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THE DORSAL COLUMN NUCLEUS IN A REPTILE, *CAIMAN CROCODILUS*

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The dorsal column nucleus of *Caiman crocodilus* was identified by using standard orthograde techniques to trace the degeneration that resulted from dorsal rhizotomies in brachial and lumbar regions. Although the dorsal column nucleus was difficult to locate in Nissl and fiber preparations, it was easily identified in histochemical material because it stained intensely with succinate dehydrogenase and acetylcholinesterase.

Anatomical data suggest that somatosensory information from the body surface reaches the telencephalon in at least one group of reptiles, *Caiman crocodilus* [12]. While the neural circuitry of this sensory system in *Caiman* has been partly outlined, several details remain to be elucidated. These unanswered questions include the central connections of the dorsal column nucleus. However, before determining the ascending connections of the dorsal column nucleus, positive and reliable identification of this area is mandatory.

A dorsal column nucleus has been labeled in descriptive material in *Alligator mississipiensis* [4, 6]. Since the brains of *Caiman* and *Alligator* are quite similar, the caudal medulla of *Caiman* was examined with cell and fiber stains similar to those used in identifying the dorsal column nucleus in *Alligator*. However, this cyto- and myeloarchitectonic analysis in *Caiman* did not reveal the sharp delineation of the dorsal column nucleus that had been described in *Alligator*. Therefore, another approach was used. Since a dorsal column nucleus had been identified in several groups of reptiles including *Caiman* by its dorsal root input [3, 5, 7], dorsal rhizotomies in brachial (forelimb) and lumbar (hindlimb) regions were performed in *Caiman* and the central connections were traced with anterograde degeneration techniques. With this knowledge, the cyto- and myeloarchitectonics of this region were again reviewed. Nevertheless, the dorsal column nucleus still proved difficult to identify. For this reason, other techniques were employed. Of these, histochemistry proved the most useful since the dorsal column nucleus stained in-

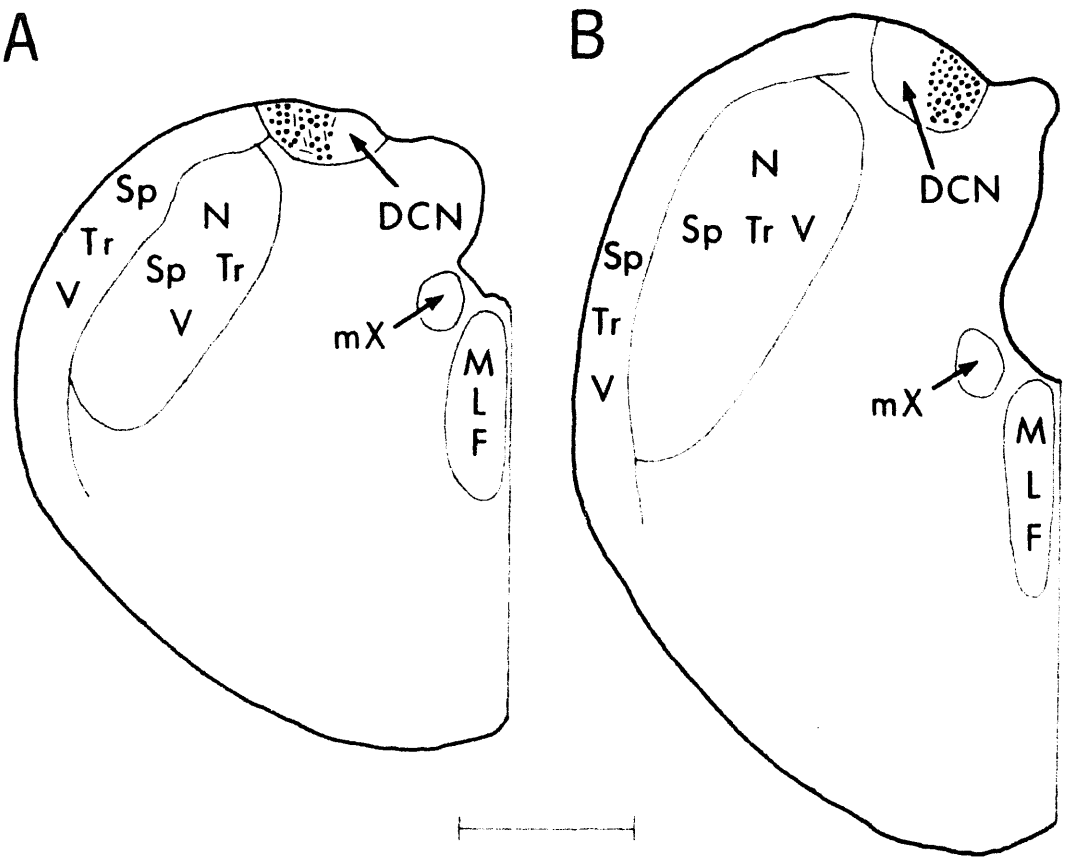
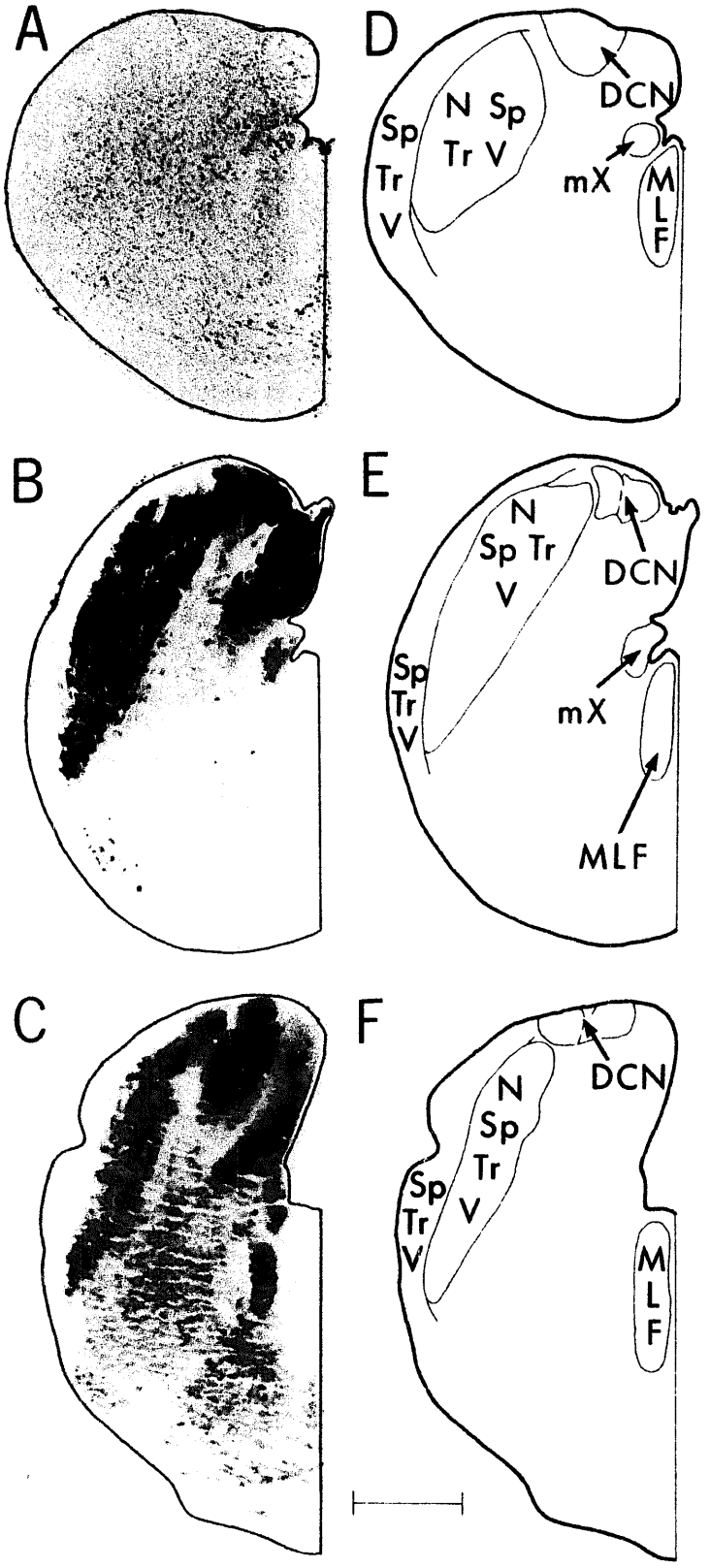


Fig. 1. Dorsal root projections to the brainstem. The termination of dorsal root axons in the brainstem after transection of brachial (A) and lumbar (B) dorsal roots is illustrated. Short line segments (see A) represent degenerated axons while dots indicate terminal degeneration. Abbreviations: DCN, dorsal column nucleus; mX, dorsal motor nucleus of the vagus; MLF, medial longitudinal fasciculus; N Sp Tr V, nucleus of the spinal trigeminal tract; Sp Tr V, spinal trigeminal tract. Bar = 1 mm.

tensely with acetylcholinesterase and succinate dehydrogenase. These observations form the basis of this report.

Intradural dorsal rhizotomy proximal to the ganglion through a small laminectomy was performed in 4 juvenile *Caiman crocodilus* under cold narcosis. After survival periods of 15–24 days at core temperatures of 16–30°C, each animal received an overdose of sodium pentobarbital and was perfused transcardially with 10% for-

Fig. 2. Dorsal column nucleus morphology. Photographs of transverse sections stained for cell bodies with a Nissl stain (A), acetylcholinesterase (B) and succinate dehydrogenase (C), illustrate the morphology of the dorsal column nucleus. Line drawings of each respective photograph are shown to the right in D, E and F. Abbreviations: DCN, dorsal column nucleus; mX, dorsal motor nucleus of the vagus; MLF, medial longitudinal fasciculus; N Sp Tr V, nucleus of the spinal trigeminal tract; Sp Tr V, spinal trigeminal tract. Bar = 1 mm.


A
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malin. Brains were then processed for the determination of orthograde degeneration [1] by standard techniques [9].

After transection of brachial dorsal roots, degenerating axons could be seen to collect in a lateral portion of the dorsal funiculus in the high cervical region to terminate in a discrete, lateral portion of the dorsal medulla (Fig. 1A). Transection of lumbar dorsal roots resulted in degenerating axons located in a medial portion of the dorsal funiculus to end in a distinct medial part of this same area in the dorsal medulla (Fig. 1B). This region of the medulla was felt to represent the dorsal column nucleus in *Caiman*.

With the dorsal column nucleus reliably identified by a specific afferent system, the cyto- and myeloarchitecture of this part of the medulla were studied again. In Nissl-stained material (Fig. 2A), difficulty was still encountered in outlining the dorsal column nucleus. Fiber stains [2] better demonstrated this area but reliable identification still proved difficult. For this reason, other techniques were sought. *Caiman* brains processed for histochemistry according to standard techniques [8] were reviewed.

Although sections were cut in a plane somewhat different from the experimental material [11], identification of the dorsal column nucleus proved quite simple. This was because the dorsal column nucleus stained intensely with both acetylcholinesterase (Fig. 2B) and with succinate dehydrogenase (Fig. 2C). In fact, these histochemical preparations suggested the presence of a cleft dividing this nucleus dorsoventrally into a medial and lateral portion. Based on the experimental information presented here and that described previously in *Caiman* [5], it is tempting to suggest that this division of the dorsal column nucleus seen in the histochemical preparations is not artificial but corresponds to the differential termination of dorsal root axons in the dorsal column nucleus.

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