脱乙酰刺乌头碱的镇痛作用部位时所得结果一致.

电损毁双侧 LC 后，使用电刺激法测得的 DABA 镇痛作用消失，说明 LC 与 DABA 镇痛作用有密切关系、与郑平等[2]用乌头碱进行的同类型实验所得结果一致. 为了进一步分析 LC 是 DABA 的原发作用部位？或是中间环节？向大鼠 LC 注入20 μg DABA，结果在电刺激法及甩尾法上均未产生镇痛作用，而注入5 μg 吗啡则产生显著镇痛作用，提示 LC 不是 DABA 镇痛的原发作用部位，而是其中间环节之一. 但它是吗啡的原发作用部位之一.

本文还发现 PAG 注射20 μg DABA 只抑制舔足反应和嘶叫反应，而不抑制甩尾反应，怎样解释这一现象呢？已知 PAG 发出下行纤维到蓝斑及其它神经核，这些神经核又发出纤维下行至脊髓，抑制疼痛的传导[9,10]；此外 PAG 和 LC 尚均发出上行纤维[10,11]. 因此，我们认为 DABA 可能是作用于 PAG 后经其上行纤维和/或原发作用于 PAG 间接地通过 LC 的上行纤维，对需要脊髓以上神经结构参与的疼痛反应呈现镇痛作用.

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葛根素对猫离体血管平滑肌的作用

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Effects of puerarin on cat vascular smooth muscle *in vitro*

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ABSTRACT Puerarin is an isoflavone compound isolated from *Pueraria lobata* (Willd). This study characterized the vascular action of

puerarin in order to more clearly elucidate its pharmacological activities. Helically cut strips of cat femoral veins and renal arteries were suspended in an organ chamber filled with Krebs bicarbonate solution for measurement of isometric force development. In the cases of femoral veins and renal arteries isoproterenol (0.01 $\mu mol \cdot L^{-1}$ —0.1 $mmol \cdot L^{-1}$) caused relaxation of methoxamine-induced contraction (0.01 $mmol \cdot L^{-1}$) in a concentration—related manner. Puerarin (0.01—0.1 $mmol \cdot L^{-1}$) inhibited the relaxation response to isoproterenol in a concentration-response fashion. Propranolol (0.1—1 $\mu mol \cdot L^{-1}$) inhibited the isoproterenol-induced relaxation too. Puerarin (0.1 $mmol \cdot L^{-1}$) did not alter the relaxation response to nitroglycerin (1 $\mu mol \cdot L^{-1}$). These results indicated that puerarin acted as a beta-adrenoreceptor antagonist in isolated arteries and veins.

KEY WORDS puerarin; isoflavones; isoproterenol; propranolol; nitroglycerin; femoral vein; renal artery; drug dose-response relationship; vascular smooth muscle

摘要 本文研究葛根素对离体血管的作用。异丙肾上腺素使猫的股静脉及肾动脉对甲氧明引发的收缩产生的舒张作用呈剂量依赖式。葛根素能阻滞此种舒张反应，并呈剂量依赖式。普萘洛尔也能阻滞异丙肾上腺素引起的这种舒张。葛根素不能阻滞硝酸甘油引起的舒张反应。这些结果表明葛根素对猫的离体静脉及动脉具有β—受体阻断作用。

关键词 葛根素；异黄酮类；异丙肾上腺素；普萘洛尔；硝酸甘油；股静脉；肾动脉；药物剂量—反应关系；血管平滑肌

葛根素(puerarin, Pue)是从野葛 *Pueraria lobata* (Willd)中分离出的一种异黄酮单体。具有降压、抗心律失常及抗心肌梗死等效应[1—3]。对含有β—受体的离体器官(家兔心房肌、豚鼠气管条)及整体动物(猫)均有阻滞作用[4,5]。本文取含丰富的β—受体的股静脉(femoral veins, FV)及肾动脉(renal arteries, RA)[6,7]为材料，观察 Pue 对离体血管平滑肌的作用。

MATERIALS AND METHODS

盐酸甲氧明(methoxamine, Met，武汉制药厂)。盐酸异丙肾上腺素(isoproterenol Iso，上海天丰制药厂)。Pue，紫外分光光度法测其纯度>98%，山东省医科院药物所药厂生产。普萘洛尔(propranolol, Pro，北京第二制药总厂)。硝酸甘油(nitroglycerin, Nit，广州明星制药厂)。

猫体重3.5±s 0.4 kg，♀♂不拘，ip 戊巴比妥钠 4.5 $mg \cdot kg^{-1}$麻醉，取其 FV 及 RA，于显微镜下剥去结缔组织，剪成1.5 mm×10 mm 左右的血管条，垂直悬吊于血管平滑肌浴皿中，一端连于肌力换能器(LWA-20型)，经 XWT-204型平衡记录仪描记张力[8,9]。其静息张力，FV 为200 g，RA 为600 g。浴液组成：NaCl 130, KCl 4.7, KH_2PO_4 1.18, $MgSO_4 \cdot 7H_2O$ 1.17, $CaCl \cdot 2H_2O$ 1.6, $NaHCO_3$ 14.9, dextrose 5.5, CaNa-EDTA 0.01 $mmol \cdot L^{-1}$, pH 7.4，通以95% O_2+5% CO_2，37 ℃。平衡2 h 后进行实验。

先加 Met 引起血管平滑肌收缩，然后加 Iso 使其舒张，观察 Pue 及 Pro 对 Iso 舒张反应的影响，及 Pue 对 Nit 的舒张作用的影响。

实验结果以 $\bar{x}$±s 表示，经 t 检验后以 $P<0.05$为有效。

RESULTS

Pue 及 Pro 对 Iso 引起舒张反应的影响 FV 及 RA 血管条用 Met 0.01 $mmol \cdot L^{-1}$引起收缩后，加入 Iso 0.01 $\mu mol \cdot L^{-1}$—0.1 $mmol \cdot L^{-1}$使其舒张为对照。冲洗恢复后，重复上述步骤并在加入 Iso 前加入 Pue 0.01—0.1 $mmol \cdot L^{-1}$或 Pro 0.1—1 $\mu mol \cdot L^{-1}$。结果 Pue 及 Pro 对 Iso 引起 FV 的舒张反应及对 Iso 引起 RA 的舒张反应都呈明显的抑制作用(Fig 1)。

Pue 对 Nit 引起舒张反应的影响 FV 及 RA 血管条预先用 Met 0.01 $mmol \cdot L^{-1}$产生收

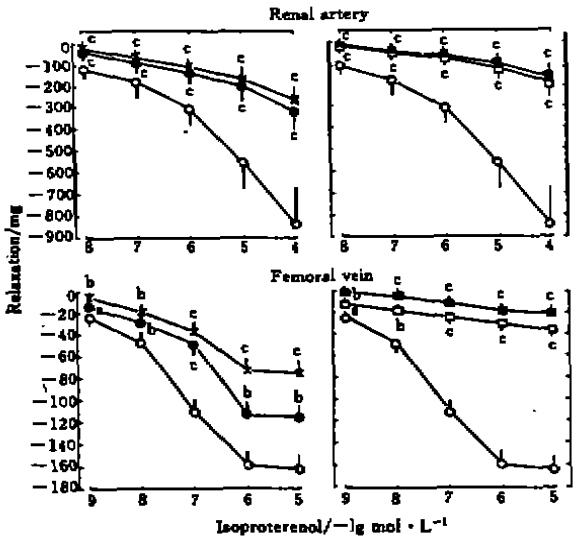

Fig 1. Effects of puerarin 0.01 (●), 0.1 (×) mmol·L^{-1}, propranolol 0.1 (□), 1 (■) μmol·L^{-1} and control (○) on isoproterenol-induced relaxation of methoxamine contractions in cat vessels. $n=6$, $\bar{x}\pm s$, $^aP>0.05$, $^bP<0.05$, $^cP<0.01$ vs control.

缩，加入 Nit 1 μmol·L^{-1}使之舒张作为对照，冲洗恢复后，用 Pue 0.1 mmol·L^{-1}阻滞之(Tab 1)。结果 Pue 对此种舒张反应并无阻滞作用。

Tab 1. Effect of puerain on nitroglycerin - indoced relaxation of methoxamine contractions on cat blood vessels. $n=6$, $\bar{x}\pm s$. $^aP>0.05$ vs nitroglycerin.

Drug	Renal Arteries relaxation/mg	Femoral Veins relaxation/mg
Nit	739±196	228±38
Nit+Pue	693±198^a	204±43^a

DISCUSSION

实验表明，Pue 对由 Iso 引起的猫的 FV 及 RA 血管平滑肌的舒张效应有明显的阻滞作用，但不能阻滞 Nit 松弛血管平滑肌的作用，说明这种阻滞是经β-受体作用产生的。

实验中 Pue 与 Pro 对 FV 及 RA 的β-受体阻滞效应进行的比较说明 Pue 的作用弱于 Pro。

由于不同动物或同一动物不同血管间的反应性有很大差别，具有多样性(heterogeneity)或个性化(individuality)的特点[10]，因此除 FV 及 RA 外，其他血管对葛根素的反应性值得探讨。

由于 Pue 对血管具有此种β—受体阻滞作用，因此不仅在葛根素影响血流动力学方面要考虑此种血管作用，而且对全面了解 Pue 的药理作用也有重要意义。

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