

# Interactions between the striatal glutamate, GABA, and dopaminergic activity during electrical stimulation of forepaw in rats.

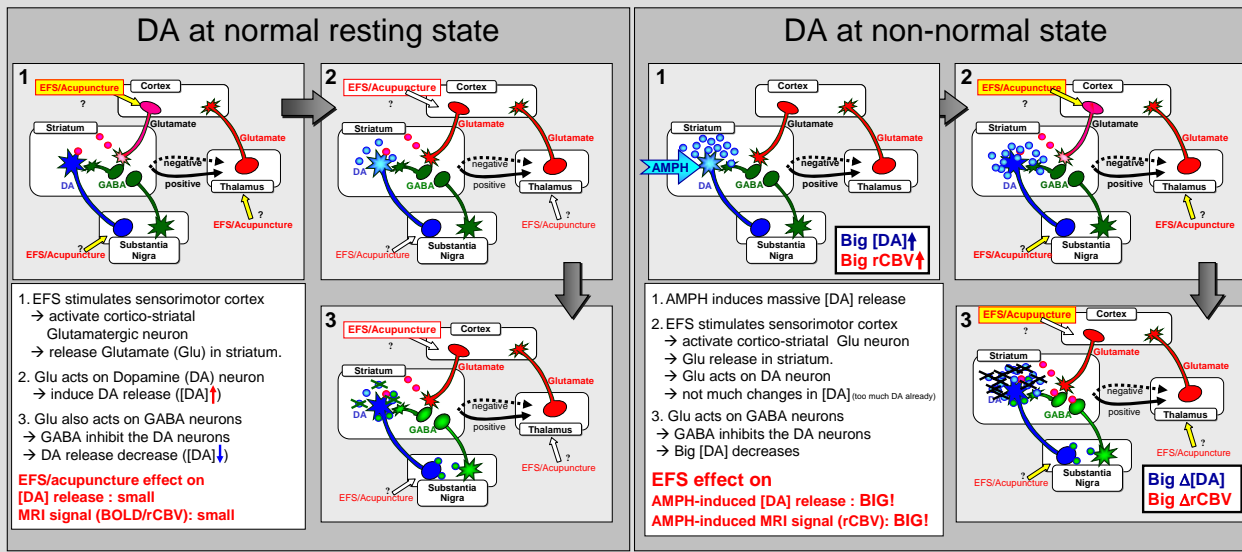


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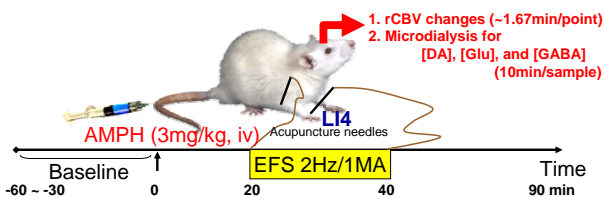
## Hypothesis of Acupuncture Action on the Dopaminergic(DA) function

- Acupuncture or electrical forepaw stimulation (EFS) modulates brain function partly through the cortico-striatal circuitry, involving neurotransmitters such as dopamine (DA), glutamate (Glu) and gamma-aminobutyric acid (GABA).
- The degree of EFS-induced modulation on the neurotransmitters are basal state dependent.



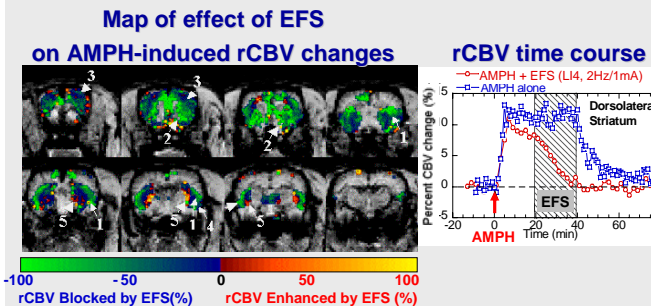
## Method

- **Subjects** Sprague-Dawley rats with 1% halothane anesthesia (in 1:1 O<sub>2</sub> & N<sub>2</sub>O)
- **EFS/Acupuncture** Electrical Forepaw Stimulation (EFS, 2Hz/1mA) at acupoint LI4 on the forepaw and subcutaneously on the same limb.
- **MRI measurement**
  - Relative cerebral blood volume (rCBV) images were acquired repeatedly using IRON<sup>1</sup> method with superparamagnetic contrast agent MION.
  - MR parameters: Conventional gradient echo sequence (~1.67min/time point) at a Bruker 4.7T or 9.4T scanner.
- **Microdialysis measurement**
  - Dialysate samples (2μl/sample, 10min sample time) were obtained from the dorsolateral striatum [AP 0.5 ML 2.7 DV -7.2], as indicated by the MRI results.
  - Degree of DA, Glu, and GABA release was measured by HPLC.



## MRI results --- rCBV changes

- EFS significantly attenuated the AMPH-induced rCBV increase in the dorsolateral striatum (1), Nucleus accumbens (2), cingulate (3), and insulate cortex (4).
- Degree of the EFS induced attenuation was stronger in the dorsolateral striatum (1) than in the medial striatum (5).

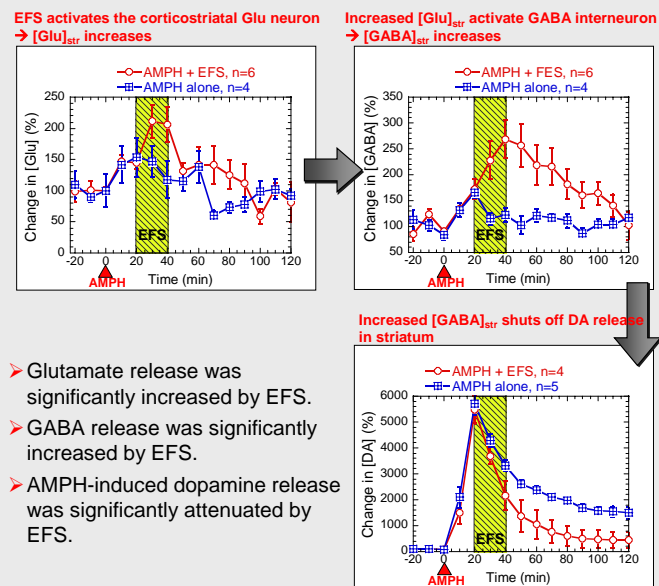


## Abbreviation

DA : dopamine  
 Glu: glutamate  
 GABA: gamma-aminobutyric acid

EFS: electrical forepaw stimulation  
 rCBV: relative cerebral blood volume

## Microdialysis results --- Dorsolateral striatum



- Glutamate release was significantly increased by EFS.
- GABA release was significantly increased by EFS.
- AMPH-induced dopamine release was significantly attenuated by EFS.

## Conclusion

This set of data suggests that the effect of acupuncture on the brain could be, at least partly, acting through the corticostriatal circuitry, involving changes in the function of neurotransmitters including Glu, GABA and DA.

## References

- Chen, (2001) J Magn Reson Imaging 14(5): 517-24.

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