

# J005A电磁波屏蔽织物对电磁脉冲辐照后 小鼠血脑屏障的影响

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医疗、科研和国防电子仪器设备以及计算机、手机、微波炉等电磁波在生活用具的广泛应用,已极大地造福于人类。然而,电磁波的应用也给人类带来了危害。电磁波虽不引起物质的电离,但其能引起分子或原子的振动并改变电子能级。已有研究表明<sup>[1,2]</sup>,电磁辐射如电磁脉冲(Electromagnetic pulse, EMP)会引起小鼠和大鼠的脑神经递质代谢异常,使它们的学习能力和记忆能力下降,也会影响麻醉大鼠的脑电波。对大鼠的免疫系统、生殖系统与内分泌系统也有一定影响。

本工作以血脑屏障通透性作为观察指标,旨在探讨J005A电磁波屏蔽织物对电磁脉冲辐照引起小鼠血脑屏障开放的防护作用。实验采用雄性BALB/c小鼠48只,体质量(20±2)g,按不同处理方法(单纯照射、J005A电磁波屏蔽织物防护)及辐射场强(0、100、200、400 kV m<sup>-1</sup>)分为8组(n=6)。小鼠置于电磁脉冲模拟器中照射,照后用甲酰胺法定量测定脑组织内伊文思兰(Evans blue, EB)的渗出量。结果表明,在照射次数相同的条件下,照后即刻小鼠脑内EB含量较未辐照对照组显著增高(p<0.01),防护组小鼠接受3个不同场强照射后,脑内EB含量均较未防护辐照组明显下降(p<0.05)。结论为100、200与400 kV m<sup>-1</sup> EMP照射可导致小鼠血脑屏障的开放,而J005A电磁波屏蔽织物对辐射所致小鼠脑损伤有一定的防护作用。

关键词 电磁脉冲, J005A电磁波屏蔽织物, 血脑屏障

中图分类号 R818.2

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## Effects of J005A electromagnetic wave shielding textile on blood-brain barrier of mice after exposed to electromagnetic pulses

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With wide applications of electromagnetic instruments and equipments in medical treatment, scientific research and national defense, and daily life items of computers, mobile telephones, and microwave ovens etc, electromagnetic radiations have brought us great benefit. However, there are potential damages with electromagnetic radiations, e.g. the electromagnetic pulse (EMP), which is not ionizing radiation but can cause vibration of atoms or molecules and alter electron energy levels. It has been reported that EMP could decrease the learning and recollection ability of mice and rats through inducing metabolic disorder of neurotransmitter in mice brain and affect

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the brain wave of anesthetized rats. EMP also has some effect on immune, procreation and endocrine system of mice.

The integrity of the blood-brain barrier (BBB) was detected in order to observe the effects of J005A electromagnetic wave shielding textile (JEWST) on bio-effects of EMP. 48 BALB/c male mice were randomly divided into exposure groups and JEWST protection groups ( $n=6$ ). EMP was generated from a bounded-wave simulator and transmitted into a GTEM cell in which the mice were exposed. The field intensity was 0, 100, 200 and 400  $\text{kV m}^{-1}$ , respectively. The integrity of the BBB was determined by a quantitative measurement of Evans blue (EB) dye. The quantity of penetrated EB in brains of the mice increased obviously after exposure to 100, 200 and 400  $\text{kV m}^{-1}$  EMP, compared with the control groups ( $p<0.01$ ). In JEWST prevention groups, the quantity of penetrated EB was significantly decreased after exposure compared with the exposure groups. EMPs of 100, 200 and 400  $\text{kV m}^{-1}$  could increase the permeability of BBB in mice. The J005A electromagnetic wave shielding textile may prevent BBB from EMP induced BBB injury in mice.

**KEYWORDS** Electromagnetic pulse, J005A electromagnetic wave shielding textile, Blood-brain barrier

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