

铅接触者红细胞嘧啶 5'-核苷酸酶活性 与其他生物监测指标相关关系研究

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提 要 本文在 20 名接触铅和 20 名非接触铅工人中,进行了红细胞嘧啶 5'-核苷酸酶 (P5N) 活性,血铅 (BPb) 及尿中 δ -氨基乙酰丙酸 (δ -ALA) 测定,并进行相关分析。结果在 20 名接触铅工人中红细胞 P5N 活性明显低于对照组并与 BPb 有很好的负相关关系 ($r = -0.51$),与尿 δ -ALA 也有负相关关系 ($r = 0.31$),表明红细胞 (P5N) 可作为铅接触的特异性指标。

关键词 铅 红细胞嘧啶 5'-核苷酸酶 血铅 尿 δ -ALA

红细胞 P5N 是一种催化嘧啶 5'-核糖-磷酸水解脱磷酸的酶。1975 年 Paglia 和 Valentine 首先在铅中毒患者中发现该酶活性明显下降^[1],以后陆续有这方面的报告^[2~4]。为了进一步确定该酶在监测铅中毒中的价值,我们选择了接铅和非接铅工人各 20 名,进行了红细胞 P5N 活性、BPb 和尿 δ -ALA 测定,并进行相关关系研究,现将方法和结果报告如下。

1 对象与方法

1.1 对象

接铅组为蓄电池厂涂填工,男 15 名,女 5 名,年龄 27~47 岁,工龄 1~31 年,非接铅组为蓄电池厂一分厂劳资统计职工,男 10 名,女 10 名,年龄 30~40 岁,工龄及社会经济条件与接铅组相近。

1.2 方法

接铅和非接铅工人均进行一次静脉采血,供红细胞 P5N 活性及 BPb 测定用,并同时取尿样测定尿 δ -ALA。红细胞 P5N 活性测定采用高效液相色谱法,用美国 Waters 高效液相色谱仪参照文献 [5, 6] 介绍的方法进行测定,具体方法如下。

血液标本:肝素抗凝血样本

试剂:使用的所有试剂均为分析纯

(1) 5'-UMP·Na (5'-尿苷-磷酸二钠盐)

(2) Uridine (尿嘧啶核苷)

(3) 50mM Tris-HCl 缓冲液 pH7.5

(4) 0.1M MgCl₂

酶底物的配制:将 74mg 的 5'-UMP·2Na 溶解在 50ml Tris-HCl 缓冲液中配制成 4mM UMP 酶底物,4℃储存。

标准液的配制:将尿嘧啶核苷 (Uridine) 12.2mg 溶解在 50ml 蒸馏水中,配成 1mM 尿核苷储备液,用时将储备液 10 倍稀释成 100 μ m 的应用液。

分析程序:0.6ml 蒸馏水加肝素抗凝血 0.2ml,加 MgCl₂ 0.2ml,加 UMP 1.0ml,37℃培养 1 小时,试管煮沸水浴 2 分钟终止反应冷后离心 3000rpm 5 分钟,取上清移入另一试管,进行高效液相分析,进样量 10 μ l 紫外检测器 $\lambda = 260\text{nm}$ 。红细胞 P5N 活性计算, $\frac{\text{样品峰高}}{\text{标准峰高}} \times \frac{100}{\text{Hb (g/dl)}}$ 。

血铅测定采用无焰原子吸收分光光度法 (国家标准方法),使用日立 180~80 原子吸收分光光度计。尿 δ -ALA 测定采用对二甲氨基甲醛比色法。

2 结果

接铅和非接铅工人各 20 名三项指标测定结果: 红细胞 P5N, 正常对照组为 10.23, 接铅组为 $3.77\mu\text{mol}$ 尿嘧啶/h/Hbg/dl, 比对照组下降近 70%, 红细胞 P5N 和 BPb、 δ -ALA 的关系, 做了相关分析, 红细胞 P5N 与 BPb 比较 $r = -0.51$ 有显著的负相关关系, 红细胞 P5N 与 δ -ALA 比较 $r = -0.31$ 有负相关关系, 但经相关系数显著性检验结果不显著。详见下表。

红细胞嘧啶 5'-核苷酸酶、
血铅、尿 δ -ALA 测定结果

	Red-CellP5N (μmol 尿嘧啶/h/Hbg/dl)	Blood lead ($\mu\text{mol/L}$)	Urine δ -ALA ($\mu\text{mol/L}$)
对照组 ($\bar{X} \pm \text{SD}$)	10.23 \pm 2.34	0.59 \pm 0.33	38.02 \pm 4.71
接铅组 1	5.78	2.09	44.4
2	4.77	2.33	118.6
3	3.72	1.45	40.5
4	2.83	3.29	97.9
5	3.72	2.52	76.5
6	3.06	3.03	140.0
7	1.59	3.91	97.7
8	3.19	2.23	44.4
9	3.68	1.58	42.8
10	3.27	3.27	76.5
11	2.71	2.52	84.9
12	4.89	1.23	42.8
13	2.50	1.61	59.7
14	3.04	2.55	44.4
15	5.66	2.23	42.8
16	2.90	1.98	44.4
17	2.23	3.22	76.0
18	1.86	2.60	61.2
19	2.98	3.35	76.5
20	3.11	2.44	55.1
($\bar{X} \pm \text{SD}$)	3.77 \pm 1.14	2.47 \pm 0.71	68.36 \pm 28.34

P5N 与 BPb 相关系数 $r = -0.51$ $tr =$

2.4 $P < 0.05$

P5N 与 Urine δ -ALA 相关系数 $r =$
 -0.31 $tr = 1.3$ $P > 0.05$

3 讨论

据国外文献报道, 采用高效液相色谱法测定红细胞 P5N, 简便、快速、灵敏^[4], 与铅的其他生物监测指标有很好的相关关系^[2~4], 无论暴露于低、中、高铅浓度下, 都与血铅增加有很好的线性关系^[4], 说明该酶对铅十分敏感。铅抑制红细胞 P5N 活性的机理尚不清楚。本研究结果接铅组红细胞 P5N 活性明显受抑制并与血铅有显著的负相关关系, 与尿 δ -ALA 也有负相关关系, 但经相关系数显著性检验处理后不显著, 这可能与尿 δ -ALA 采用的测定方法适用于大数量筛选、方法比较简单有关。

本研究结果与国外文献报道基本一致, 证实了红细胞 P5N 在评价铅接触水平方面是有应用价值的指标。

4 参考文献

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to each rat, respectively. After forty days, the blood GSH-Px activity decreased obviously. Sixty days later, the blood GSH-Px activity declined very significantly, and the GSH-Px activity of kidney decreased obviously ($P < 0.05$), but the GSH-Px activity of liver made no change. The GSH-Px activity of kidney after sixty days in 40mg dose group decreased more significantly than that in 20mg dose group ($P < 0.05$). The blood GSH-Px activity in coking workers was significantly lower than that in controls ($P < 0.01$). The results showed that CTP could decreased blood GSH-Px activity and enhanced 63 the level of lipid peroxidation.

Key words: coal tar pitch, lipid peroxidation, glutathione peroxidase

Study on the protective effects of heat stress protein against quartz in cultural alveolar macrophage

Gong Pengfei, et al

Previous studies both in vitro and in vivo demonstrated that quartz could increases the expression of HSP-70 in pulmonary macrophage and the increased level of HSPs may serve as an autoprotective mechanism. In this research, the protective effect of HSPs induced by heat stress (42°C, 15 min) on the cultural AM of rats against quartz were studied. The results showed that the increased level of HSPs in AM could obviously increase the survival rate of AM and remarkably decrease the content of MDA of AM and the LDH activity of the culture medium. It was suggested that raising the level of HSPs in AM may provide a new route for protecting and improving lung clearance mechanism, preventing the development and progression of silicosis and other lung diseases.

Key words: heat stress protein, alveolar macrophage, quartz

Correlation between erythrocyte pyrimidine 5'-nucleotidase (P5N) and other biological monitoring indices in lead-exposed workers

Wang Yuzi, et al

In the paper the erythrocyte pyrimidine 5'-nucleotidase (P5N) activity, blood lead (BPb) and urinary δ -aminolevalinic acid (δ -ALA) levels in 20 lead-exposed workers and 20 control workers were studied, and correlative analysis among them were performed too. The results showed that the P5N activity was significantly lower in lead-exposed workers than that of the control group, and was negatively correlated with blood lead ($r = -0.51$) and urinary δ -ALA ($r = -0.31$). It was suggested that the P5N activity might be one of the most reliable indicators for lead exposure.

Key words: lead, erythrocyte pyrimidine 5-nucleotidase, blood lead, urinary δ -ALA

Psychological stress in seamen

Wang Haiming, et al

The score of the self-rating anxiety scale, 24 hour urinary excretion values of 17-hydroxycorticosteroid, keto steroid, catecholamine, epinephrine and norepinephrine, and the attention were measured in 36 seamen in different periods of a 61-day ocean travelling and in 8 of them in overstaying 60 days after the voyage. The results showed that the seamen were under psychological stress on the voyage. The stress tended to be more intensive with the travelling going on and was relieved through a period of mainland living. Suggestions were made for the seamen to relieve psychological stress.

key words: psychological stress, seamen, urine hormone