International Agency for Research on Cancer

World Health Organization

List of classifications by cancer sites with *sufficient* or *limited evidence* in humans, *IARC Monographs* Volumes 1–136[a]		
Cancer site	**Carcinogenic agents with *sufficient evidence* in humans**	**Agents with *limited evidence* in humans**
Lip, oral cavity, and pharynx		
Lip		Hydrochlorothiazide Solar radiation
Oral cavity	Acetaldehyde associated with consumption of alcoholic beverages Alcoholic beverages Betel quid with tobacco Betel quid without tobacco Human papillomavirus type 16 Tobacco, smokeless Tobacco smoking	Bitumens, occupational exposure to hard bitumens and their emissions during mastic asphalt work Bitumens, occupational exposure to oxidized bitumens and their emissions during roofing Human papillomavirus type 18
Salivary gland	Acetaldehyde associated with consumption of alcoholic beverages X- and Gamma-radiation	Radioiodines, including iodine-131
Pharynx: oropharynx [b]	Human papillomavirus type 16	
Pharynx: tonsil [b]	Human papillomavirus type 16	
Pharynx: nasopharynx [b]	Epstein–Barr virus Formaldehyde Salted fish, Chinese-style Wood dust	Pickled vegetables (traditional Asian)
Pharynx: all combined	Acetaldehyde associated with consumption of alcoholic beverages Alcoholic beverages Betel quid with tobacco Tobacco smoking	Asbestos (all forms) Bitumens, occupational exposure to hard bitumens and their emissions during mastic asphalt work Bitumens, occupational exposure to oxidized bitumens and their emissions during roofing Opium consumption Tobacco smoke, secondhand

List of classifications by cancer sites with *sufficient* or *limited evidence* in humans, *IARC Monographs* Volumes 1–136[a]

Cancer site	Carcinogenic agents with *sufficient evidence* in humans	Agents with *limited evidence* in humans
Digestive organs		
Oesophagus	Acetaldehyde associated with consumption of alcoholic beverages Alcoholic beverages Betel quid with tobacco Betel quid without tobacco Tobacco, smokeless Tobacco smoking X- and Gamma-radiation	Bitumens, occupational exposure to hard bitumens and their emissions during mastic asphalt work Bitumens, occupational exposure to oxidized bitumens and their emissions during roofing Dry cleaning Opium consumption Pickled vegetables (traditional Asian) Rubber manufacturing industry Very hot beverages (squamous cell carcinoma)
Stomach	*Helicobacter pylori* (infection with) Rubber manufacturing industry Tobacco smoking X- and Gamma-radiation	Art glass, glass containers and pressed ware (manufacture of) Asbestos (all forms) Epstein–Barr virus Lead compounds, inorganic Nitrate or nitrite (ingested) under conditions that result in endogenous nitrosation Opium consumption Pickled vegetables (traditional Asian) Processed meat (consumption of) Salted fish, Chinese-style
Colon	Alcoholic beverages Processed meat (consumption of) Tobacco smoking X- and Gamma-radiation	Asbestos (all forms) Firefighter (occupational exposure as a) Night shift work Red meat (consumption of) *Schistosoma japonicum* (infection with)

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List of classifications by cancer sites with *sufficient* or *limited evidence* in humans, *IARC Monographs* Volumes 1–136[a]

Cancer site	Carcinogenic agents with *sufficient evidence* in humans	Agents with *limited evidence* in humans
Rectum	Alcoholic beverages Processed meat (consumption of) Tobacco smoking	Asbestos (all forms) Night shift work Red meat (consumption of) *Schistosoma japonicum* (infection with) X- and Gamma-radiation
Anus	Human immunodeficiency virus type 1 (infection with) Human papillomavirus type 16	Human papillomavirus types 18 and 33
Liver	Aflatoxins Alcoholic beverages Estrogen–progestogen oral contraceptives (combined) Hepatitis B virus (chronic infection with) Hepatitis C virus (chronic infection with) Plutonium Thorium-232 and its decay products Tobacco smoking (in smokers and in smokers' children) Vinyl chloride	Androgenic (anabolic) steroids Arsenic and inorganic arsenic compounds Aspartame (hepatocellular carcinoma) Betel quid without tobacco DDT (4,4'-dichlorodiphenyl-trichloroethane) Human immunodeficiency virus type 1 (infection with) *Schistosoma japonicum* (infection with) Trichloroethylene X- and Gamma-radiation
Bile duct	*Clonorchis sinensis* (infection with) 1,2-Dichloropropane *Opisthorchis viverrini* (infection with) Plutonium Thorium-232 and its decay products Tobacco smoking (in smokers)	Androgenic (anabolic) steroids Arsenic and inorganic arsenic compounds Betel quid without tobacco DDT (4,4'-dichlorodiphenyl-trichloroethane) Dichloromethane (methylene chloride) Hepatitis B virus (chronic infection with) Hepatitis C virus (chronic infection with) *Schistosoma japonicum* (infection with) Trichloroethylene X- and Gamma-radiation

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List of classifications by cancer sites with *sufficient* or *limited evidence* in humans, *IARC Monographs* Volumes 1–136[a]

Cancer site	Carcinogenic agents with *sufficient evidence* in humans	Agents with *limited evidence* in humans
Gall bladder	Thorium-232 and its decay products	
Pancreas	Tobacco, smokeless Tobacco smoking	Alcoholic beverages Opium consumption Red meat (consumption of) Thorium-232 and its decay products X- and Gamma-radiation
Digestive tract, unspecified		Radioiodines, including iodine-131
Respiratory and intrathoracic organs		
Nasal cavity and paranasal sinus	Isopropyl alcohol manufacture using strong acids Leather dust Nickel compounds Radium-226 and its decay products Radium-228 and its decay products Tobacco smoking Wood dust	Carpentry and joinery Chromium(VI) compounds Formaldehyde Textile manufacturing industry (work in)
Larynx	Acetaldehyde associated with consumption of alcoholic beverages Acid mists, strong inorganic Alcoholic beverages Asbestos (all forms) Opium consumption Tobacco smoking	Bitumens, occupational exposure to hard bitumens and their emissions during mastic asphalt work Bitumens, occupational exposure to oxidized bitumens and their emissions during roofing Human papillomavirus types 16 and 18 Rubber manufacturing industry Sulfur mustard Tobacco smoke, secondhand
Lung	Acheson process, occupational exposure associated with Acrylonitrile Aluminium production Arsenic and inorganic arsenic compounds Asbestos (all forms) Beryllium and beryllium compounds Bis(chloromethyl)ether; chloromethyl	Acid mists, strong inorganic Art glass, glass containers and pressed ware (manufacture of) Benzene Biomass fuel (primarily wood), indoor emissions from household combustion of Bitumens, occupational exposure to hard bitumens and their

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List of classifications by cancer sites with *sufficient* or *limited evidence* in humans, *IARC Monographs* Volumes 1–136[a]

Cancer site	Carcinogenic agents with *sufficient evidence* in humans	Agents with *limited evidence* in humans
	methyl ether (technical grade) Cadmium and cadmium compounds Chromium(VI) compounds Coal, indoor emissions from household combustion Coal gasification Coal-tar pitch Coke production Engine exhaust, diesel Haematite mining (underground) Iron and steel founding (occupational exposure during) MOPP and other combined chemotherapy including alkylating agents Nickel compounds Opium consumption Outdoor air pollution Outdoor air pollution, particulate matter in Painter (occupational exposure as a) Plutonium Radon-222 and its decay products Rubber manufacturing industry Silica dust, crystalline, in the form of quartz or cristobalite Soot (as found in occupational exposure of chimney sweeps) Sulfur mustard Tobacco smoke, secondhand Tobacco smoking Welding fumes X- and Gamma-radiation	emissions during mastic asphalt work Bitumens, occupational exposure to oxidized bitumens and their emissions during roofing Carbon electrode manufacture *alpha*-Chlorinated toluenes (benzal chloride, benzotrichloride, benzyl chloride) and benzoyl chloride (combined exposures) Cobalt metal with tungsten carbide Creosotes Diazinon Frying, emissions from high-temperature Hydrazine Non-arsenical insecticides (occupational exposures in spraying and application of) Printing processes (occupational exposures in) Silicon carbide, fibrous 2,3,7,8-Tetrachlorodibenzo-*para*-dioxin Trivalent antimony Uranium, mixture of isotopes
Upper aerodigestive tract		
Upper aerodigestive tract (oral cavity, pharynx, larynx, oesophagus)	Acetaldehyde associated with consumption of alcoholic beverages Alcoholic beverages Tobacco smoking	Bitumens, occupational exposure to hard bitumens and their emissions during mastic asphalt work Bitumens, occupational exposure to oxidized bitumens and their

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List of classifications by cancer sites with *sufficient* or *limited evidence* in humans, *IARC Monographs* Volumes 1–136[a]

Cancer site	Carcinogenic agents with *sufficient evidence* in humans	Agents with *limited evidence* in humans
		emissions during roofing
Bone		
Bone	Plutonium Radium-224 and its decay products Radium-226 and its decay products Radium-228 and its decay products X- and Gamma-radiation	Radioiodines, including iodine-131
Skin		
Skin (melanoma)	Polychlorinated biphenyls Solar radiation Ultraviolet-emitting tanning devices	Firefighter (occupational exposure as a) Petroleum refining (occupational exposures in)
Skin (malignant non-melanoma)	Arsenic and inorganic arsenic compounds Azathioprine Coal-tar distillation Cyclosporine Methoxsalen (8-methoxypsoralen) plus ultraviolet A radiation Mineral oils, untreated or mildly treated Shale oils Solar radiation Soot (as found in occupational exposure of chimney sweeps) X- and Gamma-radiation	Creosotes Human immunodeficiency virus type 1 (infection with) Human papillomavirus types 5 and 8 (in patients with *epidermodysplasia verruciformis*) Hydrochlorothiazide Merkel cell polyomavirus (MCV) Nitrogen mustard Petroleum refining (occupational exposures in) Ultraviolet-emitting tanning devices
Mesothelium, endothelium, and soft tissue		
Mesothelium (pleura, peritoneum, and other)	Asbestos (all forms) Erionite Firefighter (occupational exposure as a) Fluoro-edenite fibrous amphibole Painter (occupational exposure as a)	
Endothelium (Kaposi sarcoma)	Human immunodeficiency virus type 1 (infection with) Kaposi sarcoma herpesvirus	

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List of classifications by cancer sites with *sufficient* or *limited evidence* in humans, *IARC Monographs* Volumes 1–136[a]

Cancer site	Carcinogenic agents with *sufficient evidence* in humans	Agents with *limited evidence* in humans
Soft tissue		Polychlorophenols and their sodium salts (combined exposures) Radioiodines, including iodine-131 2,3,7,8-Tetrachlorodibenzo-*para*-dioxin
Breast		
Breast	Alcoholic beverages Diethylstilbestrol Estrogen–progestogen oral contraceptives (combined) Estrogen–progestogen menopausal therapy (combined) X- and Gamma-radiation	Dieldrin, and aldrin metabolized to dieldrin Digoxin Estrogen therapy, postmenopausal Ethylene oxide Night shift work Polychlorinated biphenyls Tobacco smoking
Female genital organs		
Vulva	Human papillomavirus type 16	Human immunodeficiency virus type 1 (infection with) Human papillomavirus types 18, and 33
Vagina	Diethylstilbestrol (exposure in utero) Human papillomavirus type 16	Human immunodeficiency virus type 1 (infection with)
Uterine cervix	Diethylstilbestrol (exposure in utero) Estrogen–progestogen oral contraceptives (combined) Human immunodeficiency virus type 1 (infection with) Human papillomavirus types 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, and 59 Tobacco smoking	Human papillomavirus types 26, 53, 66, 67, 68, 70, 73, and 82
Endometrium	Estrogen therapy, postmenopausal Estrogen–progestogen menopausal therapy (combined) Tamoxifen	Diethylstilbestrol
Ovary	Asbestos (all forms) Estrogen therapy, postmenopausal	Talc[h] X- and Gamma-radiation

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Cancer site	**Carcinogenic agents with *sufficient evidence* in humans**	**Agents with *limited evidence* in humans**
	Tobacco smoking	
Male genital organs		
Penis	Human papillomavirus type 16	Human immunodeficiency virus type 1 (infection with) Human papillomavirus type 18
Prostate		Androgenic (anabolic) steroids Arsenic and inorganic arsenic compounds Cadmium and cadmium compounds Firefighter (occupational exposure as a) Malathion Night shift work Red meat (consumption of) Rubber manufacturing industry Thorium-232 and its decay products X- and Gamma-radiation
Testis		DDT (4,4'-dichlorodiphenyl-trichloroethane) Diethylstilbestrol (exposure in utero) *N*,*N*-Dimethylformamide Firefighter (occupational exposure as a) Perfluorooctanoic acid (PFOA)

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Cancer site	**Carcinogenic agents with *sufficient evidence* in humans**	**Agents with *limited evidence* in humans**
Urinary tract		
Kidney	Tobacco smoking Trichloroethylene X- and Gamma-radiation	Arsenic and inorganic arsenic compounds Cadmium and cadmium compounds Perfluorooctanoic acid (PFOA) (renal cell carcinoma) Welding fumes
Renal pelvis and ureter	Aristolochic acid, plants containing Phenacetin Phenacetin, analgesic mixtures containing Tobacco smoking	Aristolochic acid
Urinary bladder	Aluminium production 4-Aminobiphenyl Arsenic and inorganic arsenic compounds Auramine production Benzidine Chlornaphazine Cyclophosphamide Firefighter (occupational exposure as a) Magenta production 2-Naphthylamine Opium consumption Painter (occupational exposure as a) Rubber manufacturing industry *Schistosoma haematobium* (infection with) Tobacco smoking *ortho*-Toluidine X- and Gamma-radiation	Acrylonitrile 4-Chloro-*ortho*-toluidine Coal-tar pitch Dry cleaning (occupational exposures in) Engine exhaust, diesel Hairdresser or barber (occupational exposure as a) 2-Mercaptobenzothiazole Outdoor air pollution Pioglitazone Printing processes (occupational exposures in) Soot (as found in occupational exposure of chimney sweeps) Tetrachloroethylene (Perchloroethylene) Textile manufacturing industry (work in)

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Cancer site	**Carcinogenic agents with *sufficient evidence* in humans**	**Agents with *limited evidence* in humans**
Eye, brain, and central nervous system		
Eye	Human immunodeficiency virus type 1 (infection with) Ultraviolet emissions from welding Ultraviolet-emitting tanning devices	Solar radiation
Brain and central nervous system	X- and Gamma-radiation	Radiofrequency electromagnetic fields (glioma and acoustic neuroma)
Endocrine glands		
Thyroid	Radioiodines, including iodine-131 X- and Gamma-radiation	
Lymphoid, haematopoietic, and related tissues [c]		
Childhood leukaemia		
Childhood acute lymphocytic leukaemia [d]		Tobacco smoking (parental)
Childhood acute myeloid leukaemia [d]		Benzene Teniposide Tobacco smoking (parental)
Childhood leukaemia: all combined	Fission products, including strontium-90 Thorium-232 and its decay products X- and Gamma-radiation	Chloramphenicol Magnetic fields, extremely low-frequency Painter (maternal occupational exposure as a) Radioiodines, including iodine-131 Tobacco smoking (parental exposure)

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List of classifications by cancer sites with *sufficient* or *limited evidence* in humans, *IARC Monographs* Volumes 1–136[a]		
Cancer site	**Carcinogenic agents with *sufficient evidence* in humans**	**Agents with *limited evidence* in humans**
Lymphoid, haematopoietic, and related tissues (contd) [c]		
Leukaemia		
Acute myeloid leukaemia [e]	Benzene Busulfan Chlorambucil Cyclophosphamide Etoposide in combination with cisplatin and bleomycin Formaldehyde Melphalan MOPP and other combined chemotherapy including alkylating agents Phosphorus-32, as phosphorus Semustine [1-(2-Chloroethyl)-3-(4-methylcyclohexyl)-1-nitrosourea, Methyl-CCNU] Thorium-232 and its decay products Tobacco smoking Treosulfan X- and Gamma-radiation	Bischloroethyl nitrosourea (BCNU) Etoposide Mitoxantrone Teniposide
Other acute non-lymphocytic leukaemia [e]	Benzene Formaldehyde Phosphorus-32, as phosphorus Thorium-232 and its decay products X- and Gamma-radiation	Bischloroethyl nitrosourea (BCNU)
Chronic myeloid leukaemia [e]	Formaldehyde Thorium-232 and its decay products Tobacco smoking X- and Gamma-radiation	Benzene
Acute lymphocytic leukaemia [e]	Phosphorus-32, as phosphorus Thorium-232 and its decay products X- and Gamma-radiation	
Chronic lymphocytic leukaemia [e]		Benzene Ethylene oxide

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Cancer site	Carcinogenic agents with *sufficient evidence* in humans	Agents with *limited evidence* in humans
Adult T-cell leukaemia/lymphoma (ATLL) [e]	Human T-cell lymphotropic virus type 1 Thorium-232 and its decay products X- and Gamma-radiation	
Leukaemia: all combined	1,3-Butadiene Fission products, including strontium-90 Rubber manufacturing industry Thiotepa	Chloramphenicol Diazinon Nitrogen mustard Petroleum refining (occupational exposures in) Radioiodines, including iodine-131 Radon-222 and its decay products Styrene
Lymphoma		
Hodgkin lymphoma [f]	Epstein–Barr virus Human immunodeficiency virus type 1 (infection with)	
Primary effusion lymphoma [f]	Kaposi sarcoma herpesvirus	
Non-Hodgkin lymphoma: immunosuppression-related lymphoma [f, g]	Epstein–Barr virus	
Non-Hodgkin lymphoma: Burkitt lymphoma [f, g]	Epstein–Barr virus	Malaria (caused by infection with *Plasmodium falciparum* in holoendemic areas)
Non-Hodgkin lymphoma: extranodal NK/T-cell lymphoma (nasal type) [f, g]	Epstein–Barr virus	
Non-Hodgkin lymphoma: low-grade B-cell mucosa associated lymphoid tissue (MALT) gastric lymphoma [f, g]	*Helicobacter pylori* (infection with)	
Non-Hodgkin lymphoma: all combined [f]	Azathioprine Cyclosporine Hepatitis C virus (chronic infection with) Human immunodeficiency virus type 1 (infection with) Lindane Pentachlorophenol	Benzene Chlorophenoxy herbicides DDT (4,4'-dichlorodiphenyl-trichloroethane) Diazinon Dichloromethane (methylene chloride) Ethylene oxide

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List of classifications by cancer sites with *sufficient* or *limited evidence* in humans, *IARC Monographs* Volumes 1–136[a]

Cancer site	Carcinogenic agents with *sufficient evidence* in humans	Agents with *limited evidence* in humans
		Firefighter (occupational exposure as a) Glyphosate Hepatitis B virus (chronic infection with) Malathion Polychlorinated biphenyls Polychlorophenols and their sodium salts (mixed exposures) 2,3,7,8-Tetrachlorodibenzo-*para*-dioxin Trichloroethylene X- and Gamma-radiation
Multicentric Castleman disease [f]		Kaposi sarcoma herpesvirus
Lymphoma: all combined	1,3-Butadiene Rubber manufacturing industry	Styrene
Multiple myeloma		
Multiple myeloma	1,3-Butadiene Pentachlorophenol	Benzene Ethylene oxide Styrene 1,1,1-Trichloroethane X- and Gamma-radiation
Multiple or unspecified sites		
Lymphoepithelioma-like carcinoma (LELC)		Epstein–Barr virus
Multiple sites (unspecified)	Cyclosporine Fission products, including strontium-90 X- and Gamma-radiation (exposure in utero)	Chlorophenoxy herbicides
All cancer sites (combined)	2,3,7,8-Tetrachlorodibenzo-*para*-dioxin	

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Cancer site	**Carcinogenic agents with *sufficient evidence* in humans**	**Agents with *limited evidence* in humans**

Footnotes

[a] This table does not include factors not covered in the *IARC Monographs*, notably genetic traits, reproductive status, and some nutritional factors.

[b] See also Pharynx: all combined.

[c] For historical purposes, chronic lymphocytic leukaemia (CLL) has been included with leukaemias rather than as CLL/small lymphocytic lymphoma with non-Hodgkin lymphomas.

[d] See also Childhood leukaemia: all combined.

[e] See also Leukaemia: all combined.

[f] See also Lymphoma: all combined.

[g] See also Non-Hodgkin lymphoma: all combined.

[h] The agent “Talc” includes talc containing asbestiform fibres other than asbestos, and talc not containing asbestiform fibres. For talc containing asbestos, see “Asbestos.”

Adapted from Table 4 in Cogliano *et al.* (2011); available from: http://jnci.oxfordjournals.org/content/early/2011/12/11/jnci.djr483.short?rss=1 , and supplemented with new information for more recent *IARC Monographs* evaluations and a more complete description of the evidence for cancers of lymphoid, haematopoietic, and related tissues.

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