

Introduction and Comparison between Occupational and Environmental Carcinogens Listed by International Agency for Research on Cancer in Previous Years

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Citation this Article: Seyedeh Negar Assadi, “Introduction and Comparison between Occupational and Environmental Carcinogens Listed by International Agency for Research on Cancer in Previous Years”, IJMSIR- April - 2023, Vol – 8, Issue - 2, P. No. 37 – 42.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Background: The International Agency for Research on Cancer (IARC) 's aim is research on the causes of human cancer for example occupational exposures in industries.

Objective is the introduction and comparison Agents and Occupational exposures listed by IARC in 2022 and previous years that 2022 was the last revision up to now for having better safety in the work places.

Methods: This review study compare number, kind of agents and type of industrial exposures listed by IARC in 2022 and previous years. Data analyzed in SPSS with descriptive statistics.

Results

- IARC has some Groups;1,2A,2B,3,4; in 2022 and previous years.
- In November 2022: group 1 has 122 agents and some mixtures and exposure circumstances in industry.
- In September 2021: group 1 has 121 agents and some mixtures and exposure circumstances in industry.
- group 1 has 107 agents and some mixtures and exposure In June 2011: circumstances in industry.

- In August 2010: group 1 has 107 agents and some mixtures and exposure circumstances in industry.
- In January 2009: group 1 has 108 agents and some mixtures and exposure circumstances in industry.
- In November 2007: group 1 has 102 agents and some mixtures and exposure circumstances in industry.
- In January 2003: group 1 had 88 agents and some mixtures and exposure circumstances in industry.

Conclusion: According to studies up to now some agent and occupational exposures transfer from one group to another. The identification of occupational carcinogens is important because the many of the occupational cancer are preventable with appropriate practices and protective standards.

Keywords: IARC (International Agency for Research on Cancer), Occupational Exposure, Agents

Introduction

One of two or three person in the world will have cancer in his or her life [1]. The most of causes of cancers are genetic, environmental and work exposures, lifestyle and nutrition [1].

7.5 percent of cancers are related to occupational exposures [1], then identification and demonstration of carcinogens in the workplace are important because most of these cancers are preventable with appropriate working and making protective standards and processes [1-4]. The International Agency for Research on Cancer (IARC) is part of the World Health Organization (WHO), IARC's aim is to research on the causes of human cancer, the mechanisms of carcinogenesis, and to develop methods for cancer control. The Agency is included epidemiological and laboratory research. IARC has some groups for carcinogens (1,2A,2B,3,4) and a separate part for exposure circumstances in industry and occupation with each group. Group 1 in IARC Monographs agents and mixtures are carcinogen for humans and exposure circumstances; for example in the workplace or work process that are carcinogen for workers [1].

Group 2A is included agents and mixtures are probably carcinogen for humans and some exposures that are probably Effects on them.

There are sufficient evidence of carcinogenicity for animals but insufficient for humans [1]. Group 2B is gathered from agents and mixtures are possibly carcinogen for humans and exposures in the environment or workplace are possibly [1]. Group 3 in IARC Monographs agents and mixtures are not classifiable as to carcinogen for humans also exposures that are not [1]. Group 4 is included agents and mixtures that are probably not carcinogen for humans and exposures that in environment and workplace which probably are not [1].

With industry development in countries carcinogen exposure spread in the world specially in countries with low hygienic condition.

This information help industrial managers and health and safety staff for make decision about chemical use and control, for example for group 1 and 2A is avoiding the use of them. For group 2B use with very strict controls and prevention; such as enclosure, general and local exhaust ventilation, personal protective equipment or devices such as respirators and others [1-4]. The aim of this study is comparison Agents and occupational exposures listed by IARC in 2003 with November 2007, January 2009, August 2010, June 2011, September 2021, November 2022 last revision up to now for having better safety in the work places.

Methods

This review study compare number, kind of agents and number, type of industrial exposures listed by IARC in 2003 with November 2007 with January 2009 with August 2010, June 2011, September 2021 and November 2022 occupational medicine references and websites. Data have been analyzed in SPSS, for finding frequency with descriptive statistics IARC list and monographs in 2003 and IARC list and monographs in November 2007 and January 2009, August 2010, June 2011, September 2021 and November 2022.

In this study had been used frequency and crosstab table for comparison between 4 series of IARC Monographs in 2003, 2007, 2009, 2010, June 2011, September 2021 and November 2022.

Results

IARC has some Groups;1,2A,2B,3,4; in 2003:

- Group 1 had 88 Agents,12 Mixtures, 13 Exposure Circumstances in Industry.
- Group 2A had 64 Agents, 5 Mixtures, 4 Exposure Circumstances in Industry.
- Group 2B had 236 Agents,12 Mixtures, 4 Exposure Circumstances in Industry.

• Group 3 had 496 Agents and Mixtures, 0 Exposure Circumstances in Industry.

• Group 4 had 1 Agents, 0 Mixture, 0 Exposure Circumstances in Industry.

In November 2007:

• Group 1 has 102 Agents, 16 Mixtures, 19 Exposure Circumstances in Industry.

• Group 2A has 69 Agents, 7 Mixtures, 7 Exposure Circumstances in Industry.

• Group 2B has 246 Agents, 13 Mixtures, 7 Exposure Circumstances in Industry.

• Group 3 has 516 Agents, 11 Mixtures, 8 Exposure Circumstances in Industry.

• Group 4 has 1 Agents, 0 Mixture, 0 Exposure Circumstances in Industry.

In January 2009

• Group 1 has 108 Agents, 16 Mixtures, 19 Exposure Circumstances in Industry.

• Group 2A has 63 Agents, 7 Mixtures, 7 Exposure Circumstances in Industry.

• Group 2B has 248 Agents, 13 Mixtures, 7 Exposure Circumstances in Industry.

• Group 3 has 515 Agents, 11 Mixtures, 8 Exposure Circumstances in Industry.

• Group 4 has 1 Agents, 0 Mixture, 0 Exposure Circumstances in Industry.

In August 2010

Group 1 has 107 Agents, 2A has 58, 2B has 249, 3 has 512 and Group 4 has 1 Agents. [11-12]

In June 2011

Group 1 has 107 Agents, 2A has 59, 2B has 267, 3 has 508 and Group 4 has 1 Agents.

In September 2021

Group 1 has 121 Agents, 2A has 89, 2B has 319, 3 has 500 and Group 4 has not Agents.

In November 2022

Group 1 has 122 Agents, 2A has 93, 2B has 319, 3 has 501 and Group 4 has not Agents. (Table 1) [13-15]

Some agents, mixtures and exposures have been shown it's need for addition to some groups, for example Aristo lochic acid, dyes metabolized to benzidine, Etoposide, Ortho-toluidine and Phenacetin add to group 1 in IARC2009 [5-10].

Michler's base or 4,4' - methylene is (N, N_ dimethyl) Benz enamine, michler's ketone 4,4' - bis (dimethy lamino) benzophenone, Diepoxy butane and micro cysta in –LR add to group 2B in IARC 2009 [5-10].

Environmental and workplace or process exposures in IARC 2009 for group 1 are included

«Aluminium , Auramine production , Arsenic, Boot and shoe manufacture and repair, Chimney sweeping, Coal gasification, Coal-tar distillation ,Coke production, Furniture and cabinet making , Haematite mining (under ground) with exposure to radon , Environmental tobacco smoke (ETS) , Iron and steel, Isopropyl alcohol Manu facture, Magenta production , Painter, Paving and roofing with coal-tar pitch , Rubber industry , Strong-inorganic-acid mists containing sulfuric acid, Tobacco smoking and tobacco smoke» [5-10].

Exposures in group 2A are

«Art glass, glass containers and pressed ware (Manu facture) , Carbon electrode Manu facture, Cobalt metal with tungsten carbide , Hairdresser or barber, Petroleum refining, Shift work (circadian disruption) , Sunlamps and sunbeds» [5-10] .

Environmental and workplace exposure in group 2B are included

«Carpentry, Cobalt metal without tungsten carbide , Dry cleaning (occupational exposures) , Firefighter, Printing

processes , Talc-based body powder, Textile industry »[5-10].

and exposures in group 3 are included

« Calcium carbide production , Flat-glass and specialty glass, Hair colouring products , Leather goods Manufacture , Leather tanning and processing , Lumber industries, Paint, Pulp and paper manufacture»[5-10] .

Discussion

According to studies up to 2007 some Agent and occupational exposures transfer from group 2A to 1 for example; Silica (crystalline), Benzo[a] pyrene, 1,3-Butadiene, Formaldehyde, Gamma Radiation, Neutrons and some Agents and occupational exposure transfer from group 2B to 2A for example; Acrylamide, Lead compounds (inorganic).

By using the result of recent studies some agents, mixtures and exposures have been replaced in IARC's groups for example Aristolochic acid, dyes metabolized to benzidine, Etoposide, Ortho-toluidine and Phenacetin have been replaced from 2A to group 1 in IARC 2009 [5-10] .

Some recent studies have been demonstrate new agents or mixtures for some groups such as Michler's base and Michler's ketone for group 2B of IARC or have been replace from group 3 to group 2B for example microcystin – LR. [5-10].

The identification of occupational carcinogens is much important because the near all of the occupational cancer are completely preventable with appropriate practices and protective standards in work places [1].

«Because of change in agents and mixtures in groups ,exposures circumstances and process have been changed, environmental and occupational exposures for group 1 in

IARC 2003 were included Aluminum , Auramine production, Boot and Shoe manufacture and repair, coal

gasification, coke production, Furniture manufacture, Iron and Steel founding, Isopropyl alcohol manufacture, Magenta manufacture, Nickel refining, Rubber industry, Underground hematite mining and in IARC 2009 some exposure circumstances and process add to the list; Arsenic in drinking water, chimney sweeping, Coal-tar distillation, Environmental tobacco smoke, painter, paving and roofing with coal-tar pitch and strong inorganic acid mists containing sulfuric acid » [7, 8].

«In industrialized countries, exposure to known or suspected carcinogenic agents declined because of strict control and prevention or protection from exposure and change in process and circumstances in chemical production in industries.

but in developing countries; protection, prevention and change in process are in early stage, they are trying for better health specially in their industries by exposure control and protection as well as surveillance and medical practice» [1].

I had some studies on occupational exposures in some work such as Health care worker in all of them I recommended standard precautions and protective practices for safety and fitness for work according to IARC from WHO and others [15-18].

Conclusion

In introduction and comparison of total number of groups agents in IARC 2003, 2007, 2009, 2010, 2011, 2021 and 2022; because of recent studies about the agents and mixtures some of them reduce from one group and add to another more important group but has not reduction of total.

Acknowledgements

The author would like to thank the Vice Chancellor for Research of Mashhad University of Medical Sciences for supporting the research.

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Table 1: Number of Agents in Monographs of 2003, 2007, 2009, 2010, 2011, 2021 and 2022

Year Group	2003 Number of agents	2007 Number of agents	2009 Number of agents	2010 Number of agents	2011Number of agents	2021 Number of agents	2022 Number of agents
1	88	102	108	107	107	121	122
2A	64	69	63	58	59	89	93
2B	236	246	248	249	267	319	319
3	496	516	515	512	508	500	501
4	1	1	1	1	1	0	0