DIRECT CONNECTIONS BETWEEN THE BRAIN AND THE AREA OF THE SPINAL GENERATOR FOR EJACULATION:

A NEUROANATOMICAL TRACING STUDY IN THE RAT

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PELVI PHARM

RATIONALE

- **Lumbar spinothalamic (LSt) neurons identified in rats as spinal generator for ejaculation (SGE) in L2-L4 spinal segments**

(Truitt & Coolen, 2002)

- **LSt project to thalamus (parvicellular subparafascicular nucleus)**

(Ju et al., 1987)

- **LSt project to spinal ejaculatory centres (S, PS, and somatic)**

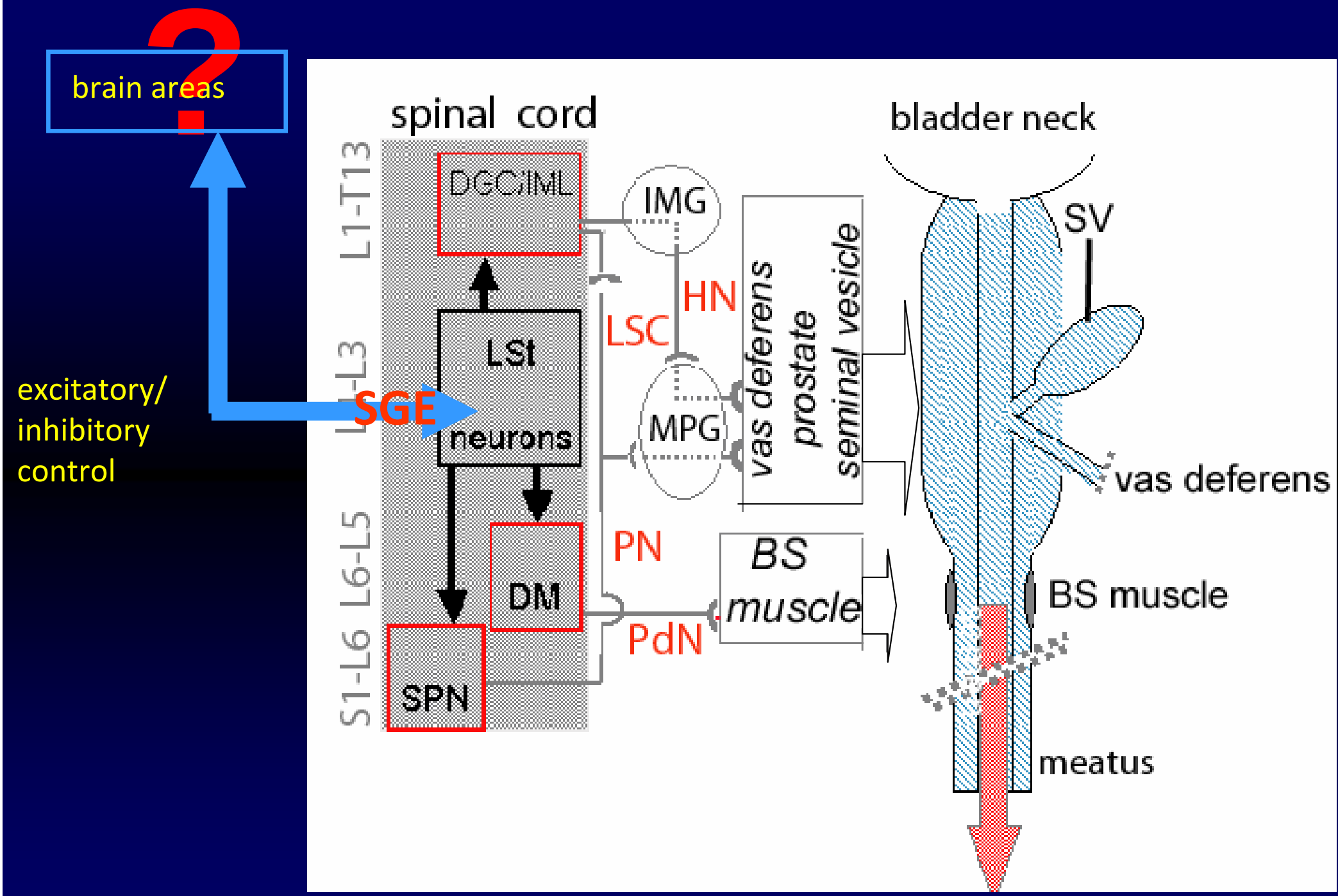
- **Brain descending projections to LSt still not described**

- **LSt under activatory/inhibitory influences from brain**

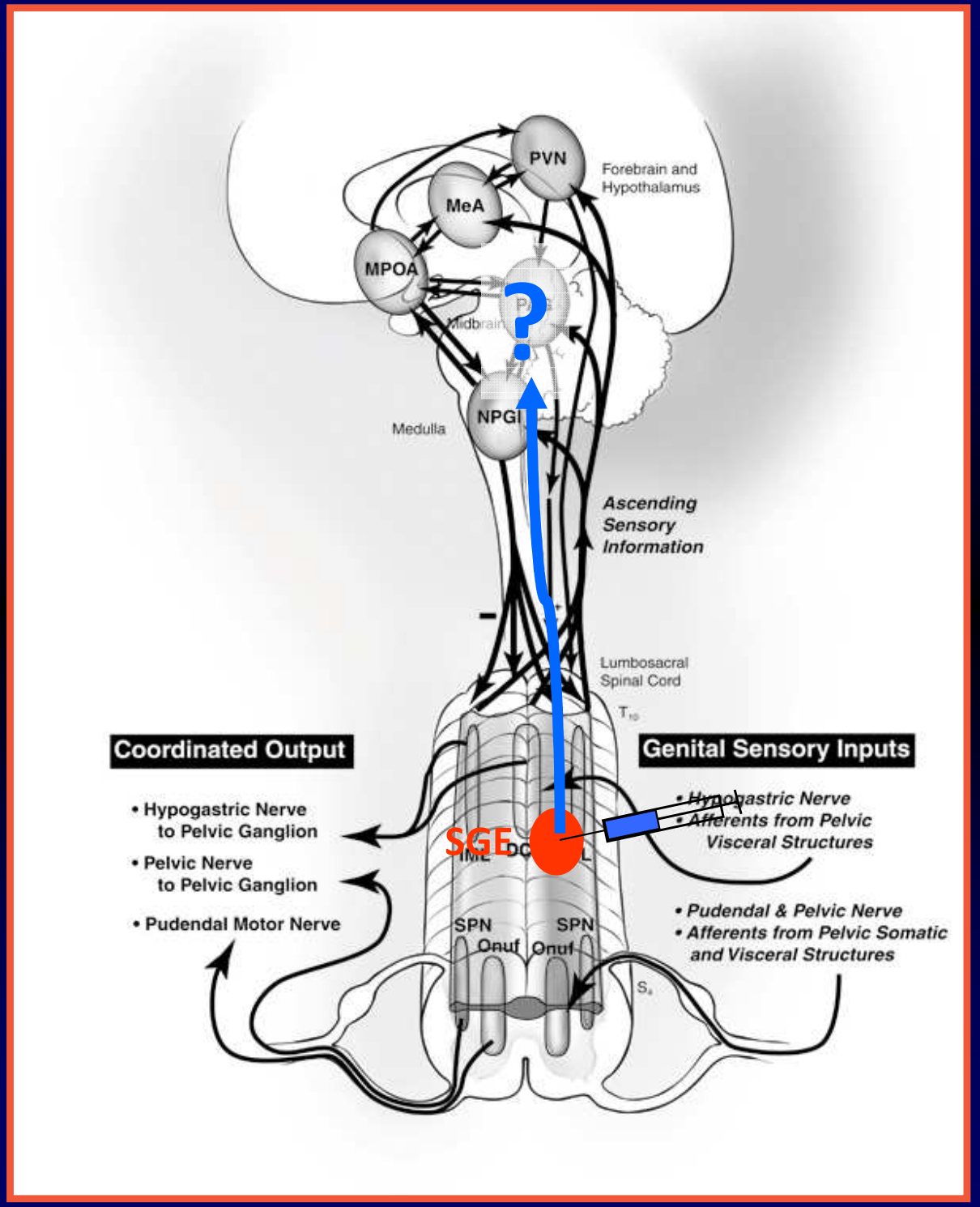
Chen X. et al Neuroscience 2005, 2006; Sun XQ et al *Neuroscience 2009*

OBJECTIVE

- **To identify brain structures projecting onto LSt by injecting retrograde tracer into LSt area**


brain areas
?
excitatory/
inhibitory
control
spinal cord
bladder neck
L1-T13
L1-L3
L6-L5
S1-L6
DGCIML
LSt
neurons
SGE
DM
SPN
IMG
HN
LSC
MPG
PN
PdN
vas deferens
prostate
seminal vesicle
BS
muscle
SV
vas deferens
BS muscle
meatus

Retrograde tracing technique for detecting neural connections from synapse in SGE to soma in brain

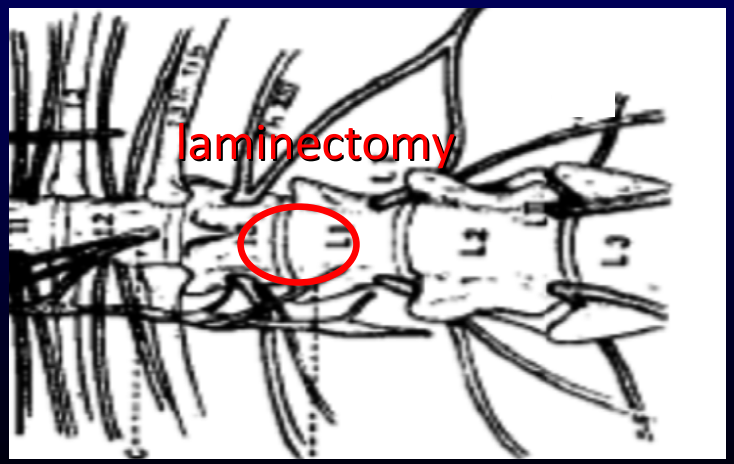


MATERIALS AND METHODS

- Wistar male rats sexually naive (250-300 g)
- Partial laminectomy between T13-L1 vertebrae
- Glass capillary lowered in spinal cord (L3-L4)
- Injection of 2% fluorogold (0.2 µl) using hydraulic microdriving system
- Capillary removed 5 min after injection end + agar in laminectomy
- Animals kept over 14 days and then perfused (PBS + PAF4%)
- Spinal cord and brain collected and sliced with cryostat (40 µm thick)

INJECTION SITE OF THE DYE IN THE SPINAL CORD

Caudo-rostral

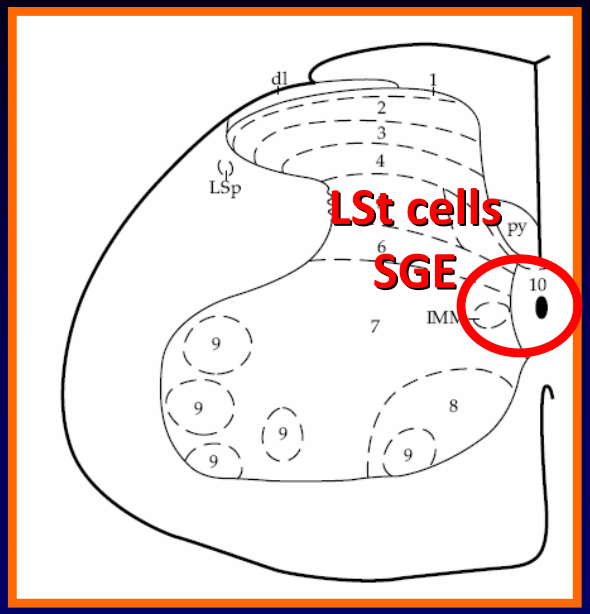


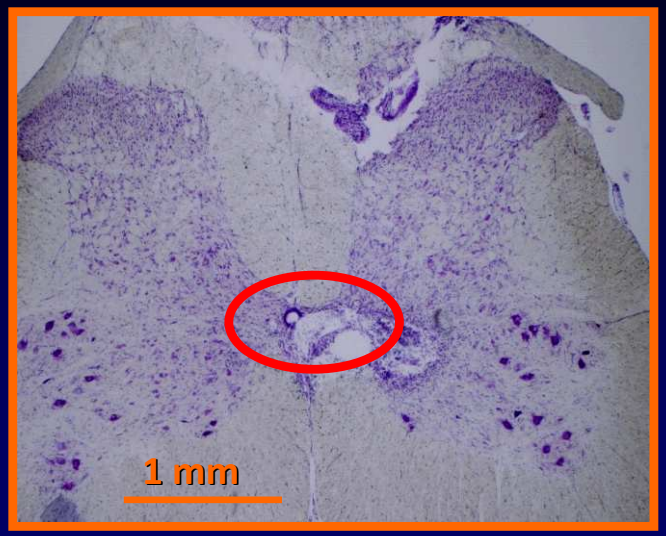
Caudo-rostral spreading: L4-L2

Intense fluorogold signal in areas X and VII medial

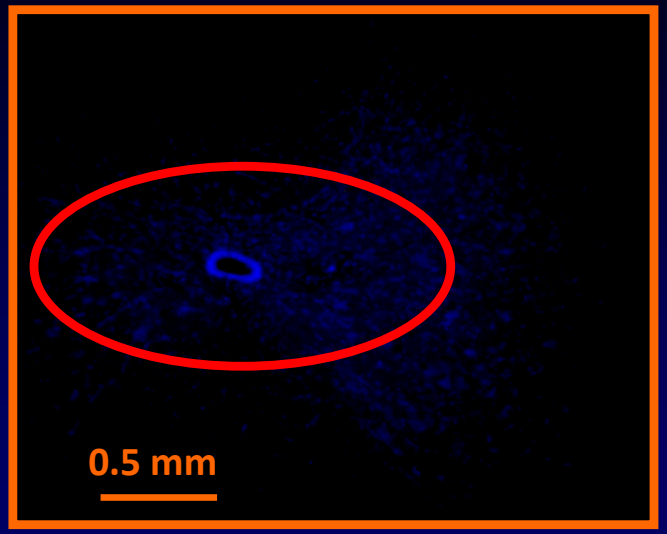
Moderate fluorogold signal in areas VI and VIII

Spinal cord sections



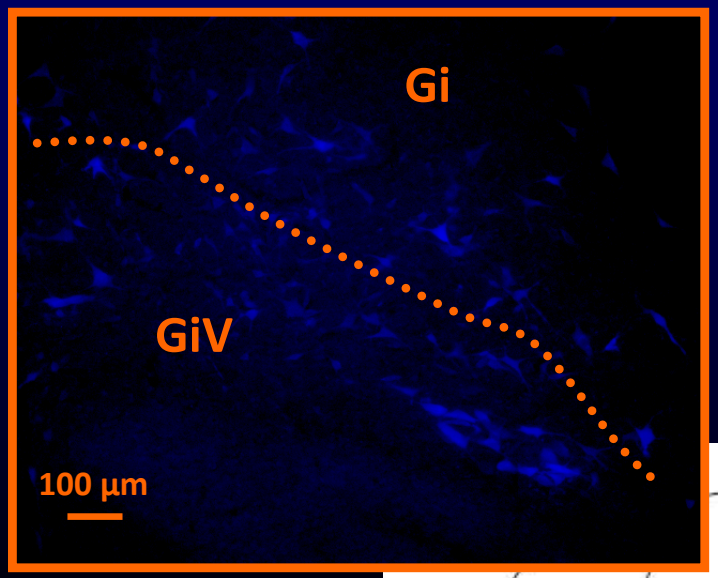


Cresyl violet

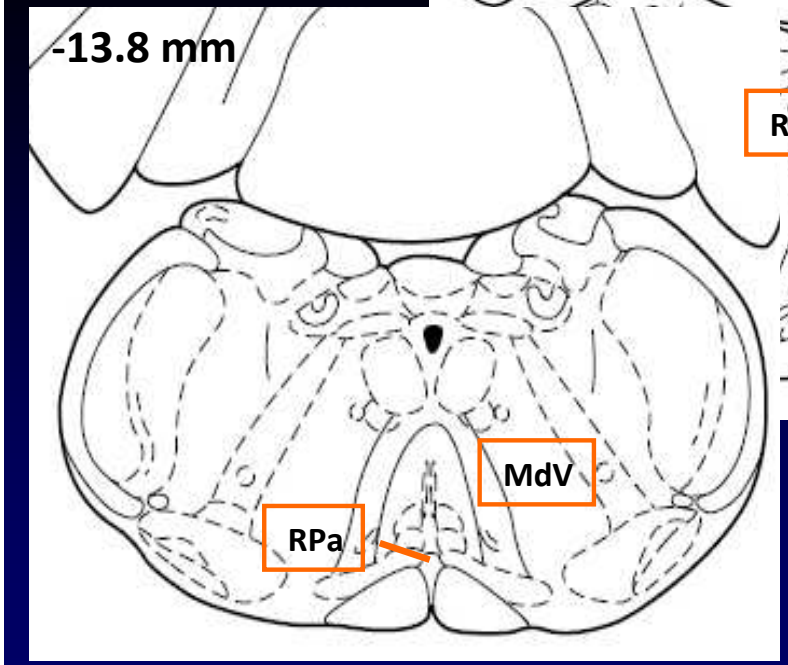


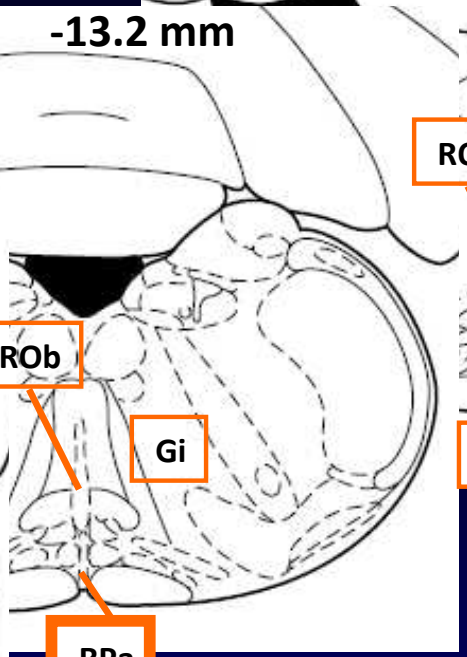
Fluorogold signal

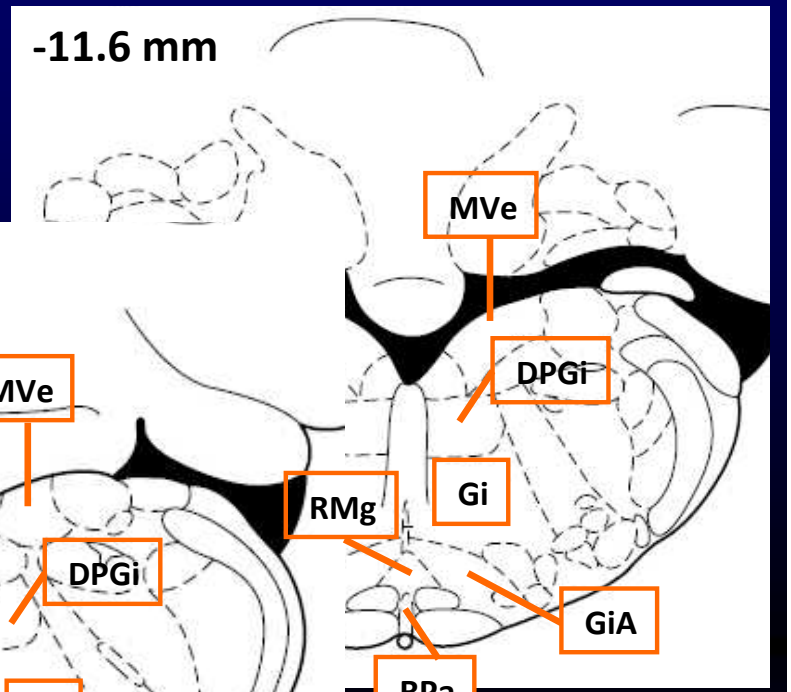
RESULTS : FLUOROGOLD-POSITIVE BRAIN SITES



MEDULLA OBLONGATA

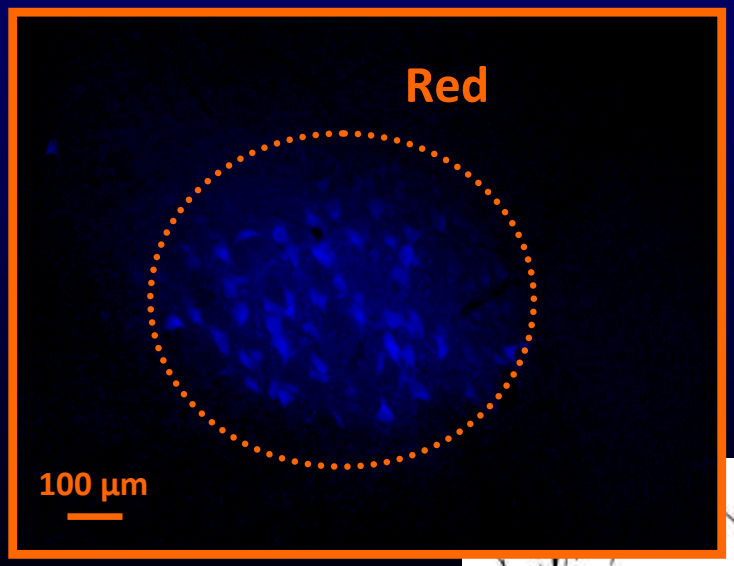




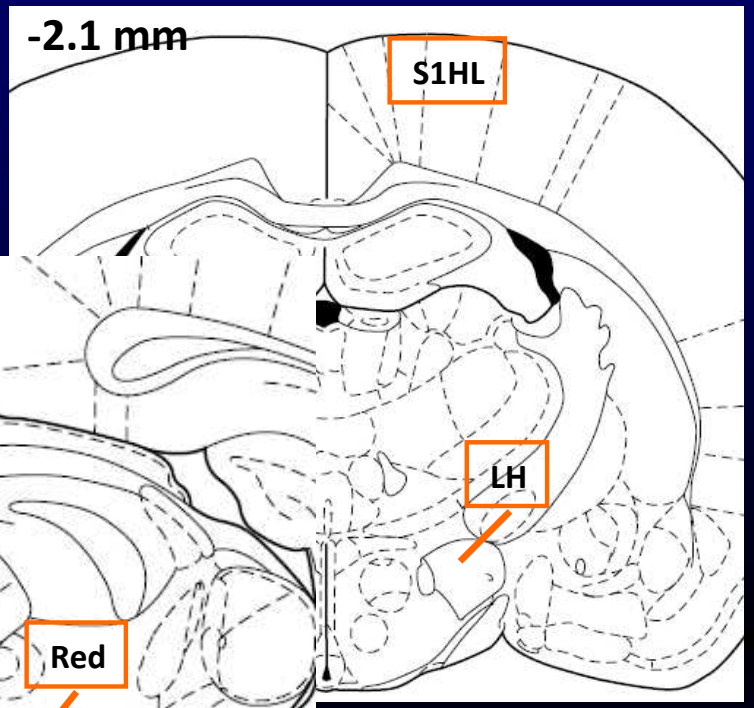


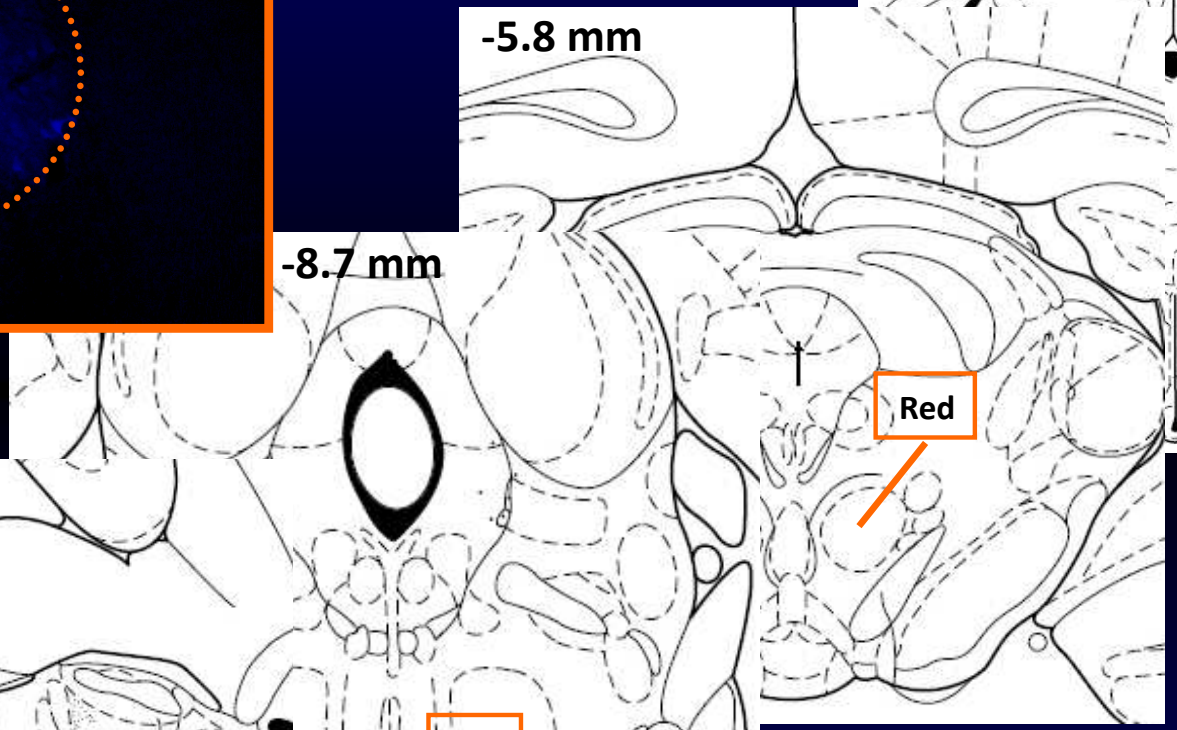
DPGi: dorsal paragigantocellular
Gi: gigantocellular
GiA: gigantocellular alpha
GiV: gigantocellular ventral
MdV: medullary reticular, ventral
MVe: medial vestibular
RMg: raphe magnus
Rob: raphe obscurus
RPa: raphe pallidus

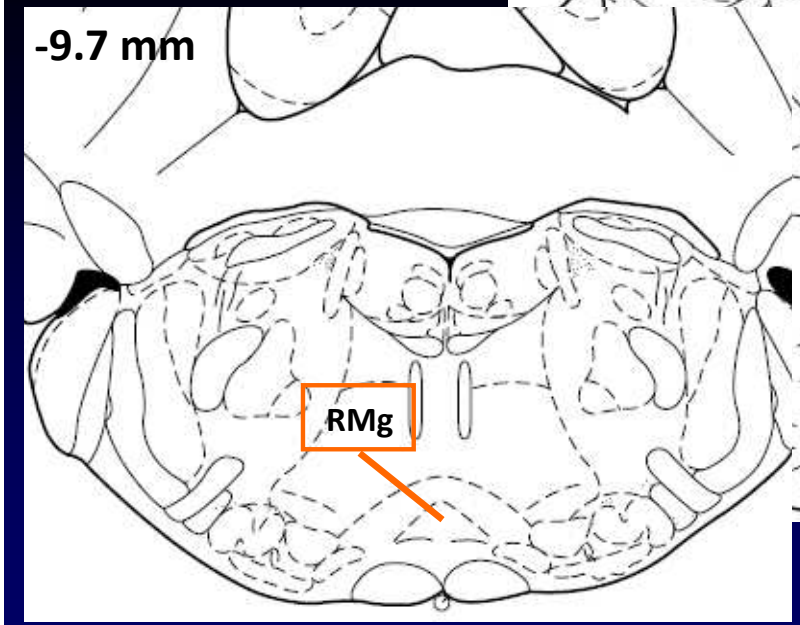
RESULTS : FLUOROGOLD-POSITIVE BRAIN SITES cont'd



PONS & FOREBRAIN







LH: lateral hypothalamus
Pr5: sensory trigeminal nucleus
Red: red nucleus
RMg: raphe magnus
S1HL: primary somatosensory cortex, hindlimb region

RESULTS : QUANTITATIVE DATA

MEDULLA OBLONGATA				PONS		FOREBRAIN	
	Mean cell Nb / mm²		Mean cell Nb / mm²		Mean cell Nb / mm²		Mean cell Nb / mm²
DPGi	5.1 ± 1.1	MdV	5.6 ± 2.2	LVe	10.4 ± 5	LH	1.8 ± 0.4
Gi	4.9 ± 0.6	RMg	7.1 ± 1.6	MVe	5 ± 2.3	S1HL	19.4 ± 7.6
GiA	13.1 ± 3.6	ROb	12.6 ± 1.5	Pr5	4.5 ± 3.1		
GiV	40.2 ± 7.4	RPa	31.7 ± 1.5	Red	17.3 ± 11.3		
LPGi	7.8 ± 3.3						

Data expressed for each structure as mean number of cells per mm² in 3 rats

CONCLUSION

- **15 brain structures found with direct projections onto LSt cells /SGE area**

- **Highest density of projecting neurons found in the gigantocellular ventral (GiV) and raphe pallidus (Rpa)**

- **Among the FG-positive brain structures** gigantocellular (**Gi**), gigantocellular alpha (**GiA**), **GiV, LPGi, and RPa are known to be involved in ejaculation**

- **This study points out brain structures to be targeted for identifying the exact neuronal population projecting to LSt/SGE**

- **Next step: anterograde tracer in Gi subnuclei and RPa coupled with immunodetection of LSt**