

性激素对中枢甲硫氨酸脑啡肽含量的影响*

彭应秀 刘 国

(生理学教研室)

提 要 用放免法测定大白鼠脑之纹状体、海马、下丘脑、垂体前叶与后叶中甲硫氨酸脑啡肽(met-enkephalin, MEK)的含量,显示去势雌鼠纹状体、海马、下丘脑、垂体前叶 MEK 明显下降,去势雄鼠下丘脑、垂体前叶也明显下降,注射已烯雌酚,黄体酮及睾丸酮的雌鼠,下丘脑 MEK 明显降低而垂体后叶明显升高,注射睾丸酮的雄鼠,垂体前叶与后叶 MEK 下降,雄鼠注射已烯雌酚,未见有显著改变,提示性腺与性激素对中枢 MEK 含量有影响。

关键词 甲硫氨酸脑啡肽 去势 性激素 大鼠

1975年 Hughes^[1]在针刺镇痛机制的研究中,发现了脑啡肽,由5个氨基酸组成,是内源性镇痛物质,后经许多学者研究,还发现脑啡肽在神经、循环、呼吸、消化、内分泌、生殖等系统活动中起作用,在生殖系统,它使生乳素升高,黄体生成素降低^[2],抑制排卵。作者应用放射免疫分析法^[3],探讨性腺和性激素对中枢 MEK 含量的关系,以期了解在生殖与避孕的机理上 MEK 的重要影响。

材 料 和 方 法

用SD种成年大白鼠104只进行以下实验:

去势组 11只雄鼠去睾丸,9只雌鼠去卵巢,对照做假手术,再养3个月后测 MEK。

注射组 1. 注雌激素 11只雌鼠、7只雄鼠肌肉注射5mg/ml的已烯雌酚0.04ml/日,连续10日,处死动物制成脑匀浆,待测 MEK。

2. 注雄激素 11只雄鼠、7只雌鼠、每日肌注50mg/ml睾丸酮0.04ml,以后的处理同上。

3. 注孕激素 10只雌鼠每日肌注10mg/ml黄体酮0.04ml 以后的处理同上。

测定 MEK 含量 将大白鼠迅速断头取脑,立即置入定量沸腾的生理盐溶液煮4分钟,分离纹状体、海马、下丘脑、垂体前叶与后叶后制成脑匀浆,取上清液,用放免法测定各部分之 MEK 含量(pg/mg)。

结 果

去势对大白鼠 MEK 含量的影响

1. 雌鼠去势组 纹状体 MEK = $387 \pm 103(\bar{x} \pm s)$ 后同, $n = 9$, 与对照组(565 ± 192 , $n = 9$)比($P < 0.05$), 海马 MEK = 20 ± 12 , $n = 10$, 与对照组(80 ± 44 , $n = 9$)比($P < 0.01$), 下丘脑 MEK = 615 ± 126 , $n = 10$, 与对照组(895 ± 134 , $n = 9$)比($P < 0.001$), 垂体前叶 MEK = 581 ± 216 , $n = 9$, 与对照组(1143 ± 473 , $n = 8$)比($P < 0.05$), 垂体后叶 MEK = 5145 ± 1944 , $n = 9$, 与对照组(4297 ± 1354 , $n = 7$)比($P > 0.05$), 看出纹状体、海马、下丘脑、垂体前叶4个部分MEK含量都显著下降(图1A)。

2. 雄鼠去势组 纹状体 MEK = 436 ± 182 , $n = 11$, 与对照组(429 ± 95 , $n = 9$)比($P > 0.05$), 海马 MEK = 18 ± 16 , $n = 10$, 与对照组(14 ± 6 , $n = 8$)比($P > 0.05$), 下丘脑 MEK = 606 ± 116 , $n = 10$, 与对照组(989 ± 190 , $n = 7$)比($P < 0.001$), 垂体前叶 MEK = 409 ± 225 , $n = 9$, 与对照组(990 ± 588 , $n = 9$)比($P < 0.05$), 垂体后叶 MEK = 3007 ± 1059 , $n = 10$, 与对照组(3590 ± 2701 , $n = 7$)比($P > 0.05$), 看出下丘脑和垂体前叶 MEK 含量亦显著下降(图1B)。

注射性激素对大白鼠 MEK 含量的影响

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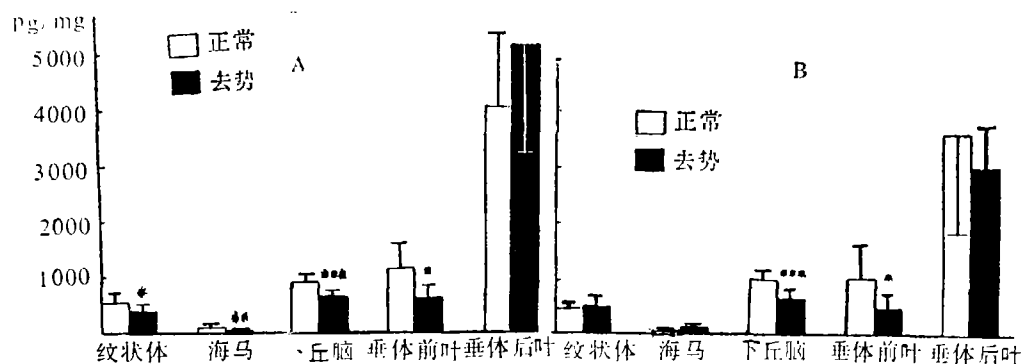


图1 正常与去势大白鼠 MEK 含量

A. 雌性 B. 雄性

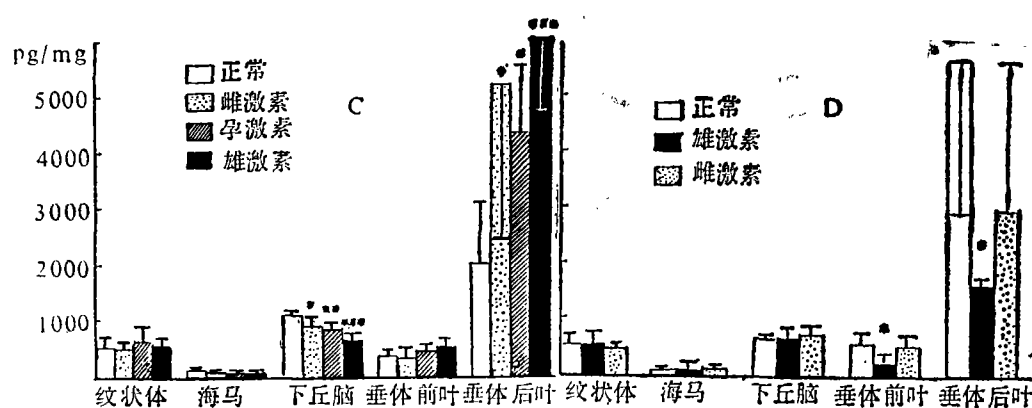
* $P < 0.05$ ** $P < 0.01$ *** $P < 0.001$ 

图2 性激素对大白鼠 MEK 含量的影响

C. 雌性 D. 雄性

* $P < 0.05$ ** $P < 0.01$ *** $P < 0.001$

1. 注射己烯雌酚 雌鼠纹状体 MEK = 561 ± 144 , $n = 11$, 与对照组 (566 ± 198 , $n = 8$) 比 ($P > 0.05$), 海马 MEK = 105 ± 66 , $n = 11$, 与对照组 (114 ± 51 , $n = 8$) 比 ($P > 0.05$), 下丘脑 MEK = 891 ± 168 , $n = 8$, 与对照组 (1070 ± 165 , $n = 8$) 比 ($P < 0.05$), 垂体前叶 MEK = 324 ± 204 , $n = 7$, 与对照组 (341 ± 101 , $n = 6$) 比 ($P > 0.05$), 垂体后叶 MEK = 5283 ± 2784 , $n = 7$, 与对照组 (2024 ± 1061 , $n = 6$) 比 ($P < 0.05$), 看出雌鼠下丘脑 MEK 含量显著下降而垂体后叶显著升高 (图 2 C)。雄鼠纹状体 MEK = 468 ± 127 , $n = 6$, 对照组 (541 ± 199 , $n = 11$), 海马 MEK = $113 \pm$

38 , $n = 7$, 对照组 (102 ± 22 , $n = 11$), 下丘脑 MEK = 875 ± 199 , $n = 6$, 对照组 (739 ± 134 , $n = 12$), 垂体前叶 MEK = 531 ± 231 , $n = 5$, 对照组 (581 ± 275 , $n = 9$), 垂体后叶 MEK = 2908 ± 2537 , $n = 5$, 对照组 (5753 ± 2848 , $n = 6$), 比较后以上 5 个部分 ($P > 0.05$) 未见显著差异 (图 2 D)。

2. 注射睾丸酮 雌鼠纹状体 MEK = 594 ± 148 , $n = 7$, 对照组结果与注射己烯雌酚相同后略, 二者相比 ($P > 0.05$), 海马 MEK = 88 ± 26 , $n = 6$, 与对照组比 ($P > 0.05$), 下丘脑 MEK = 768 ± 106 , $n = 6$, 与对照组比 ($P < 0.01$), 垂体前叶 MEK = 477 ± 145 , $n = 7$, 与对照组比 ($P > 0.05$), 垂体后叶

MEK = 6262 ± 1297 , $n = 6$, 与对照组比 ($P < 0.001$), 看出雌鼠下丘脑 MEK 含量显著下降而垂体后叶则极显著升高 (图 2C)。雄鼠纹状体 MEK = 556 ± 171 , $n = 11$, 与对照组比 ($P > 0.05$), 海马 MEK = 110 ± 87 , $n = 11$, 与对照组比 ($P > 0.05$), 下丘脑 MEK = 830 ± 210 , $n = 11$, 与对照组比 ($P > 0.05$), 垂体前叶 MEK = 290 ± 182 , $n = 7$, 与对照组比 ($P < 0.05$), 垂体后叶 MEK = 1615 ± 135 , $n = 10$, 与对照组比 ($P < 0.05$), 看出垂体前叶与后叶 MEK 含量都显著降低 (图 2D)。

3. 注射黄体酮 雌鼠纹状体 MEK = 689 ± 260 , $n = 10$, 与对照组比 ($P > 0.05$), 海马 MEK = 90 ± 36 , $n = 10$, 与对照比 ($P > 0.05$) 下丘脑 MEK = 824 ± 157 , $n = 10$, 与对照组比 ($P < 0.01$) 垂体前叶 MEK = 441 ± 182 , $n = 6$, 与对照组比 ($P > 0.05$), 垂体后叶 MEK = 4321 ± 1168 , $n = 7$, 与对照组比 ($P < 0.05$), 看出下丘脑 MEK 含量下降十分显著而垂体后叶显著升高 (图 2C)。

讨 论

本实验摘除雌鼠和雄鼠性腺后观察到, 下丘脑和垂体前叶内 MEK 含量都显著降低, 表明去势后由于性激素减少, 可引起 MEK 减少。Hong 等^[4,5]也发现, 雄鼠去势后, 垂体前叶 MEK 含量下降与我们结果一致, 但雌鼠去势后, 垂体前叶 MEK 含量升高与我们结果相反。

众所周知, 下丘脑与垂体前叶调节性腺活动, 一些学者^[6,7]证明, MEK 使黄体生成素 (LH) 分泌减少而生乳素 (PRL) 分泌增多, 我们摘除性腺后下丘脑与垂体前叶 MEK 含量显著下降, 可以认为, 性腺与 MEK 含量有相互关系, 性腺存在时下丘脑与垂体前叶 MEK 含量高, 相反则低。在雌鼠, 纹状体与海马内 MEK 含量也显著下降, 看来在雌鼠下丘脑与垂体外神经结构——纹状体、海马的 MEK 含量也受性腺的影响。

注射性激素后, 雌鼠注射 3 种性激素, 在下丘脑内 MEK 含量下降, 这是否与激素的剂量和作用时间有关? 还待进一步研究。

值得注意的是, 两性大白鼠去势后, 垂体后叶 MEK 含量变化不显著, 而注射 3 种性激素, 对雌鼠垂体后叶 MEK 含量都显著升高, 而雄鼠注射睾丸酮后, 垂体后叶 MEK 含量则显著下降, 看来性激素不仅影响下丘脑和垂体前叶, 而且也影响垂体后叶 MEK 的含量。Martin^[8]等发现, MEK 与加压素、催产素同时存在下丘脑视上核和室旁核, 再流入垂体后叶。同时我们也看到, 性激素在两性大白鼠, 对 MEK 含量的影响不同。Watson^[9]等发现, 用性类固醇处理后, 大白鼠视前区在阿片肽的分布上有性别差异, 雌鼠分布比雄鼠密集。

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EFFECTS OF GONADAL HORMONES ON MET-ENKEPHALIN IN BRAIN

Peng Yingxiu Liu Guo

(Department of Physiology)

The relationship between gonadal hormones and met-enkephalin(MEK) in the brain was investigated to explore the role of gonadal hormones in regulating the contents of MEK. Experiments were performed on rats of both sexes. The animals were divided into four groups: the control (including the pseudooperation and the peanut oil injected) groups, the castrated group and the gonadal hormone (estradiol, progesterone and testosterone) injected group. The contents of MEK in striatum, hippocampus, hypothalamus, anterior and posterior lobe of pituitary gland of the animals were measured respectively with radioimmunoassay. (1) The contents of MEK in the hypothalamus and anterior lobe of the pituitary in rats of both sexes from the castrated group were significantly lower than those in the control (pseudooperation) group, but in the striatum and in the hippocampus of ovariectomized rats, the contents of MEK were also lower than those of the control group. (2) The contents of MEK in hypothalamus from the gonadal hormone injected group were significantly lower than those in the control (peanut oil injected) group, but in the posterior lobe of the pituitary the contents were significantly higher than those in the control female rats. (3) The contents of MEK in the anterior and posterior lobe of pituitary gland from male rats in the testosterone injected group were significantly lower than those in the control group. The results imply that both gonadal glands and gonadal hormones may play an important role in regulating the contents of MEK in brain.

Key words MEK(met-enkephalin) Castration Gonadal hormone
Rat