

快报

人血淋巴细胞微核测定 可以用作辐射生物剂量计

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微核测定被誉为染色体畸变快速测定方法。Countryman 和 Heddle 创立的人外周血培养淋巴细胞微核测定法,提示可能用来估算人的受照剂量^[1]。国内外学者都证实了上述作者的结果^[2-4],发现不论是X线、中子或⁶⁰Co γ 线,在一定剂量范围内,其诱发的微核率均和受照剂量呈现很好的线性关系。我们还在狗和家兔身上首次发现动物整体照射与血标本离体照射诱发的微核率基本一致^[5,6],这就为应用微核体外刻度曲线来推算人体照射剂量提供了实验依据。我们进而在一例意外照射的病人身上进行了应用,得到了很好的结果,现简要报道于后。

患者王××,男性,不幸于19××年9月1日意外受到⁶⁰Co γ 线照射。我们于事故后2.5小时采取静脉血0.5 ml左右进行培养(培养液由RPMI 1640、小牛血清和PHA组成),37℃条件下培养96小时后制片染色镜检,见到微核率为87%。

血液离体照射微核刻度曲线:取4名健康青年静脉血用⁶⁰Co源 γ 线照射不同剂量,照射剂量率为0.71 Gy/min。经培养后计数其微核率,结果如下表所示。

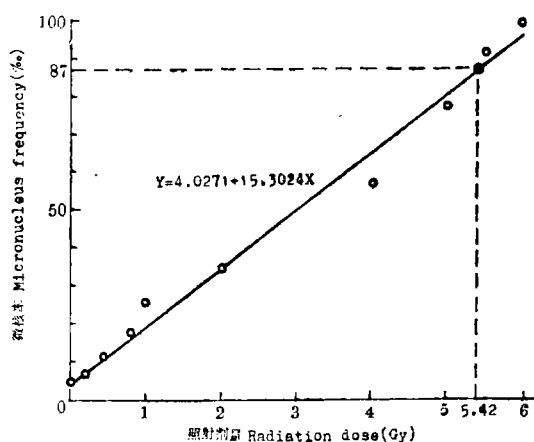
⁶⁰Co γ 线离体照射诱发人淋巴细胞微核

⁶⁰Co γ ray induced micronuclei in human lymphocytes

剂量 dose (Gy)	微核数 No. of Micronuclei	微核率 Micronucleus frequency(%)		
		均值	mean	S. E.
0	20		5.0	0.35
0.2	26		6.5	0.40
0.4	45		11.3	0.53
0.8	70		17.5	0.66
1.0	101		25.5	0.79
2.0	138		34.3	0.93
4.0	228		57.0	1.19
5.0	314		78.3	1.39
5.5	364		91.0	1.51
6.0	398		99.5	1.57

在所用照射剂量0.2~6 Gy范围内,微核率随着照射剂量的增加而增高,呈现良好的线性关系,如下图。其直线回归方法 $Y = 4.0271 + 15.3024 X$,此处Y代表微核率(%),X代表照射剂量(Gy),相关系数 $r = 0.994$ 。

由上述刻度曲线的直线回归方程,推算该病例受照剂量为5.42 Gy,这和物理剂量算出的全身等效均匀照射剂量5.22 Gy比较接近,也位于其它生物剂量计估算的剂量范围(4.27~6.48 Gy)之内。我们的实践表明,微核率完全可以用作受到较大照射剂量病人的生物剂量估算。



^{60}Co γ 线离体照射诱发人血淋巴

细胞微核的剂量效应曲线

Dose-response curve of micronuclei in
human blood lymphocytes irradiated with

^{60}Co γ -ray IN VITRO

在本实验条件下, 它适用的剂量范围为 0.4~6.0 Gy。0.2 Gy 剂量照射, 其微核率有所增高, 但和照前数值相比, 没有统计学差异, 看来可以测出的受照剂量下限不及染色体畸变分析敏感。但此法简便可靠, 可以和染色体指标互为补充, 互相验证。它适用于大量样品筛选, 在涉及许多人受害情况下(如核事故等)可能特别有用。

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(上接封三)

THE POTENTIALITY OF MICRONUCLEUS ASSAY IN HUMAN BLOOD LYMPHOCYTES AS A RADIATION BIOLOGICAL DOSIMETER

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The micronucleus assay has been considered as a fast method for determination of the chromosome aberration. It was shown in our earlier study that the micronucleus frequency was increased with the radiation doses in certain range, no matter what the radiation source is (x-rays, γ -rays and neutron). We proved firstly that micronucleus frequency induced by irradiation between *in vivo* and *in vitro* coincided well. That was the evidence for extrapolation value of the radiation dose in human from micronucleus graduated curve *in vitro*. Furthermore we got good result when it was used in a patient exposed accidentally. This case was as follows:

Mr. Wang, male, was irradiated by $^{60}\text{Co}\gamma$ -rays in an accident on 1st September, 1980. The frequency of micronuclei was found 87‰ 2.5 hrs after irradiation in cultured blood. The table showed the dose-response relationship from 4 healthy blood donors *in vitro*. The curve could be described by a linear-quadratic model $Y = 4.0271 + 15.3024 X$ (Y —micronucleus frequency, ‰; X —irradiation doses, Gy) with the dose range from 0.2 to 6 Gy, the correlation coefficient $r = 0.994$. From this model, we estimated that the irradiated dose received by this patient was 5.42 Gy. It was close to the dose from either physical calculation (5.22 Gy), or chromosome aberration, or other biological dosimeter. We consider the micronucleus assay can be used completely as a biological dosimeter for patients exposed by higher dose. Although the sensitivity is less than that of chromosome aberration, it is less time-consuming, less expensive procedure and very useful to examine the large number of samples, especially in the nuclear accident.

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