

· 休克与复苏 ·

# 内毒素/脂多糖对烫伤大鼠休克期肝脏脂肪代谢的影响

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**【摘要】** 目的 观察内毒素/脂多糖(LPS)对烫伤大鼠休克期肝脏脂肪代谢的影响。方法 采用30%TBSAⅢ度烫伤大鼠模型,随机分为单纯烫伤组(烫伤组)和烫伤后LPS攻击组(攻击组),另设假烫对照组(对照组),每组20只。攻击组大鼠于烫伤后2h腹腔注射LPS,3.0 mg/kg。伤后24、48h分别检测3组大鼠血浆LPS、肿瘤坏死因子(TNF) $\alpha$ 、游离脂肪酸(FFA)含量和肝组织内腺苷三磷酸(ATP)、甘油三酯(TG)及丙二醛(MDA)含量,并进行肝组织形态学观察。结果 对照组大鼠假烫后24、48h,血浆FFA水平分别为(0.4 $\pm$ 0.3)、(0.5 $\pm$ 0.3) mmol/L,烫伤组分别为(0.9 $\pm$ 0.3)、(1.2 $\pm$ 0.5) mmol/L,攻击组大鼠伤后增加至(2.3 $\pm$ 0.3)、(2.5 $\pm$ 0.4) mmol/L,后两组之间比较差异有统计学意义( $P < 0.01$ )。伤后48h,烫伤组和攻击组的肝组织TG含量分别为(242 $\pm$ 27) mmol/g和(530 $\pm$ 30) mmol/g,ATP含量分别为(6.0 $\pm$ 2.4)  $\mu$ mol/g和(1.7 $\pm$ 0.5)  $\mu$ mol/g,组间比较差异有统计学意义( $P < 0.01$ )。组织形态学检查见,烫伤组大鼠肝细胞脂肪变性和线粒体损伤程度明显轻于攻击组,对照组肝细胞形态正常。结论 烧伤后早期LPS打击可引发脂源性能量利用障碍,并加剧肝脂肪变性。

**【关键词】** 内毒素类; 烧伤; 肝; 脂类; 代谢

The influence of lipopolysaccharide on adipose metabolism in liver during shock stage of scalded rats HAO Dai-feng, GUO Zhen-rong, CHAI Jia-ke, WU Yan-qiu. Burn Institute, First Affiliated Hospital to PLA General Hospital (Formerly 304 Hospital), Beijing 100037, P. R. China

**【Abstract】** Objective To investigate the influence of lipopolysaccharide (LPS) on adipose metabolism in liver during shock stage of scalded rats. Methods Sixty adult Wistar rats were inflicted with 30% TBSA full thickness scald and were randomly divided into 3 groups: i. e. sham group (control, n = 20), simple scald group [ (n = 20) and LPS group (n = 20, with intra-peritoneal injection of 3.0 mg/kg LPS at 2 postscald hour (PSH)]. The contents of LPS, tumor necrosis factor  $\alpha$  (TNF- $\alpha$ ), free fatty acids (FFA) in plasma and adenosine triphosphate (ATP), triglyceride (TG), malonaldehyde (MDA) in liver in each group were determined at 24 and 48 PSH. The histological changes in hepatic tissue in each group were also observed. Results The plasma contents of FFA in LPS group at 24 and 48 PSH were 2.3 $\pm$ 0.3 mmol/L and 2.5 $\pm$ 0.4 mmol/L, respectively, which were obviously higher than those in control (0.4 $\pm$ 0.3 mmol/L, 0.5 $\pm$ 0.3 mmol/L) and scald (0.9 $\pm$ 0.3, 1.2 $\pm$ 0.5 mmol/L,  $P < 0.01$ ) groups. Meanwhile, there was obvious difference in the contents of TG and ATP in liver between LPS group (TG: 530 $\pm$ 30 mmol/g, ATP: 1.7 $\pm$ 0.5  $\mu$ mol/g) and scald group (TG: 242 $\pm$ 27 mmol/g, ATP: 6.0 $\pm$ 2.4  $\mu$ mol/g,  $P < 0.01$ ). Pathological examination revealed that adipose denaturalization and injury to mitochondria in hepatocytes in scald group were significantly milder than those in LPS group. The morphology of hepatocyte in control group appeared normal. Conclusion LPS challenge to burn subjects could induce impairment in utilizing fat-derived energy, and it would aggravate adipose denaturalization in the liver.

**【Key words】** Endotoxins; Burns; Liver; Fat; Metabolism

严重烧伤的代谢反应中,脂肪代谢对整体代谢水平和脏器功能都将产生重大影响。肝脏是脂肪代谢的枢纽器官,在脂类的消化、吸收、合成、分解、转运等过程中起着重要作用。部分烧伤患者由于早期处置不当,机体在休克期就开始经受来自消化道或创面感染的打击,其后发生脓毒症时,往往出现严重

的肝功能异常和代谢紊乱。为观察烧伤后早期感染对肝脏脂肪代谢的影响,笔者进行了如下研究。

## 材料与方 法

### 一、动物实验及分组

雄性 Wistar 大鼠 60 只(中国农业科学院动物繁殖中心),6 月龄,清洁级(二级动物),体重 180 ~ 220 g。随机分为 3 组:假烫对照组(对照组),单纯烫伤组(烫伤组),烫伤后内毒素/脂多糖(LPS)攻击组(攻击组),每组 20 只。大鼠伤前 12 h 开始禁食、

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