Advisory Group recommendations on priorities for the *IARC Monographs*

Published Online
April 12, 2024
https://doi.org/10.1016/S1470-2045(24)00208-0

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Declaration of interests
All Monographs Advisory Group members declare no competing interests

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None

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Declaration of interests
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Declaration of interests
RB is a a salaried employee of Regulatory Science Associates and CropLife International sponsored his travel to and attendance at the Advisory Group meeting. JB is employed by ToxStrategies, and they sponsored her travel to the Advisory Group meeting

In March, 2024, an Advisory Group of 28 independent scientists from 22 countries met in Lyon, France to recommend priorities for carcinogenicity evaluations by the International Agency for Research on Cancer (IARC) *Monographs* programme during 2025–29. IARC periodically convenes such advisory groups to ensure that the agents evaluated in the *Monographs* are selected on the basis of the latest scientific evidence relevant to carcinogenicity.[1] A detailed report of the Advisory Group recommendations will be published in due course.[2]

The Advisory Group assessed the response to a public call for nominations and considered more than 200 candidate agents, including the recommended priority agents remaining from a similar Advisory Group meeting convened in 2019.[3] The Advisory Group comprised scientists with expertise across the spectrum of topics relevant to carcinogenicity. In drawing

	Rationale
Agents not previously evaluated by *IARC Monographs*	
Disinfection byproducts in water, including haloacetic acids; sleep disruption; hair straightening products; metalworking fluids; obesity*; platinum-based chemotherapies as mechanistic class†; dibutyl phthalate; nitrogen dioxide‡; artificial light at night‡; sugar-sweetened beverage consumption‡; GLP-1 analogues‡; Fonofos‡	Relevant human cancer, animal cancer, and mechanistic evidence
Fusobacterium nucleatum; human cytomegalovirus; sedentary behaviour; ultrafine; ultraprocessed food consumption; anthracyclines as mechanistic class†; BRAF inhibitors—dabrafenib, encorafenib, vemurafenib; epirubicin; tetracycline; tofacitinib and other Janus kinase inhibitors; perfluorohexanesulfonic acid; cannabis smoking‡; ultrafine particles‡; assisted reproductive techniques‡; chlorpyrifos‡	Relevant human cancer and mechanistic evidence
Electronic nicotine delivery systems; estragole; carbadox; alachlor; cyfluthrin; cypermethrin; mancozeb; neonicotinoid insecticides; tebuconazole; vinclozolin; bisphenol A; bisphenol S; bisphenol F; 2,3-butanedione; carbon disulfide; diisononyl phthalate; glycidamide; hexafluoropropylene oxide dimer acid; methanol; ozone; pentabromodiphenyl ethers; triclosan; zearalenone‡	Relevant animal cancer and mechanistic evidence
Hepatitis D virus; *Salmonella typhi*; taconite; terbufos‡	Relevant human cancer evidence
Metyltetraprole; proquinazid; butyraldehyde; chlorinated paraffins; tris(chloropropyl)phosphate	Relevant animal cancer evidence
Methamphetamine; Congo red; cumyl hydroperoxide; 2,4-dihydroxybenzophenone; parabens; electronic waste work‡; polyhexamethyleneguanidine‡	Relevant mechanistic evidence
Agents previously evaluated by *IARC Monographs*§	
Hair colouring products (personal use of); coal dust; paracetamol (acetaminophen); textured implants (breast and buttock); carbaryl; ethylenedithiocarbamates; permethrin; pyrethrins and pyrethroids	New human cancer, animal cancer, and mechanistic evidence to warrant re-evaluation of the classification
Non-ionising radiation (radiofrequency)‡	New human cancer and animal cancer evidence to warrant re-evaluation of the classification
Human papillomavirus β; *Opisthorchis felineus*; indoor combustion of biomass; textile manufacturing industry work; inorganic lead compounds; daunorubicin; doxorubicin; methotrexate; atrazine and other triazine pesticides; acetaldehyde; acrylamide; Merkel cell polyomavirus‡; clomiphene citrate‡; progestogen-only contraceptives‡; chlordecone‡	New human cancer and mechanistic evidence to warrant re-evaluation of the classification
Multiwalled carbon nanotubes; butyl benzyl phthalate; 5-nitro-*o*-toluidine; 4-nitrotoluene; *p*-phenylenediamine	New animal cancer and mechanistic evidence to warrant re-evaluation of the classification
Metallic nickel; very hot beverages and food¶; carbon tetrachloride‡; tetrachloroethylene‡	New human cancer evidence to warrant re-evaluation of the classification
Piperonyl butoxide	New animal cancer evidence to warrant re-evaluation of the classification
Schistosoma japonicum; *Schistosoma mansoni*; patulin; safrole; anaesthetics, volatile—isoflurane, sevoflurane, and desflurane; malathion; bromate compounds; 3,3′-dimethoxybenzidine; 3,3′-dimethylbenzidine; isoprene; fluoranthene‡	New mechanistic evidence to warrant re-evaluation of the classification
Helicobacter pylori‡; aflatoxins‡; outdoor air pollution‡; tobacco smoking and second-hand smoke‡; silica dust‡; asbestos‡; hormone replacement therapy‡; radon and its decay products‡; ethylene oxide‡; formaldehyde‡	Group 1 carcinogen with evidence for new cancer sites (see section 3 of the Preamble to the *IARC Monographs*[1])

Evidence of human exposure was identified for all agents. Agents are ordered by readiness for evaluation and then by type (infectious, biotoxins, complex exposures, occupations, particles, fibres, metals, physical agents, nutritional agents, pharmaceuticals, pesticides, other chemicals). *A minority of the Advisory Group considered that obesity is not an exogenous agent and therefore should not be evaluated. †Advised to evaluate each pharmaceutical individually in the same volume. ‡Advised to conduct in latter half of 5-year period. §See https://monographs.iarc.who.int/list-of-classifications/ for current list of classifications. ¶Very hot food has not been previously evaluated.

Table 1: **Agents recommended for evaluation by the *IARC Monographs* with high priority**

	Previous evaluation status
Toxoplasma gondii; black cohosh extracts; outdoor combustion of biomass; tattoos and permanent make up; anatase-type nano-TiO_2; neonatal phototherapy; anti-thymocyte globulin; bifenthrin; biphenyl; pendimethalin; α-pinene; sulfolane	Agents not previously evaluated by the *IARC Monographs*
Fumonisin B1; pyrrolizidine alkaloids; ingested nitrate; selenium and selenium compounds; xylenes	Agents previously evaluated by the *IARC Monographs**

Evidence of human exposure was identified for all agents. Agents are ordered by type (infectious, biotoxins, complex exposures, particles, metals, physical agents, pharmaceuticals, pesticides, other chemicals). *See https://monographs.iarc.who.int/list-of-classifications/ for current list of classifications.

Table 2: **Agents recommended for evaluation by the *IARC Monographs* with medium priority**

	Rationale
Chronic circadian dysfunction; diabetes; insomnia; reduction of sex hormones with human aging; violation of tissue renewal or regeneration with human aging; alefacept	No evidence of exposure, or not an exogenous exposure
Dysbiotic microbiota; poor oral hygiene; nitrate-reducing bacteria in tobacco; SARS-CoV-2; cleaning products; long working hours; social isolation and loneliness; phosphorescent paints; laboratory work and occupation as a chemist; occupation as a pesticide applicator; semiconductor industry work; acrylonitrile-butadiene-styrene particles emitted by three-dimensional printers; engineered stone fabrication; microplastics and nanoplastics; aluminium; rare earth elements; intense pulsed light; artificially sweetened beverage consumption; dietary salt intake; indole-3-carbinol; isoflavones; sucralose; gadolinium-based contrast agents; gene or cell therapy or vectors; glucocorticoids; glutathione; reversible acetylcholinesterase inhibitors; allyl alcohol; ametryn; atraric acid; boscalid; *o*-benzyl-*p*-chlorophenol; cinidon ethyl; *p*-cresol; 1,2-cyclohexanedicarboxylic acid, diisononyl ester; 2,4-dichlorophenol; 2,4-dimethylphenol; ethyl anthranilate; *S*-ethyl-*N*,*N*-dipropylthiocarbamate; furmecyclox; hexythiazox; 2-hydroxy-4-methoxybenzophenone; menthyl anthranilate; methyl anthranilate; palmitic acid; phosmet; red dye number 3 (erythrosine); styrene-acrylonitrile (SAN) trimer; 2,4,6-tribromophenol	Existing evidence does not appear to support a first-time classification
Malaria; cyclopeptide cyanotoxins; dental amalgam; night shift work; carbon black, bulk and nanoscale; extremely low-frequency magnetic fields; androstenedione; oxymetholone; *o*-aminoazotoluene; catechol; *p*-cresidine; cumene; 2,4-diaminotoluene; 1,2-dibromo-3-chloropropane; *p*-dichlorobenzene; dichloromethane; diethylhexyl phthalate; 1,2-dihydroxybenzene; 1,1-dimethylhydrazine; 1,4-dioxane; furan; glyphosate; nitrilotriacetic acid; perfluorooctanesulfonic acid; thioacetamide; tris(2-chloroethyl) phosphate	Existing evidence does not appear to support a change in classification*

Agents are ordered by type (infectious, biotoxins, complex exposures, occupations, particles, metals, physical agents, pharmaceuticals, chemicals). *See https://monographs.iarc.who.int/list-of-classifications/ for current list of classifications.

Table 3: **Nominated agents not recommended for evaluation by the *IARC Monographs* during 2025–29**

their conclusions, the members appraised, for each nominated agent, the evidence regarding human exposure, cancer in humans, cancer in experimental animals, and carcinogen mechanisms according to precepts described in the Preamble to the *IARC Monographs*.[1] Systematic literature searches were complemented by a text mining and database fusion approach to identify relevant studies, document the relative abundance of literature for the different evidence streams, and map chemical similarity[4] in support of decisions on prioritisation for individual agents and groups of agents.

To develop its priority recommendations, the Advisory Group deliberated on all nominated agents by both evidence stream (ie, human exposure, cancer in humans, cancer in experimental animals, and mechanistic evidence in humans and experimental systems) and type of agent (eg, infectious agents, biotoxins, complex exposures, occupations, particles and fibres, metals, pharmaceuticals, physical agents, pesticides, and a variety of miscellaneous chemicals). Priority was assigned based on (a) evidence that there is contemporary human exposure (whether widespread or more narrow) and (b) the extent to which available evidence on carcinogenicity from each stream could support a new or updated evaluation according to the Preamble to the *IARC Monographs*.[1] Any of the three evidence streams alone could support prioritisation of agents with no previous evaluation. For previously evaluated agents, the Advisory Group considered the basis of the current classification and the potential impact of the newly available evidence during integration across streams (see table 4 in the Preamble to the *IARC Monographs*[1]).

The Advisory Group recommended a broad range of agents for evaluation with high (table 1) or medium (table 2) priority. Other agents were assigned no priority for evaluation (table 3). The Advisory Group particularly noted that the *Monographs* programme has not conducted an evaluation of pesticides since 2015, or of infectious agents since 2012; as a result, many high-priority recommendations (19 and ten, respectively) have accrued in these categories. Noting that suggestive evidence for additional cancer sites was found for all ten nominated agents currently classified in Group 1 (table 1), the Advisory Group considered a systematic appraisal of all 128 Group 1 agents to identify new cancer sites with 'sufficient' or 'limited' evidence to be warranted.[1] The Advisory Group further

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Declaration of interests
All IARC–WHO Secretariat members declare no competing interests

Upcoming meetings
June 11–18, 2024: Volume 136: Talc and acrylonitrile
Nov 5–12, 2024: Volume 137: Hydrochlorothiazide, voriconazole, and tacrolimus
Feb 25 to March 4, 2025: Volume 138: Automotive gasoline and some oxygenated additives

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For the **Preamble to the IARC Monographs** see https://monographs.iarc.who.int/wp-content/uploads/2019/07/Preamble-2019.pdf

For the **IARC declarations of interests see https://monographs.iarc.who.int/wp-content/uploads/2024/01/Short_List_of_Participants_AGP2024.pdf**

recommended that agents may merit priority consideration if compelling evidence indicating an emerging carcinogenic hazard (eg, from cancer epidemiology studies, cancer bioassays, or mechanistic studies on key characteristics of carcinogens) becomes available in the next 5 years.

We declare no competing interests.

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1 International Agency for Research on Cancer. Preamble to the *IARC Monographs*. Lyon, France; 2019. https://monographs.iarc.who.int/wp-content/uploads/2019/07/Preamble-2019.pdf.

2 International Agency for Research on Cancer. Report of the Advisory Group to Recommend Priorities for the *IARC Monographs* during 2025–2029; 19–22 March, 2024. Lyon, France; in press.

3 Marques MM, Berrington de Gonzalez A, Beland FA, et al. Advisory Group recommendations on priorities for the IARC Monographs. *Lancet Oncol* 2019; **20:** 763–64.

4 Barupal DK, Schubauer-Berigan MK, Korenjak M, et al. Prioritizing cancer hazard assessments for IARC Monographs using an integrated approach of database fusion and text mining. *Environ Internat* 2021; **156:** 106624.