western Railway Company*, 75
- Lymphocytes. See B cells; T cells; Natural killer cells
- Lymphoid organs. See Organs
- Macrophages
 - cell-mediated immunity and, 19
 - humoral immunity and, 18
 - nonspecific immunity and, 17
 - role in immune responsiveness of, 4, 13, 16, 18
 - test to assess activity of, 29,30
 - test to assess functional capability of in antibody production, 28
- Maryland, study related to environmental illness and multiple chemical sensitivity, 9
- Material safety data sheets, 61,62
- 2-mercaptobenzothiazole, 52
- Mercury, 7,38,57
- Metals
 - immunosuppression and, 7,37
 - role in autoimmune processes, 8
 - role in hypersensitivity, 8
 - see *also* Cadmium; Lead; Mercury; Nickel; Organotins
- Methyl carbamate, 51
- Methyl isocyanate, 50,51

- Michigan, polybrominated biphenyl exposure case in, 33
- Mine Safety and Health Act, 54,61
- Mine Safety and Health Administration (MSHA), research or regulation by, 8,61
- Mixed leukocyte response (MLR), 29
- Moore v. Polish Power, Inc.*, 74
- Mouse ear swelling test (MEST), 30-31
- Multiple chemical sensitivity, 9,73
- Murine local lymph node assay, 30-31
- NK cells. See Natural killer cells
- National Academy of Sciences
meeting on human exposure data sponsored by, 32
study of multiple chemical sensitivity by, 9
- National Ambient Air Quality Standards (NAAQS), 52, 57
- National Cancer Institute (NCI), 49
- National Center for Toxicological Research (NCTR) – FDA, 49
- National Commission on State Workmen’s Compensation Laws, 72
- National Institute for Occupational Safety and Health (NIOSH), 49
- National Institute of Allergy and Infectious Diseases, 53
- National Institute of Environmental Health Sciences (NIEHS), 49,53
- National Institutes of Health (NIH), research in immunotoxicology by, 8,49,53
- National Library of Medicine (NLM), 9,62-63
- National Toxicology Program (NTP)
agencies comprising, 49
funding for immunotoxicological research by, 51,63
objectives of, 49
research in immunotoxicology by, 8,49-52
substances tested for hypersensitivity by, 52
substances tested for immunosuppression by, 51
testing approach developed by, 8,49-52
- Natural killer cells
cell-mediated immunity and, 19
nonspecific immunity and, 17
role in immune responsiveness of, 4, 17
test to assess activity of, 29,30
- New Jersey, study related to environmental illness and multiple chemical sensitivity, 9
- Nickel
hypersensitivity and, 8,38
immunosuppression and, 37-38
- Nickel chloride, 38
- Nickel sulfate, 51
- Nitrobenzene, 51
- Nitrofurazone, 51
- Nitrogen dioxide, 7, 37,59
- n-nitrosodimethylamine, 51
- m-nitrotoluene, 51
- p-nitrotoluene, 51
- Nitrophenylpentadien, 50,52
- Nonspecific immunity
description of, 4,17
immunotoxicological tests for, 5,27,29-30,50
role of NK cells in, 17
tests for host resistance as a measure of, 30
- Ochratoxin A, 51
- Occupational Safety and Health Act (OSH Act), 54
- Occupational Safety and Health Administration (OSHA)
regulation by, 8,54,63
role in NTP of, 49
substances regulated as sensitizers by, 8,54-55
worker right-to-know and, 8,61,63
workers’ compensation and, 70-71
- Office of Health Research (OHR) –EPA, 52
- Office of Pesticide Programs (OPP) –EPA, 52,58-59
- Office of Technology Assessment (OTA)
evaluation of environmental noncancer health risks by, 3
organization of report by, 3
previous studies on regulation of toxic substances by, 49
- Office of Toxic Substances (OTS) –EPA, 52
- Oleic acid diethanolamine, 52
- Organotins, 7,38
- Organs
immunotoxicity testing of, 28
of the immune system, 4, 17
- Oxidant gases, 37. See *also* Immunosuppression; Nitrogen dioxide; Ozone
- Oxymetholone, 51
- Ozone, immunosuppression and, 7,37,57

- Pathology, immunotoxicological tests for, 5,28
- Penicillin, hypersensitivity and 8,39
- Pentachlorophenol, 51
- Pentamidine isethionate, 51
- Pesticides
 - EPA testing guidelines for immunotoxicity of, 8,58-59
 - hypersensitivity and, 8,39
 - immunosuppression and, 7,38
- Pharmaceuticals. See Drugs
- Phenothiazine, 55
- Phenyl glycidyl ether, 55
- l-phenyl-5-vinyl-2-imidazolidine-thione (PVIZT), 40
- o-phenylphenol, 51
- Phorbol myristate acetate, 51
- Picric acid, 55
- Plaque forming cells (PFC), test to assess, 28
- Polybrominated biphenyls (PBBs)
 - immunosuppression and, 6,32,36
 - Michigan exposure case, 33
- Polychlorinated biphenyl (PCB)
 - immunosuppression and, 6,32,36
 - regulation by EPA under CWA of, 58
 - regulation by FDA of, 55
 - Taiwan exposure case, 34
- Polycyclic aromatic hydrocarbons (PAH), immunosuppression and, 7,37
- Polydimethylsiloxane fluid, 52
- Prednisolone, immunosuppression and, 6,35
- Registry of Toxic Effects of Chemical Substances (RTECS)-NLM, 62
- Regulation
 - by OSHA of substances as sensitizers, 54-55
 - major Federal laws controlling toxic substances, 54-61
 - of sulfites based on immunotoxic criteria, 8,55
 - of Yellow Dye No. 5 based on immunotoxic criteria, 55
- Research
 - Federal agencies involved in, 8,49-54
 - interest in Federal interagency coordination committee, 54
 - need for integration of immunology and toxicology, 35
 - see *also* Funding
- Resource Conservation and Recovery Act (RCRA), 56, 60
- Respiratory disorders and hypersensitivity, 7-8,38-39
- Ribavirin, 51
- Safe Drinking Water Act (SDWA), 56,58
- Selenium, immunosuppression and, 37-38
- Senate Committee on Environment and Public Works, Subcommittee on Toxic Substances, Environmental Oversight, Research and Development
 - interest in noncancer health risks by, 3
 - request for this OTA background paper by, 3
- Silicone, 50,51
- Social Security Administration (SSA), 69
- Social Security Disability Income (SSDI), immune system injury and, 69
- South Carolina, workers' compensation and immune system injury, 71-72
- Spain, toxic oil exposure case in, 40
- Stiles v. Sudstrand*, 75
- Subtilisins, 55
- Sulfites, role in hypersensitivity and restriction by FDA of, 8,55,63
- Supplemental Security Income (SSI), 69
- Suppression of immune responsiveness. See Immunosuppression
- T cells
 - cell-mediated immunity and, 19-20
 - humoral immunity and, 18-19
 - mixed lymphocyte response as a measure of, 29
 - quantitation of as a measure of immunotoxicity, 28
 - role in immune responsiveness, 4, 15-16, 18, 19
 - suppression by cyclosporin A on, 36
 - suppression by glucocorticosteroids on, 35
 - test to assess cytotoxic, 29
 - test to assess functional capability of antibody production, 28
 - test to assess host resistance activity of, 30
 - test to assess mitogen response of, 29
- Taiwan, polychlorinated biphenyl exposure case in, 34
- Terminology, 3-4
- Testing
 - challenges and difficulties of, 5-6,32-35
 - methods of, 27-31
- Tests
 - for cell-mediated immunity, 29
 - for host resistance, 30
 - for humoral immunity, 28-29
 - for nonspecific immunity, 29-30
 - for pathology, 28

- for potential to induce hypersensitivity, 30-31
selection of, 31
see *also* Testing; Tier testing
- 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), 36, 51
See *also* Dioxin
- Tetraethyl lead, 51
- Tetrahydrocannabinol, 51
- Therapeutic drugs. See Drugs
- 4,4-thiobis (6-t-butyl-m-cresol), 51
- Tier testing
EPA approach for biochemical pesticides and, 58-59
EPA efforts to develop, 52,63
FDA perspective on appropriateness of, 31
for possible immunotoxicants, 31
interest in developing for hypersensitivity assessment, 31
NTP approach to, 49-52
- Toluene, 51
- Toluene-2,3-diisocyanate (TDI)
hypersensitivity and, 39
regulation by OSHA as sensitizer, 39,55
- Tort law
congressional interest in, 75
description of, 72-73
difficulties in proving immune system injury under, 75-76
immune system injury and, 73-75
- Toxic Release Inventory (TRI) – NLM, 62
- Toxic Substances Control Act (TSCA), 54,56,59-60
- Toxic torts. See Tort law
- Toxicology, general principles of, 7,21-23
- Toxicology Data Network (TOXNET) – NLM, 62
- TOXLINE-NLM, 62-63
- Tributyltin oxide, 52
- Triethanolamine, 52
- Tris (2,3-dichloropropyl) phosphate, 51
- Vanadium pentoxide, 51
- Vinyl chloride, 57
- 4-vinyl-1-cyclohexene diepoxide, 51
- White cells, 4, 15
- Wisconsin, workers' compensation and, 70
Woodrow Sterling et al. v. Velsicol Chemical Corp., 73
- Worker Right-to-Know, 8,61,63
- Workers' compensation
congressional interest in, 72
description of, 69-71
difficulties in proving immune system injury under, 75-76
immune system injury and, 71-72
OSHA and, 70-71
- Xylenesulfonic acid, 52
- Yellow Dye No. 5,55,63
- Zirconium, hypersensitivity and, 38

Other Related OTA Reports

- **Neurotoxicity: Identifying and Controlling Poisons of the Nervous System--Special Report.** Describes the scope of the public health threat posed by neurotoxic substances; Federal research, testing, monitoring, and regulatory programs to address it; and the economic considerations associated with testing and regulatory programs. BA-436, 4/90; 350 p.
GPO stock #052-003-01184-1; \$15.00 per copy
- **Summary—Neurotoxicity: Identifying and Controlling Poisons of the Nervous System.** BA-437, 4/90; 48 p.
GPO stock #052-003-01185-9; \$2.25 per copy
- **Genetic Monitoring and Screening in the Workplace.** Examines efficacy, accuracy, and cost of technologies used by employers for genetic screening and monitoring; and the legal and ethical issues pertinent to employer testing. BA-455, 10/90; 270p.
Free summary available from OTA.
GPO stock #052-003-01217-1; \$12.00 per copy
NTIS order #PB 91-105 940/AS
- **Identifying and Regulating Carcinogens (BP-H-42)**
NTIS order #PB 88-136999
- **Preventing Illness and Injury in the Workplace (H-256)**
NTIS order #PB 86-115 334/AS
- **Assessment of Technologies for Determining Cancer Risks From the Environment (H-138)**
NTIS order #PB 81-235400
- **Catching Our Breath: Next Steps for Reducing Urban Ozone.** Focuses on the health-based air quality standards for ozone; addresses the problem of regional oxidants; evaluates the cost-effectiveness of controlling various sources of hydrocarbon emissions for lowering ozone levels. 0-412, 7/89; 252 p.
GPO stock #052-003-01158-1; \$10.00 per copy
NTIS order #PB 90-130 451/AS
- **Superfund Strategy.** Examines future Superfund needs and how permanent cleanups can be accomplished in a cost-effective manner for diverse types of sites; describes the interactions among many components of the complex Super-fund system; and analyzes the consequences of pursuing different strategies for implementing the program. ITE-252, 4/85; 292 p.
Free summary available from OTA.
GPO stock #052-003-00994-3; \$10.00 per copy
NTIS order #PB 86-120 425/AS
- **Protecting the Nation's Groundwater From Contamination: Volume I (O-233)**
NTIS order #PB 85-154 201/AS
- **Acid Rain and Transported Air Pollutants: Implications for Public Policy.** Characterizes the potential benefits of acting now to abate long-range transported air pollution and the potential costs of premature action. 0-204, 6/84; 324p.
NTIS order #PB 84-222 967/AS
- **MEDLARS and Health Information Policy (TM-H-11)**
NTIS order #PB 83-168658

NOTE: Reports are available from the U.S. Government Printing Office, Superintendent of Documents, Washington, DC 20402-9325, (202) 783-3238; and/or the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161-0001, (703) 487-4650.