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## AGENTS CLASSIFIED BY THE *IARC MONOGRAPHS*, VOLUMES 1–113

|             |   |               |
|-------------|---|---------------|
| Group 1     | <i>Carcinogenic to humans</i>                                   | 117<br>agents |
| Group 2A    | <i>Probably carcinogenic to humans</i>                          | 74            |
| Group<br>2B | <i>Possibly carcinogenic to humans</i>                          | 287           |
| Group 3     | <i>Not classifiable as to its carcinogenicity<br/>to humans</i> | 503           |
| Group 4     | <i>Probably not carcinogenic to humans</i>                      | 1             |

For definitions of these groups, please see the [Preamble](#).

It is strongly recommended to consult the complete *Monographs* on these agents, the publication date, and the list of studies considered. Significant new information might support a different classification.

For agents that have not been classified, no determination of non-carcinogenicity or overall safety should be inferred.

- [List of classifications, Volumes 1-113 \(embedded spreadsheet\)](#)
- [List of classifications by cancer site \(PDF file\)](#)
- [French version](#) of the List of classifications by cancer site, as hosted by Centre Léon Bérard

See [Preventable Exposures Associated With Human Cancers](#) (Cogliano *et al.*, 2011)

Although care was taken in preparing these lists, mistakes may be present.

If you find an error, please notify us at [imo@iarc.fr](mailto:imo@iarc.fr).

Last update: 24 August 2015

## Agents Classified by the IARC Monographs, Volumes 1–112

| CAS No      | Agent  | Group | Volume              | Year    |
|-------------|--|-------|---------------------|---------|
| 000075-07-0 | Acetaldehyde associated with consumption of alcoholic beverages  | 1     | 100E                | 2012    |
|             | Acheson process, occupational exposure associated with   | 1     | 111                 | In prep |
|             | Acid mists, strong inorganic   | 1     | 54, 100F            | 2012    |
| 001402-68-2 | Aflatoxins   | 1     | 56, 82, 100F        | 2012    |
|             | Alcoholic beverages  | 1     | 44, 96, 100E        | 2012    |
|             | Aluminium production   | 1     | 34, Sup 7, 100F     | 2012    |
| 000092-67-1 | 4-Aminobiphenyl  | 1     | 1, Sup 7, 99, 100F  | 2012    |
|             | Areca nut  | 1     | 85, 100E            | 2012    |
| 000313-67-7 | Aristolochic acid<br>(NB: Overall evaluation upgraded to Group 1 based on mechanistic and other relevant data)   | 1     | 82, 100A            | 2012    |
| 000313-67-7 | Aristolochic acid, plants containing   | 1     | 82, 100A            | 2012    |
| 007440-38-2 | Arsenic and inorganic arsenic compounds  | 1     | 23, Sup 7, 100C     | 2012    |
| 001332-21-4 | Asbestos (all forms, including actinolite, amosite, anthophyllite, chrysotile, crocidolite, tremolite)<br>(NB: Mineral substances (e.g. talc or vermiculite) that contain asbestos should also be regarded as <i>carcinogenic to humans</i> .) | 1     | 14, Sup 7, 100C     | 2012    |
| 013768-00-8 |  |       |                     |         |
| 012172-73-5 |  |       |                     |         |
| 017068-78-9 |  |       |                     |         |
| 012001-29-5 |  |       |                     |         |
| 012001-28-4 |  |       |                     |         |
| 014567-73-8 | Auramine production  | 1     | Sup 7, 99, 100F     | 2012    |
| 000446-86-6 | Azathioprine   | 1     | 26, Sup 7, 100A     | 2012    |
| 000071-43-2 | Benzene  | 1     | 29, Sup 7, 100F     | 2012    |
| 000092-87-5 | Benzidine  | 1     | 29, Sup 7, 99, 100F | 2012    |
|             | Benzidine, dyes metabolized to<br>(NB: Overall evaluation upgraded to Group 1 based on mechanistic and other relevant data)  | 1     | 99, 100F            | 2012    |
| 000050-32-8 | Benzo[a]pyrene<br>(NB: Overall evaluation upgraded to Group 1 based on mechanistic and other relevant data)  | 1     | 92, 100F            | 2012    |
| 007440-41-7 | Beryllium and beryllium compounds  | 1     | 58, 100C            | 2012    |
|             | Betel quid with tobacco  | 1     | 85, 100E            | 2012    |
|             | Betel quid without tobacco   | 1     | 85, 100E            | 2012    |

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| CAS No                     | Agent   | Group | Volume                | Year    |
|----------------------------|---|-------|-----------------------|---------|
| 000542-88-1<br>000107-30-2 | Bis(chloromethyl)ether; chloromethyl methyl ether<br>(technical-grade)  | 1     | 4, Sup 7,<br>100F     | 2012    |
| 000055-98-1                | Busulfan  | 1     | 4, Sup 7,<br>100A     | 2012    |
| 000106-99-0                | 1,3-Butadiene   | 1     | 97, 100F              | 2012    |
| 007440-43-9                | Cadmium and cadmium compounds   | 1     | 58, 100C              | 2012    |
| 000305-03-3                | Chlorambucil  | 1     | 26, Sup 7,<br>100A    | 2012    |
| 000494-03-1                | Chlornaphazine  | 1     | 4, Sup 7,<br>100A     | 2012    |
| 018540-29-9                | Chromium (VI) compounds   | 1     | 49, 100C              | 2012    |
|                            | <i>Clonorchis sinensis</i> (infection with)   | 1     | 61, 100B              | 2012    |
|                            | Coal, indoor emissions from household combustion of   | 1     | 95, 100E              | 2012    |
|                            | Coal gasification   | 1     | 92, 100F              | 2012    |
| 008007-45-2                | Coal-tar distillation   | 1     | 92, 100F              | 2012    |
| 065996-93-2                | Coal-tar pitch  | 1     | 35, Sup 7,<br>100F    | 2012    |
|                            | Coke production   | 1     | 92, 100F              | 2012    |
| 000050-18-0<br>006055-19-2 | Cyclophosphamide  | 1     | 26, Sup 7,<br>100A    | 2012    |
| 059865-13-3<br>079217-60-0 | Cyclosporine (see ciclosporin)  |       |                       |         |
| 000078-87-5                | 1,2-Dichloropropane   | 1     | 41, Sup 7,<br>71, 110 | in prep |
| 000056-53-1                | Diethylstilbestrol  | 1     | 21, Sup 7,<br>100A    | 2012    |
|                            | Engine exhaust, diesel  | 1     | 46, 105               | 2013    |
|                            | Epstein-Barr virus  | 1     | 70, 100B              | 2012    |
| 066733-21-9                | Erionite  | 1     | 42, Sup 7,<br>100C    | 2012    |
|                            | Estrogen-only menopausal therapy  | 1     | 72, 100A              | 2012    |
|                            | Estrogen therapy, postmenopausal (see Estrogen-only menopausal therapy)   |       |                       |         |
|                            | Estrogen-progestogen menopausal therapy (combined)  | 1     | 72, 91, 100A          | 2012    |
|                            | Estrogen-progestogen oral contraceptives (combined)<br>(NB: There is also convincing evidence in humans that these agents confer a protective effect against cancer in the endometrium and ovary) | 1     | 72, 91, 100A          | 2012    |
| 000064-17-5                | Ethanol in alcoholic beverages  | 1     | 96, 100E              | 2012    |



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|---|---|-------|-----------------|---------|
| 000075-21-8                               | Ethylene oxide<br>(NB: Overall evaluation upgraded to Group 1 based on mechanistic and other relevant data)   | 1     | 97, 100F        | 2012    |
| 033419-42-0                               | Etoposide<br>(NB: Overall evaluation upgraded to Group 1 based on mechanistic and other relevant data)  | 1     | 76, 100A        | 2012    |
| 033419-42-0<br>015663-27-1<br>011056-06-7 | Etoposide in combination with cisplatin and bleomycin   | 1     | 76, 100A        | 2012    |
|   | Fission products, including strontium-90  | 1     | 100D            | 2012    |
|   | Fluoro-edenite fibrous amphibole  | 1     | 111             | In prep |
| 000050-00-0                               | Formaldehyde  | 1     | 88, 100F        | 2012    |
|   | Haematite mining (underground)  | 1     | 1, Sup 7, 100D  | 2012    |
|   | <i>Helicobacter pylori</i> (infection with)   | 1     | 61, 100B        | 2012    |
|   | Hepatitis B virus (chronic infection with)  | 1     | 59, 100B        | 2012    |
|   | Hepatitis C virus (chronic infection with)  | 1     | 59, 100B        | 2012    |
|   | Human immunodeficiency virus type 1 (infection with)  | 1     | 67, 100B        | 2012    |
|   | Human papillomavirus types 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59<br>(NB: The HPV types that have been classified as <i>carcinogenic to humans</i> can differ by an order of magnitude in risk for cervical cancer) | 1     | 64, 90, 100B    | 2012    |
|   | Human T-cell lymphotropic virus type I  | 1     | 67, 100B        | 2012    |
|   | Ionizing radiation (all types)  | 1     | 100D            | 2012    |
|   | Iron and steel founding (occupational exposure during)  | 1     | 34, Sup 7, 100F | 2012    |
|   | Isopropyl alcohol manufacture using strong acids  | 1     | Sup 7, 100F     | 2012    |
|   | Kaposi sarcoma herpesvirus  | 1     | 70, 100B        | 2012    |
|   | Leather dust  | 1     | 100C            | 2012    |
|   | Magenta production  | 1     | 57, 99, 100F    | 2012    |
| 000148-82-3                               | Melphalan   | 1     | 9, Sup 7, 100A  | 2012    |
| 000298-81-7                               | Methoxsalen (8-methoxypsoralen) plus ultraviolet A radiation  | 1     | 24, Sup 7, 100A | 2012    |
| 013909-09-6                               | Methyl-CCNU   | 1     | Sup 7, 100A     | 2012    |
| 000101-14-4                               | 4,4'-Methylenebis(2-chloroaniline) (MOCA)<br>(NB: Overall evaluation upgraded to Group 1 based on mechanistic and other relevant data)  | 1     | 57, 99, 100F    | 2012    |
|   | Mineral oils, untreated or mildly treated   | 1     | 33, Sup 7, 100F | 2012    |

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|----------------------------|--|-------|--------------------|---------|
|                            | MOPP and other combined chemotherapy including alkylating agents   | 1     | Sup 7, 100A        | 2012    |
| 000091-59-8                | 2-Naphthylamine  | 1     | 4, Sup 7, 99, 100F | 2012    |
|                            | Neutron radiation<br>(NB: Overall evaluation upgraded to Group 1 with supporting evidence from other relevant data)  | 1     | 75, 100D           | 2012    |
|                            | Nickel compounds   | 1     | 49, 100C           | 2012    |
| 016543-55-8<br>064091-91-4 | N'-Nitrosornicotine (NNN) and 4-(N-Nitrosomethylamino)-1-(3-pyridyl)-1-butanone (NNK)<br>(NB: Overall evaluation upgraded to Group 1 based on mechanistic and other relevant data)   | 1     | 89, 100E           | 2012    |
|                            | <i>Opisthorchis viverrini</i> (infection with)   | 1     | 61, 100B           | 2012    |
|                            | Outdoor air pollution  | 1     | 109                | in prep |
|                            | Outdoor air pollution, particulate matter in   | 1     | 109                | in prep |
|                            | Painter (occupational exposure as a)   | 1     | 47, 98, 100F       | 2012    |
|                            | Particulate matter in outdoor air pollution (see Outdoor air pollution, particulate matter in)   |       |                    |         |
| 057465-28-8                | 3,4,5,3',4'-Pentachlorobiphenyl (PCB-126)<br>(see Polychlorinated biphenyls, dioxin-like, with a TEF according to WHO)   | 1     | 100F               | 2012    |
| 057117-31-4                | 2,3,4,7,8-Pentachlorodibenzofuran<br>(NB: Overall evaluation upgraded to Group 1 based on mechanistic and other relevant data)   | 1     | 100F               | 2012    |
| 000062-44-2                | Phenacetin<br>(NB: Overall evaluation upgraded to Group 1 with supporting evidence from other relevant data)   | 1     | 24, Sup 7, 100A    | 2012    |
|                            | Phenacetin, analgesic mixtures containing  | 1     | Sup 7, 100A        | 2012    |
| 014596-37-3                | Phosphorus-32, as phosphate  | 1     | 78, 100D           | 2012    |
| 007440-07-5                | Plutonium  | 1     | 78, 100D           | 2012    |
| 001336-36-3                | Polychlorinated biphenyls  | 1     | 18, Sup 7, 107     | in prep |
|                            | Polychlorinated biphenyls, dioxin-like, with a Toxicity Equivalency Factor (TEF) according to WHO (PCBs 77, 81, 105, 114, 118, 123, 126, 156, 157, 167, 169, 189)<br>(NB: Overall evaluation upgraded to Group 1 with strong supporting evidence from other relevant data) | 1     | 107                | in prep |
|                            | Radioiodines, including iodine-131   | 1     | 78, 100D           | 2012    |
|                            | Radionuclides, alpha-particle-emitting, internally deposited<br>(NB: Specific radionuclides for which there is <i>sufficient evidence</i> in humans are also listed individually as Group 1 agents)  | 1     | 78, 100D           | 2012    |

## Agents Classified by the IARC Monographs, Volumes 1–112

| CAS No      | Agent  | Group | Volume          | Year |
|-------------|--|-------|-----------------|------|
|             | Radionuclides, beta-particle-emitting, internally deposited<br>(NB: Specific radionuclides for which there is <i>sufficient evidence</i> in humans are also listed individually as Group 1 agents) | 1     | 78, 100D        | 2012 |
| 013233-32-4 | Radium-224 and its decay products  | 1     | 78, 100D        | 2012 |
| 013982-63-3 | Radium-226 and its decay products  | 1     | 78, 100D        | 2012 |
| 015262-20-1 | Radium-228 and its decay products  | 1     | 78, 100D        | 2012 |
| 010043-92-2 | Radon-222 and its decay products   | 1     | 43, 78, 100D    | 2012 |
|             | Rubber manufacturing industry  | 1     | 28, Sup 7, 100F | 2012 |
|             | Salted fish, Chinese-style   | 1     | 56, 100E        | 2012 |
|             | <i>Schistosoma haematobium</i> (infection with)  | 1     | 61, 100B        | 2012 |
| 013909-09-6 | Semustine (see Methyl-CCNU)  |       |                 |      |
| 068308-34-9 | Shale oils   | 1     | 35, Sup 7, 100F | 2012 |
| 014808-60-7 | Silica dust, crystalline, in the form of quartz or cristobalite  | 1     | 68, 100C        | 2012 |
|             | Solar radiation  | 1     | 55, 100D        | 2012 |
|             | Soot (as found in occupational exposure of chimney sweeps)   | 1     | 35, Sup 7, 100F | 2012 |
| 000505-60-2 | Sulfur mustard   | 1     | 9, Sup 7, 100F  | 2012 |
| 010540-29-1 | Tamoxifen<br>(NB: There is also conclusive evidence that tamoxifen reduces the risk of contralateral breast cancer in breast cancer patients)  | 1     | 66, 100A        | 2012 |
| 001746-01-6 | 2,3,7,8-Tetrachlorodibenzo- <i>para</i> -dioxin  | 1     | 69, 100F        | 2012 |
| 000052-24-4 | Thiotepa   | 1     | 50, 100A        | 2012 |
| 007440-29-1 | Thorium-232 and its decay products   | 1     | 78, 100D        | 2012 |
|             | Tobacco, smokeless   | 1     | 89, 100E        | 2012 |
|             | Tobacco smoke, second-hand   | 1     | 83, 100E        | 2012 |
|             | Tobacco smoking  | 1     | 83, 100E        | 2012 |
| 000095-53-4 | <i>ortho</i> -Toluidine  | 1     | 77, 99, 100F    | 2012 |
| 000299-75-2 | Treosulfan   | 1     | 26, Sup 7, 100A | 2012 |
| 000079-01-6 | Trichloroethylene  | 1     | 63, 106         | 2014 |
|             | Ultraviolet radiation (wavelengths 100-400 nm, encompassing UVA, UVB, and UVC)   | 1     | 100D            | 2012 |
|             | Ultraviolet-emitting tanning devices   | 1     | 100D            | 2012 |
| 000075-01-4 | Vinyl chloride   | 1     | 97, 100F        | 2012 |
|             | Wood dust  | 1     | 62, 100C        | 2012 |
|             | X- and Gamma-Radiation   | 1     | 75, 100D        | 2012 |