

ABSTRACT

Individual toxic agent screening (ITAS) for etiologic diagnosis in leukemia



Background: The etiologies of selected risk factors associated with leukemia include genetic disorders, physical and chemical exposures, radiation, and chemotherapy. In a new way of looking at this disorder, cancer is considered a toxic disease, and we must apply the principles of toxicology for diagnosis, treatment, and prevention. The simple standard evaluation of the patient by physical examination and laboratory tests, including the type of genetic mutations we routinely screen for in internal medicine diseases, is not sufficient for the correct diagnosis and treatment of cancer.

Cancer patients have historically never been referred to a medical toxicologist in the poison control center for an Individual Toxic Agent Screening (ITAS) to determine a source. A toxicology consult by a medical toxicologist should be considered for cancer patients when they have a diagnosis of myelodysplastic syndromes, acute myeloid leukemia (AML), or acute lymphatic leukemia to determine a potential associated cause. The medical toxicologist could advise patients ways to prevent any further exposure to toxic substances in their environment during management and after recovery.

Method: ITAS is done by the medical toxicologist based on the Living – Eating – Working Together (LEWT) principle to determine the toxic substances that the patient may have been exposed to. ITAS was applied to patients with a diagnosis of AML, acute lymphatic leukemia, or myelodysplastic syndrome seen in the department of hematology at Cho Ray hospital since 2020. They were followed during their course of treatment and chemotherapy.

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Results: Forty-two cases were diagnosed with AML, acute lymphatic leukemia, or myelodysplastic syndrome and had a consult with a medical toxicologist during treatment. There were forty-one cases that were associated with a chemical exposure associated with their daily habits or workplace. The chemical exposures included benzophenone-4 in nail salon workers (4.7%), toluene or xylene in shoe workers (9.5%), benzene in polyurethane coatings or paint in furniture manufacturing workers (14.2%), or construction engineers (9.5%), benzyl acetate, benzisothiazolinone benzyl alcohol in liquid fabric softeners (45.2%), nonyl, phenol or benzyl compounds in liquid house cleaners (31%), essential oils (9.5%), printer inks (4.7%), polycyclic aromatic hydrocarbons (PAHs), benzene and carbonyls in incense (9.5%), or nitrosamines in processed meats or preserved foods (11.9%). Other substances found were related to chemotherapy, antituberculosis medications, herbicides, insecticides, and tattoo ink. There were 7 deaths that occurred during follow up. There was one case with an unclear chemical exposure. All these cases were advised to avoid exposure to their presumed source for prevention or recurrence of their disease. The exposure source was removed, preventing any future development of leukemias in these patients or their relatives.

Conclusion: Myelodysplastic syndrome and leukemia patients should have a consultation with a medical toxicologist to determine the etiology and prevent any further exposure. It is essential that ITAS should be applied to help determine the causal carcinogen. This may be one of the functions of the poison control center, and it has an important role in poison and cancer prevention.

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背景

可能造成白血病的因素包括遺傳疾病、物理和化學暴露、放射及化學治療等。以毒物學的角度切入，癌症可視為暴露毒性物質後而生的疾病，可將毒理學原理應用於癌症的診斷、治療及預防上。過去癌症患者不會被轉介至毒藥物諮詢中心，由臨床毒理學專家進行個別毒物篩檢（ITAS）以確定致病因素。然而透過理學檢查和實驗室檢驗等一般標準評估及常規基因篩檢，不完全能正確診斷及治療癌症，當患者確診骨髓增生不良症候群、急性骨髓性白血病或急性淋巴性白血病應考慮諮詢臨床毒理學專家以確定潛在病因，於治療期間及痊癒後避免進一步接觸環境中的毒性致癌物質。

方法

ITAS是由臨床毒物學專家依據生活-飲食-工作合併考量原則而制定並完成，用以確定患者可能暴露之毒性致癌物質。越南大水鑛醫院於2020年開始對於血液腫瘤科確診骨髓增生不良症候群、急性骨髓性白血病或急性淋巴性白血病的患者採用ITAS，並於治療及化療的過程中追蹤其病況。

結果

本研究共收案42例確診骨髓增生不良症候群、急性骨髓性白血病或急性淋巴性白血病患者，於治療期間諮詢臨床毒物學專家，發現其中有41例之罹癌原因與患者日常生活習慣或於工作環境暴露的化學物質有關。暴露物質包含：二苯酮（美甲沙龍業者；4.7%）、甲苯或二甲苯（製鞋工人；9.5%）、PU塗層或油漆中的苯（家具製造業；14.2%）（建築工程師；9.5%）、乙酸苄酯、苯並異噻啉酮（BIT）及苯甲醇（柔軟精；45.2%）、壬基、苯酚或苄基化合物（清潔精；31%）、精油（9.5%）、影印機墨水（4.7%）、多環芳香烴（PAH）、香中的苯或羰基化合物（9.5%）或亞硝胺（加工肉品或醃製食品；11.9%）；還有其他如化療、結核藥物、除草劑、殺蟲劑及紋身用墨水等物質。追蹤期間有7名病患死亡；有1名患者暴露不明化學物質。收案期間建議所有病患避免接觸並移除可能致病源，防止患者及其親屬於未來罹患白血病或復發。

結論

罹患骨髓增生不良症候群和白血病患者應諮詢臨床毒物學專家以確定病因並防止持續暴露。應用ITAS協助確定致癌物，是毒藥物諮詢中心的功能之一，於毒物防治及避免罹癌方面有著重要的角色。