

國際癌症研究署(International Agency for Research on Cancer)人類致癌因子分類表

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歸類級別	歸類說明	歸類說明(原文) ^[5]	因子範例
<p>1 級 確定為致癌因子 Group 1 Carcinogenic to humans</p>	<p>符合以下其中一種情形：</p> <ul style="list-style-type: none"> •有充分(sufficient)流行病學研究的證據顯示出該物質對於人體具有致癌性^[1]。 •對於人體致癌性的流行病學研究證據有限(limited)或不足(inadequate)，但是有該物質引發人體細胞組織致癌機轉的強烈(strong)證據，且動物實驗證據充分(sufficient)。 	<p>This category applies whenever there is sufficient evidence of carcinogenicity in humans.</p> <p>In addition, this category may apply when there is both strong evidence in exposed humans that the agent exhibits key characteristics of carcinogens and sufficient evidence of carcinogenicity in experimental animals.</p>	<p>石棉、芥子氣、γ射線、菸草(吸或嚼)、二手菸、檳榔、甲醛、柴油引擎廢氣、太陽燈、紫外線輻射、電焊煙霧、含酒精飲料、加工過的肉、所有類型的游離輻射、室外空氣污染、煤煙、黃麴毒素、消防員(職業暴露)。</p>
<p>2A 級 <u>極有可能</u>為致癌因子 Group 2A Probably carcinogenic to humans</p>	<p>符合以下其中一種情形：</p> <ul style="list-style-type: none"> •對於人體致癌性的流行病學證據有限(limited)，但是動物實驗證據充分(sufficient)，且存在該物質引發人體細胞組織致癌機轉的證據^[2]。 •對於人體致癌性的流行病學證據不足(inadequate)，但是動物實驗證據充分(sufficient)，且有該物質引發人體細胞組織致癌機轉的強烈(strong)證據。 •對於人體致癌性的流行病學證據有限(limited)，且動物實驗證據不完全充分(less than sufficient)，但是有該物質引發人體細胞組織致癌機轉的強烈(strong)證據。 	<p>This category generally applies when the Working Group has made at least two of the following evaluations, including at least one that involves either exposed humans or human cells or tissues:</p> <ul style="list-style-type: none"> •Limited evidence of carcinogenicity in humans, •Sufficient evidence of carcinogenicity in experimental animals, •Strong evidence that the agent exhibits key characteristics of carcinogens. <p>If there is inadequate evidence regarding carcinogenicity in humans, there should be strong evidence in human cells or tissues that the agent exhibits key characteristics of carcinogens. If there is limited evidence of carcinogenicity in humans, then the second individual evaluation may be from experimental systems (i.e. sufficient evidence of carcinogenicity in experimental animals or strong evidence in experimental systems that the agent exhibits key characteristics of carcinogens).</p> <p>Additional considerations apply when there is strong evidence that the mechanism of carcinogenicity in experimental animals does not operate in humans for one or more tumor sites. Specifically, the remaining tumor sites should still support an evaluation of sufficient evidence in experimental animals in order for this evaluation to be used to support an overall classification in Group 2A.</p> <p>Separately, this category generally applies if there is strong evidence that the agent belongs, based on mechanistic considerations, to a class of agents for which one or more members have been classified in Group 1 or Group 2A.</p>	<p>高溫油炸釋出物質、苯乙烯、紅肉、Glyphosate (一種廣效型的有機磷除草劑)、DDT、無機鉛化合物。</p>

歸類級別	歸類說明	歸類說明(原文) ^[5]	因子範例
<p>2B 級 可能為致癌因子 Group 2B Possibly carcinogenic to humans</p>	<p>符合以下其中一種情形:</p> <ul style="list-style-type: none"> •對於人體致癌性的流行病學證據有限(limited)，動物實驗證據亦不完全充分(less than sufficient)，且該物質引發人體細胞組織致癌機轉的證據有限(limited)或不足(inadequate)。 •對於人體致癌性的流行病學證據不足(inadequate)，但是動物實驗證據充分(sufficient)，且存在該物質引發人體細胞組織致癌機轉的證據^[2]。 •對於人體致癌性的流行病學證據不足(inadequate)，且動物實驗證據不完全充分(less than sufficient)，但是有該物質引發人體細胞組織致癌機轉的強烈(strong)證據^[3]。 •對於人體致癌性的流行病學證據有限(limited)，但是動物實驗證據充分(sufficient)，且存在該物質引發細胞組織致癌機轉的強烈(strong)證據^[4]。 	<p>This category generally applies when only one of the following evaluations has been made by the Working Group:</p> <ul style="list-style-type: none"> •Limited evidence of carcinogenicity in humans, •Sufficient evidence of carcinogenicity in experimental animals, •Strong evidence that the agent exhibits key characteristics of carcinogens. <p>Because this category can be based on evidence from studies in experimental animals alone, there is no requirement that the strong mechanistic evidence be in exposed humans or in human cells or tissues. This category may be based on strong evidence in experimental systems that the agent exhibits key characteristics of carcinogens.</p> <p>As with Group 2A, additional considerations apply when there is strong evidence that the mechanism of carcinogenicity in experimental animals does not operate in humans for one or more tumor sites. Specifically, the remaining tumor sites should still support an evaluation of sufficient evidence in experimental animals in order for this evaluation to be used to support an overall classification in Group 2B.</p>	<p>汽油引擎廢氣、極低頻磁場、射頻電磁場 (radiofrequency electromagnetic fields)、蘆薈萃取液、鉛、醃漬蔬菜 (pickled vegetables)、乙苯、乙醛、甲基汞化合物、龍膽紫(紫藥水、染色劑)、孔雀綠(染料、淡水水產殺菌劑)、直接藍 (CI Direct Blue 218, 染劑)。</p>

歸類級別	歸類說明	歸類說明(原文) ^[5]	因子範例
<p>3 級 無法歸類為致癌因子 Group 3 Not classifiable as to its carcinogenicity to humans</p>	<p>對於人體致癌性的流行病學證據不足(inadequate)，且不存在該物質引發人體細胞組織致癌機轉的證據。</p>	<p>Agents that do not fall into any other group are generally placed in this category.</p> <p>This includes the case when there is strong evidence that the mechanism of carcinogenicity in experimental animals does not operate in humans for one or more tumor sites in experimental animals, the remaining tumor sites do not support an evaluation of sufficient evidence in experimental animals, and other categories are not supported by data from studies in humans and mechanistic studies.</p> <p>An evaluation in Group 3 is not a determination of non-carcinogenicity or overall safety. It often means that the agent is of unknown carcinogenic potential and that there are significant gaps in research.</p> <p>If the evidence suggests that the agent exhibits no carcinogenic activity, either through evidence suggesting lack of carcinogenicity in both humans and experimental animals, or through evidence suggesting lack of carcinogenicity in experimental animals complemented by strong negative mechanistic evidence in assays relevant to human cancer, then the Working Group may add a sentence to the evaluation to characterize the agent as well-studied and without evidence of carcinogenic activity.</p>	<p>極低頻電場、甲苯、氯比西林(盤尼西林之一種)、次氯酸鹽、己內醯胺(合成尼龍塑料的中間原料)、原油、汞、普拿疼、咖啡因、單寧酸和單寧、龍膽紫(紫藥水、染色劑)、孔雀綠(染料、淡水水產殺菌劑)。</p>

*國際癌症研究署(IARC)針對許多物質，依據其流行病學，動物毒理實驗證據，區分其致癌等級為1級至3級，詳細資料來源如下:

<https://monographs.iarc.fr/agents-classified-by-the-iarc/>

*IARC對於不同致癌等級皆有詳細的定義，本分類表將定義的重點摘錄後列於歸類說明當中。IARC最新公告對於每一種致癌等級的定義原文如下:

<https://monographs.iarc.fr/wp-content/uploads/2019/07/Preamble-2019.pdf>

*本分類表依據IARC於2022年09月07日最新公告的1,105項物質進行摘整，篩選後將比較常見的列於本分類表的因子範例當中。IARC公告的1,105項物質如下:

<https://monographs.iarc.fr/list-of-classifications>

*在IARC描述人體致癌性的流行病學研究或動物實驗的證據強度的時候，其公信力由大到小分別為:

充分(sufficient)>不完全充分(less than sufficient)>有限(limited)>不足(inadequate)

*在IARC描述關於某物質引發細胞組織致癌機轉研究的證據強度的時候，其公信力由大到小分別為:

強烈(strong)>有限(limited)>不足(inadequate)

備註:

^[1]如果某物質已經有充分(sufficient)流行病學研究的證據顯示出它對人體具有致癌性，則不需要進一步的動物實驗或致癌機轉研究的證據，就足以將該物質納入「1級」的歸類級別。

^[2]無論該致癌機轉的證據是強烈(strong)、有限(limited)或不足(inadequate)，都符合「存在」的定義。

^{[3][4]}仔細比較這兩項之後可以觀察到，項目^[3]當中的「人體致癌性流行病學研究」和「動物實驗」的證據強度皆低於項目^[4]，所以項目^[3]嚴格要求必須是「人體」細胞組織致癌機轉的強烈(strong)證據，而項目^[4]的生物機轉證據則沒有要求必須是「人體」。

^[5]International Agency for Research on Cancer (2019). *IARC Monographs on the Identification of Carcinogenic Hazards to Humans – PREAMBLE*. Lyon, France: Author.