

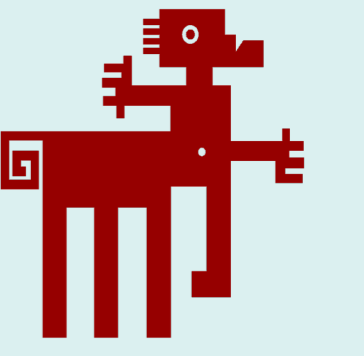
NEURAL CONTROL OF MICTURITION IN THE DOG

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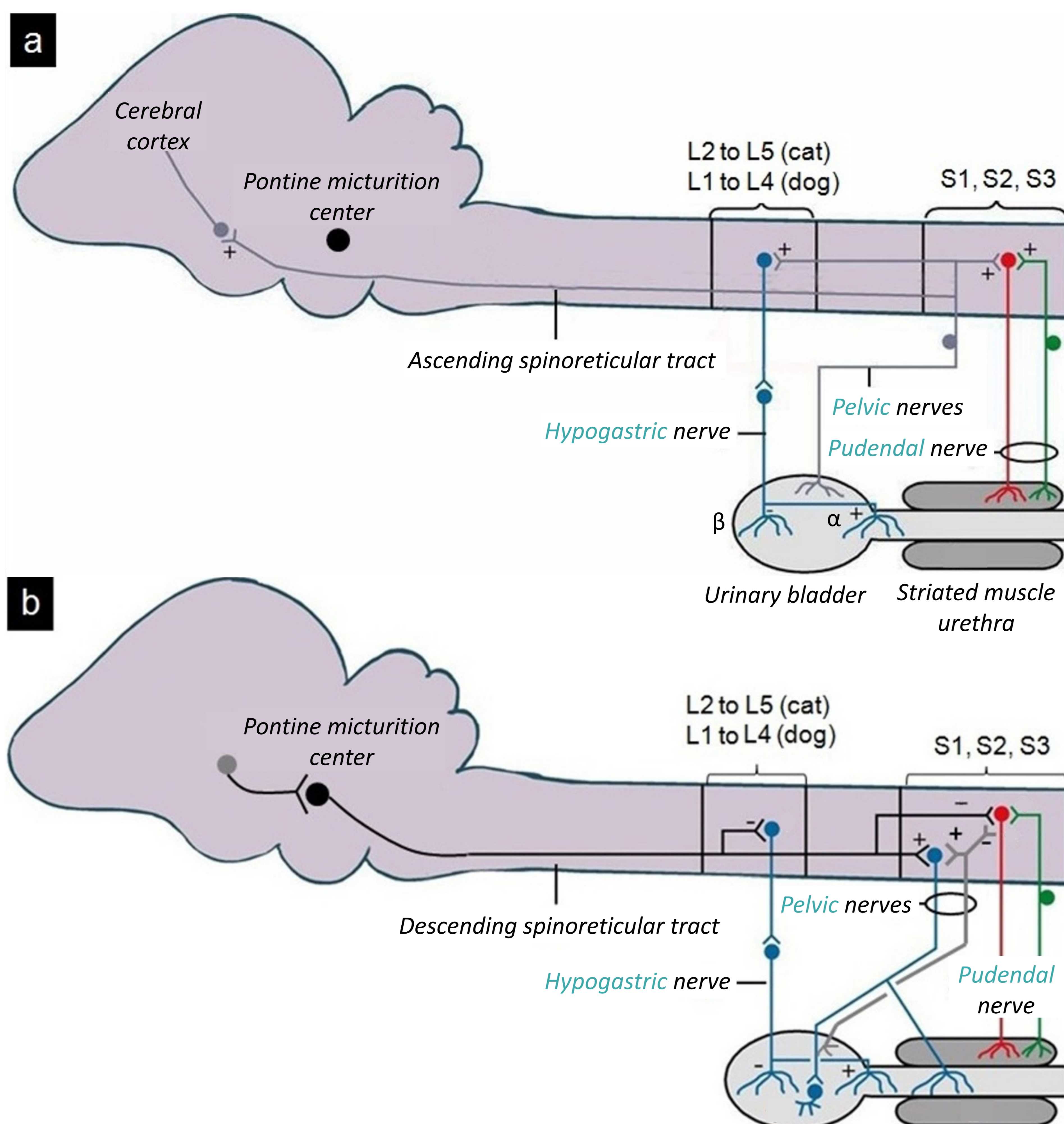
INTRODUCTION

Micturition is defined as the reflex action of emptying the urinary bladder. The urinary bladder physiologically performs two functions: the collection and storage of urine (continence), and its subsequent expulsion or emptying (micturition). These phases are controlled by the nervous system, both central and peripheral. Therefore, lesions in the nervous system can cause loss of voluntary control of micturition, which leads to urinary incontinence.

OBJECTIVES

- To describe the neuroanatomy of the bladder function.
- To describe the neurological pathways involved in micturition.
- To determine the different dysfunctions and disorders in the innervation of the urinary bladder.

NEURAL CONTROL OF MICTURITION



Continence and urine storage

The predominant input is the **sympathetic** nervous system;

- **Hypogastric** nerve stimulates:
 - **β -adrenergic** receptors \rightarrow smooth muscle of bladder wall \rightarrow Relaxation.
 - **α -adrenergic** receptors \rightarrow bladder neck + smooth muscle of urethra \rightarrow Contraction.
- **Pudendal** nerve stimulates:
 - **Nicotinic cholinergic** receptors \rightarrow striated muscle of urethra \rightarrow Contraction.
- **Pelvic** nerves: project afferent information to the central nervous system.

Micturition and urine voiding

The predominant input is the **parasympathetic** nervous system and the **pontine micturition center**;

- **Hypogastric** nerve:
 - Inhibited.
 - **Pudendal** nerve:
 - Inhibited.
 - **Pelvic** nerves stimulates:
 - **Muscarinic cholinergic** receptors \rightarrow smooth muscle of the bladder wall \rightarrow Contraction \rightarrow Increase intravesical pressure.
- } Relaxation of bladder neck + urethra

Figure 1. Schematic representation of the neural pathways involved during urine storage (a) and voiding (b).

MICTURITION DISORDERS

- ❖ **Neurogenic:** Injury spinal cord.
 - Lower motor neuron (LMN)
 - Upper motor neuron (UMN)
- ❖ **Non-neurogenic:** Structural or functional alterations of lower urinary tract

CONCLUSIONS

Control of micturition is a complex integration of sympathetic, parasympathetic and somatic pathways. To maintain continence and urine storage, activation of the sympathetic pathways to the urinary bladder and urethra is necessary, in addition to inhibition of the parasympathetic component. For emptying, when impulses generated by pressure and distension of the bladder wall reach the pontine center of micturition, sympathetic activity is inhibited and parasympathetic activity is activated. In conclusion, the neural control of micturition is a complex issue and its correct functionality is essential for the life of the animal.