

# 战伤喷剂对家兔皮肤烫伤合并感染的药效学与安全性研究

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**【摘要】** 目的: 验证战伤喷剂在创伤早期抗感染的效果, 以及战伤喷剂对战创伤感染发生的影响。方法: 采用烫伤合并人工感染绿脓杆菌的家兔模型, 用战伤喷剂与溶剂组于实验前和实验后第 1、2、4、7、14 天采集家兔血清, 测量体温, 检测白细胞数、血清  $\text{NO}_2^-/\text{NO}_3^-$  水平、血清肿瘤坏死因子水平、血清超氧阴离子等炎性因子水平以及谷丙转氨酶、碱性磷酸酶、天冬氨酸转移酶、肌苷和尿素氮等肝肾功能指标水平。结果: 实验组药效学检测指标的升高比对照组缓慢, 最终 2 组均达到较高的感染发生指标; 器官功能的安全性指标无明显变化, 且 2 组变化大致相同。结论: 战伤喷剂在创伤早期应用可以有效延迟创伤感染的发生, 但并不能阻止感染的发生或减轻感染的程度。

**【关键词】** 战伤喷剂; 感染; 炎性指标; 药效学; 烫伤

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## Research on pharmacodynamics and safety of the combat trauma spray in the treatment of skin scald with complications in rabbits

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**Abstract: Objective:** To demonstrate the effect of the combat trauma spray on anti-infection in the early stage of trauma, as well as infection occurrence following trauma. **Methods:** A rabbit model was developed with scald complicated with artificial infection of *Pseudomonas aeruginosa*. Studies were carried out by using the combat trauma spray group and the solution group. At day 1, 2, 4, 7, 14, post experiments, rabbit serum was collected, the body temperatures of animals were taken, and such inflammatory factors as white cell count, serum levels of  $\text{NO}_2^-/\text{NO}_3^-$ , serum levels of tumor necrosis factor, serum superoxide anion, as well as GPT, AKP, aspartate carbamyl transferase, urea nitrogen were also collected to measure the functions of both the kidney and liver. **Results:** The measured data of pharmacodynamics in the experimental group rose more slowly than that of the control group. However, the 2 groups all reached a rather high infection incidence. But in the safety data of organ functions, there were no significant changes, which were identical in both groups. **Conclusion:** The application of combat trauma spray in the early stage of trauma can effectively delay the occurrence of trauma infection, nevertheless, it can neither prevent infection nor alleviate the extent of infection.

**Key words:** combat casualty spray; infection; inflammatory factor; pharmacodynamics; scald

战伤喷剂是应用于战创伤早期, 喷涂于创口表面的高分子生物膜, 其形成正电荷生物屏障, 可以有效杀灭自然界存在的多种带负电荷的致病性细菌, 如大肠杆菌、绿脓杆菌等。为了考察战伤喷剂在战创伤早期抗感染或延缓创口感染发生中的作用, 我们利用家兔的皮肤烫伤合并感染模型, 对战伤喷剂进行药效学与安全性试验。现将结果报告如下。

### 1 材料与方法

#### 1.1 动物模型的建立<sup>[1]</sup>

成年家兔 12 只, 体重 2.0~2.5 kg, 购自复旦大学医学院实验动物中心。经 20% 戊巴比妥钠麻醉, 家兔背部去毛备皮, 将家兔背部浸于沸水中 12 s, 造成 20% 总体表面积 III 度烫伤, 并以生理盐水抗休克和无菌生理盐水创面擦拭除菌。用棉签蘸取  $1.0 \times 10^9$  cfu/ml 的绿脓杆菌(由第二军医大学附属长海医院烧伤科提供)溶液, 均匀涂布在烫伤创面, 然后分组进行试验。

#### 1.2 实验分组

将致伤模型家兔随机分为实验组(C)和对照组(T), 每组 6 只, 雌雄各半。

#### 1.3 给药方法和剂量

实验组采用战伤喷剂, 2 次/d, 每次 10 喷, 均匀覆盖烫伤创面。对照组采用无菌蒸馏水溶剂喷涂, 方法同前。

#### 1.4 检测指标与方法

分别于家兔致伤前、致伤后第 1、2、4、7、14 天由家兔耳缘静脉抽取血样进行检测, 并随时观察家兔的症状体征。

1.4.1 观察指标 主要观察创面情况, 进行白细胞计数和体温测定并记录, 体温测定采用肛表测温法进行。

1.4.2 血清  $\text{NO}_2^-/\text{NO}_3^-$  水平的测定 本研究采用许氏改良法<sup>[2]</sup>进行血清  $\text{NO}_2^-/\text{NO}_3^-$  水平测定, 用以指示血清一氧化氮(NO)水平。