**THE SOMATOSENSORY PATHWAY**

Almost all sensory information from the somatic seg­ments of the body enters the spinal cord through the dorsal roots of the spinal nerves. However, from the entry point into the cord and then to the brain, the sensory signals are carried through one of two alternative sensory pathways:

(1) the *dorsal column–*medial lemniscal system or

(2) the *anterolateral system*.

These two systems come back together partially at the level of the thalamus.

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| **DORSAL COLUMN-MEDIAL LEMNISCAL SYSTEM** | **ANTEROLATERAL SYSTEM** |
| The dorsal column–medial lemniscal system, as its name implies, carries signals upward to the medulla of the brain mainly in the *dorsal columns* of the cord. Then, after the signals synapse and cross to the opposite side in the medulla, they continue upward through the brain stem to the thalamus by way of the *medial lemniscus.*  The dorsal column–medial lemniscal system is com­posed of large, myelinated nerve fibers that transmit signals to the brain at velocities of 30 to 110 m/sec,  Dorsal column–medial lemniscal system has a high degree of spatial orientation of the nerve fibers with respect to their origin  Sensory informa­tion that must be transmitted rapidly with temporal and spatial fidelity is transmitted mainly in the dorsal column– medial lemniscal system;  The dorsal system is limited | Signals in the anterolateral system, imme­diately after entering the spinal cord from the dorsal spinal nerve roots, synapse in the dorsal horns of the spinal gray matter, then cross to the opposite side of the cord and ascend through the anterior and lateral white columns of the cord. They terminate at all levels of the lower brain stem and in the thalamus.    The anterolateral system is composed of smaller myelinated fibers that transmit signals at velocities ranging from a few meters per second up to 40 m/sec  whereas the anterolateral system has much less spatial orientation  that which does not need to be transmitted rapidly or with great spatial fidelity is trans­mitted mainly in the anterolateral system.  The anterolateral system has a special capability to transmit a broad spectrum of sensory modalities, such as pain, warmth, cold, and crude tactile sensations. |

TYPES OF SENSATIONS TRANSMITTED IN THE TWO SYSTEMS

**Dorsal Column–Medial Lemniscal System**

1. Touch sensations requiring a high degree of localiza­tion of the stimulus

2. Touch sensations requiring transmission of fine gra­dations of intensity

3. Phasic sensations, such as vibratory sensations

4. Sensations that signal movement against the skin

5. Position sensations from the joints

6. Pressure sensations related to fine degrees of judg­ment of pressure intensity

**Anterolateral System**

1. Pain

2. Thermal sensations, including both warmth and cold sensations

3. Crude touch and pressure sensations capable only of crude localizing ability on the surface of the body

4. Tickle and itch sensations

5. Sexual sensations

Dorsal Column–Medial Lemniscal Pathway. that nerve fibers entering the dorsal columns pass uninterrupted up to the dorsal medulla, where they synapse in the *dorsal column nuclei* (the *cuneate* and *gracile nuclei*). From there, *second-order neurons* decussate imme­diately to the opposite side of the brain stem and continue upward through the *medial lemnisci* to the thalamus. In this pathway through the brain stem, each medial lemnis­cus is joined by additional fibers from the *sensory nuclei of the trigeminal nerve;* these fibers subserve the same sensory functions for the head that the dorsal column fibers sub­serve for the body.

In the thalamus, the medial lemniscal fibers terminate in the thalamic sensory relay area, called the *ventrobasal complex.* From the ventrobasal complex, *third-order nerve fibers* project, mainly to the *post­central gyrus* of the *cerebral cortex*

**Anatomy of the Anterolateral Pathway**

The *spinal cord anterolateral fibers* originate mainly in dorsal horn laminae I, IV, V, and VI . These laminae are where many of the dorsal root sensory nerve fibers terminate after entering the cord.

The anterolateral fibers cross immediately in the *anterior commissure* of the cord to the opposite *anterior* and *lateral white columns,* where they turn upward toward the brain by way of the *anterior spi­nothalamic* and *lateral spinothalamic tracts.*

The upper terminus of the two spinothalamic tracts is mainly twofold:

(1) throughout the *reticular nuclei of the brain stem* and

(2) in two different nuclear complexes of the thalamus, the *ventrobasal complex* and the *intralami­nar nuclei.*

In general, the tactile signals are transmitted mainly into the ventrobasal complex, terminating in some of the same thalamic nuclei where the dorsal column tactile signals terminate. From here, the signals are transmitted to the somatosensory cortex along with the signals from the dorsal columns.

Conversely, only a small fraction of the pain signals project directly to the ventrobasal complex of the thalamus. Instead, most pain signals terminate in the reticular nuclei of the brain stem and from there are relayed to the intralaminar nuclei of the thalamus where the pain signals are further processed.