

TECHNICAL WHITE PAPER: ALLEN SPINAL CORD ATLAS EXPRESSION CATEGORIES

OVERVIEW

Over 17,000 genes were analyzed by RNA *in situ* hybridization across all anatomic segments of the mouse cord at postnatal days 4 and 56 for the Allen Spinal Cord Atlas. The expression of 2,149 distinct genes – 1,943 genes in P4 and 1,316 genes in P56 – were manually identified as being enriched in a particular category with respect to the density of expressing cells in that category for eleven different Expression Categories: Laminae 1-3, Laminae 4-6, Laminae 7-8, Lamina 9, Intermediolateral Column, Gray Matter, White Matter, Central Canal, Ventral-dorsal Midline in Gray Matter, Radially Arrayed in White Matter, and Vascular-like in Gray or White Matter. Of the 2,149 distinct genes, 1,110 are common to the P4 and P56 lists, 833 are specific to the P4 list, and 206 are specific to the P56 list. Definitions and examples of each category are presented below.

The Expression Categories can be browsed individually from the Gene Search page of the Atlas, or searched from the Advanced Search page, where all the genes for any two selected categories can be retrieved for the P4, P56, or both. The resulting gene lists are presented on the Search Results page, which includes an icon for each gene indicating all of the Expression Categories in which that particular gene's expression is enriched.

EXPRESSION CATEGORIES

Laminae 1-3

Gene expression is enriched in one or more of the superficial-most dorsal lamina of the gray matter and may be restricted to the dorsal lamina.

[Tac2](#)



[Camk2a](#)

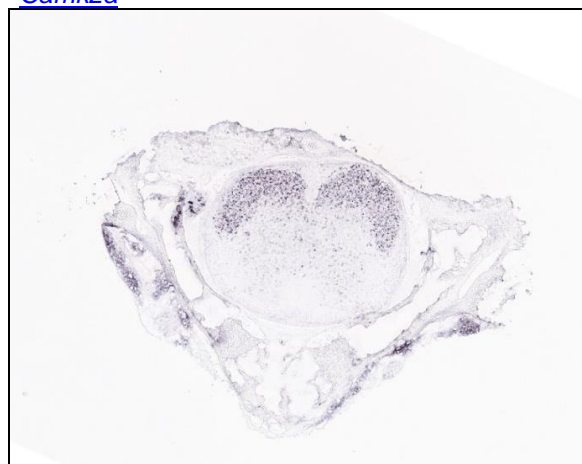


Figure 1. Gene expression enriched in Laminae 1-3. Expression was detected with Tac2 probe in P56 cervical segment (left panel), and with Camk2a probe in P4 thoracic segment (right panel).

Laminae 4-6

Gene expression is enriched in laminae 4-6 of the dorsal horn, Clarke's nucleus (D), the lumbar dorsal and sacral dorsal commissural nuclei (LDCo and SDCo), the lateral spinal nucleus (LSp), or the dorsal aspect of lamina 10.

[*Slc17a7*](#)



[*B3galt2*](#)

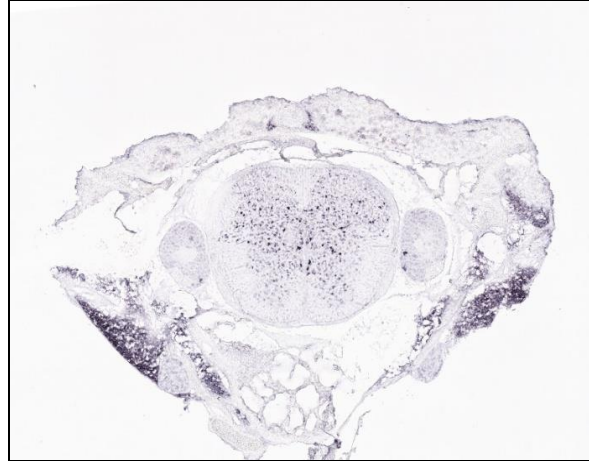
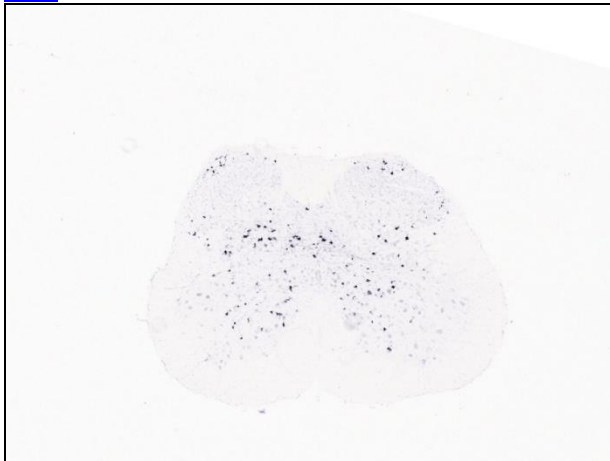


Figure 2. Gene expression enriched in Laminae 4-6. Expression was detected with *Slc17a7* probe in P56 lumbar segment (left panel), and with *B3galt2* probe in P4 thoracic segment (right panel).

Laminae 7-8

Gene expression is enriched in laminae 7-8, and may be enriched in the ventral aspect of lamina 10.

[*Dlk1*](#)



[*Cyp26b1*](#)

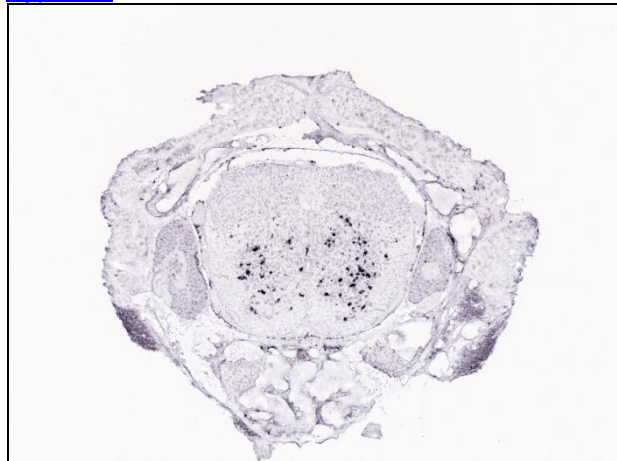
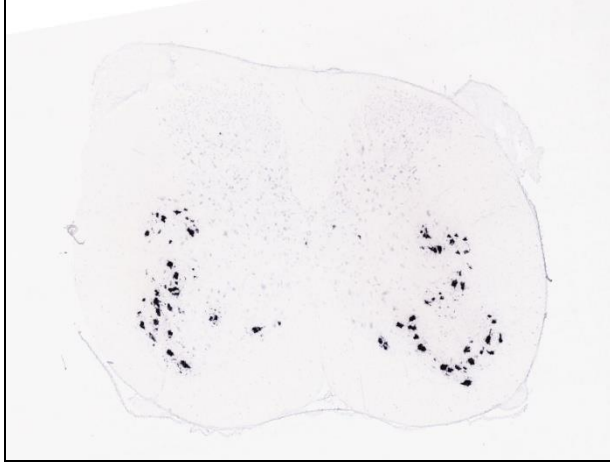


Figure 3. Gene expression enriched in Laminae 7-8. Expression was detected with *Dlk1* probe in P56 cervical segment (left panel), and with *Cyp26b1* probe in P4 thoracic segment (right panel).

Lamina 9

Gene expression is enriched in the motor neurons of lamina 9.

[Slc18a3](#)



[Brp44l](#)

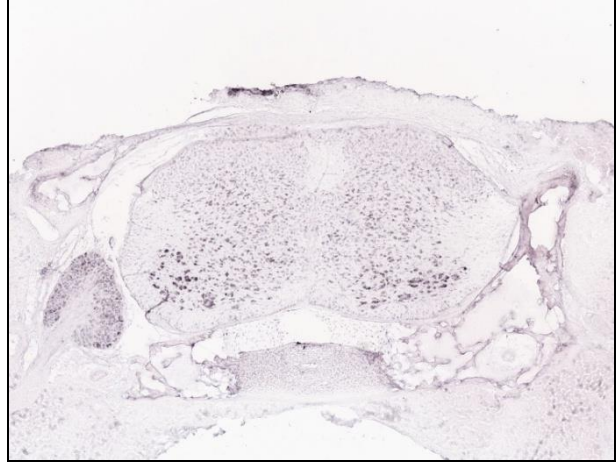
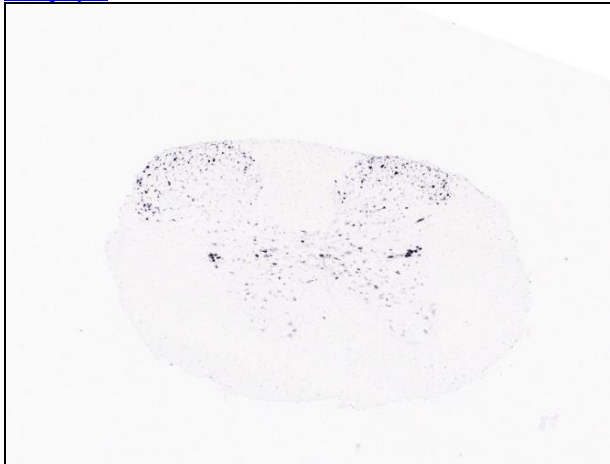


Figure 4. Gene expression enriched in Lamina 9. Expression was detected with Slc18a3 probe in P56 cervical segment (left panel), and with Brp44l probe in P4 cervical segment (right panel).

Intermediolateral Column

Gene expression is enriched in the intermediolateral column (IML).

[Adcyap1](#)



[Dmbx1](#)

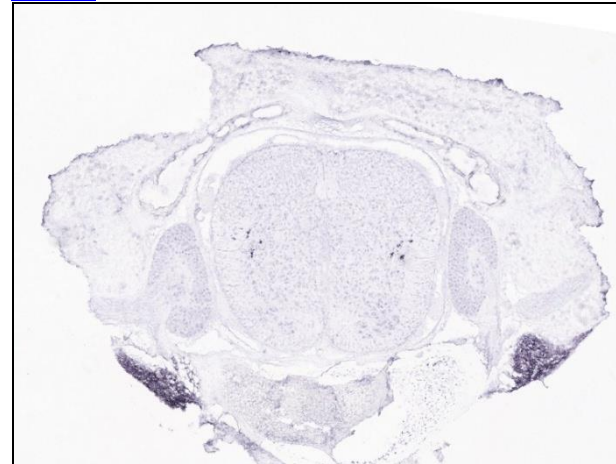


Figure 5. Gene expression enriched in IML. Expression was detected with Adcyap1 probe in P56 thoracic segment (left panel), and with Dmbx1 probe in P4 thoracic segment (right panel).

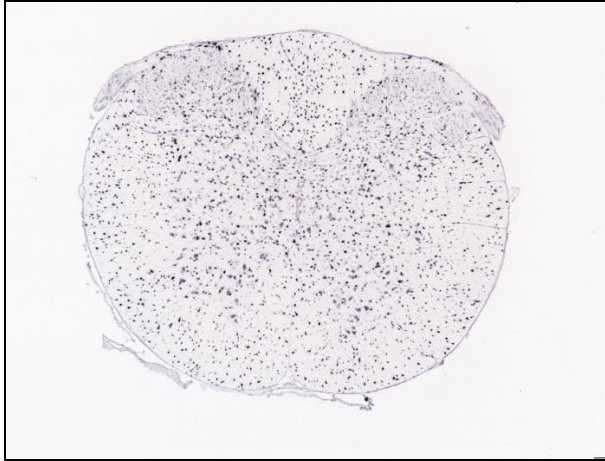
Gray Matter

Gene expression is enriched in any of the gray matter categories: Laminae 1-3, Laminae 4-6, Laminae 7-8, or Intermediolateral Column.

White Matter

Gene expression for some genes is enriched in the white matter, e.g. [Mbp in P4](#), but is often distributed throughout the gray and white matter, e.g. [Mbp in P56](#), consistent with developmentally regulated cell type specific expression.

[Gatm](#)



[1200004M23Rik](#)

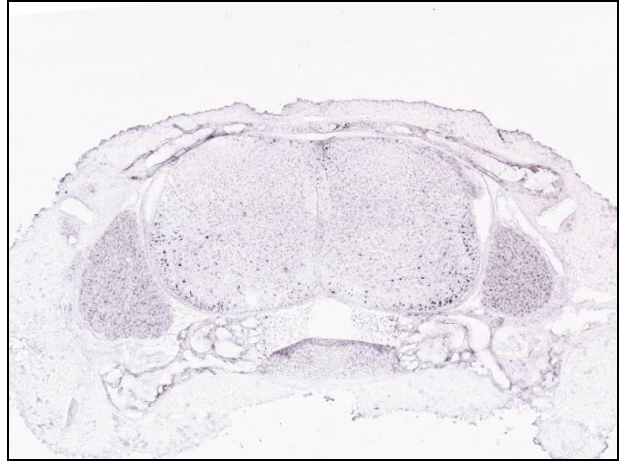


Figure 6. Gene expression enriched in White Matter. Expression was detected with Gatm probe in P56 cervical segment (left panel), and with 1200004M23Rik probe in P4 cervical segment (right panel).

Central Canal

Gene expression is enriched in ependymal cells of the central canal.

[2010001J22Rik](#)



[4930451C15Rik](#)

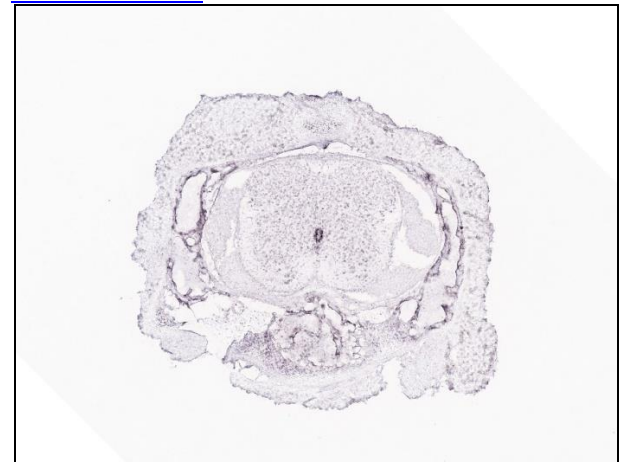
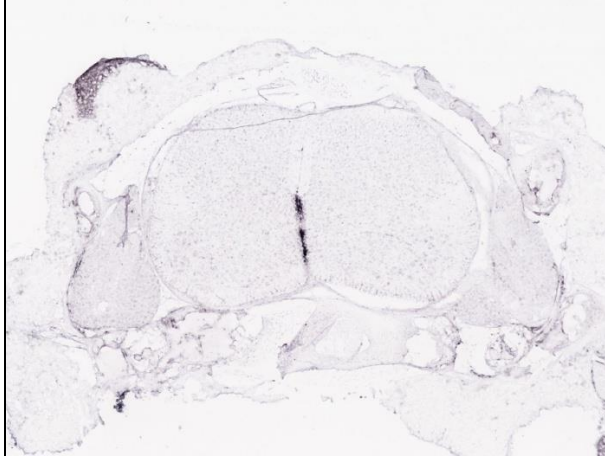


Figure 7. Gene expression enriched in Central Canal. Expression was detected with 2010001J22Rik probe in P56 lumbar segment (left panel), and with 4930451C15Rik probe in P4 sacral segment (right panel).

Ventral-dorsal Midline in Gray Matter

Gene expression is enriched along the P4 ventral-dorsal midline, but not in the ependymal cells of the central canal, and not in P56. For some genes, the enrichment is limited to either a dorsal or ventral strip of expression.

[*Ccdc3*](#)



[*Sdpr*](#)

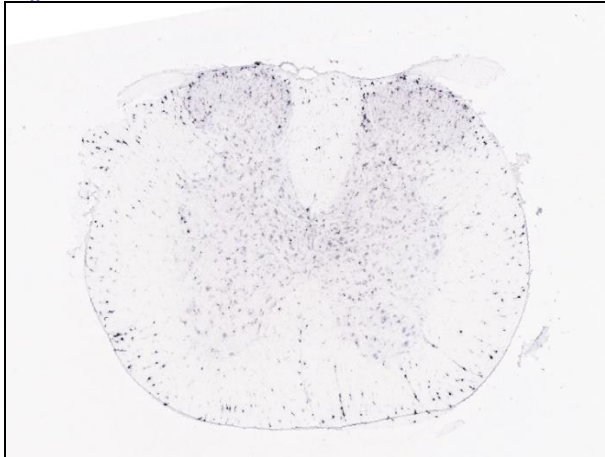


Figure 8. Gene expression enriched in Ventral-dorsal Midline in Gray Matter. Expression was detected with *Ccdc3* probe in P4 cervical segment (left panel), and with *Sdpr* probe in P4 lumbar segment (right panel).

Radially Arrayed in White Matter

Gene expression is enriched in cells at the periphery of the white matter having the appearance of radiating toward the central canal.

[*Aqp4*](#)



[*Fabp7*](#)

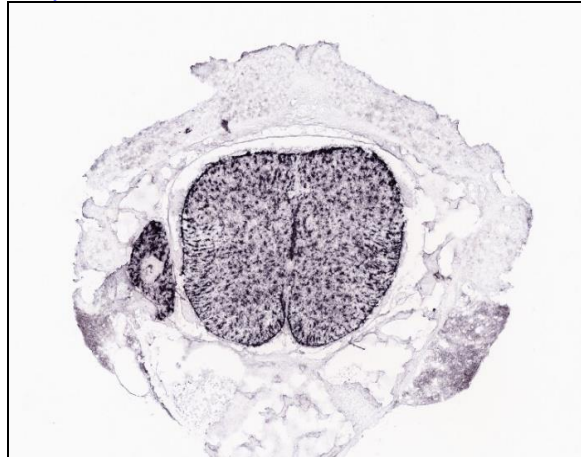
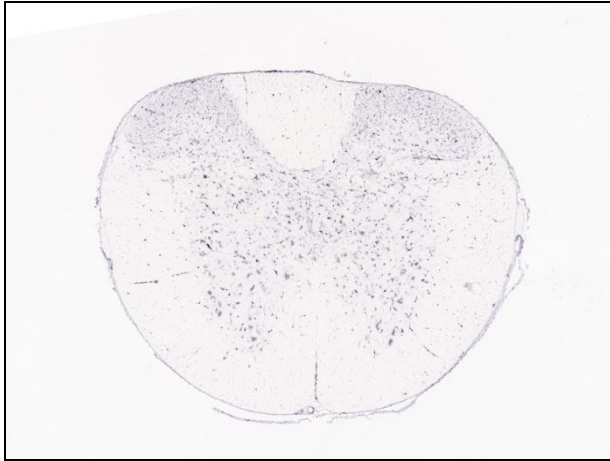


Figure 9. Gene expression for Radially Arrayed in White Matter. Expression was detected with *Aqp4* probe in P56 thoracic segment (left panel), and with *Fabp7* probe in P4 thoracic segment (right panel).

Vascular-like in Gray or White Matter

Gene expression is enriched in cells characterized by a blood vessel pattern, which for many genes looks similar to beads on a string.

[Flt1](#)



[Mfsd2](#)

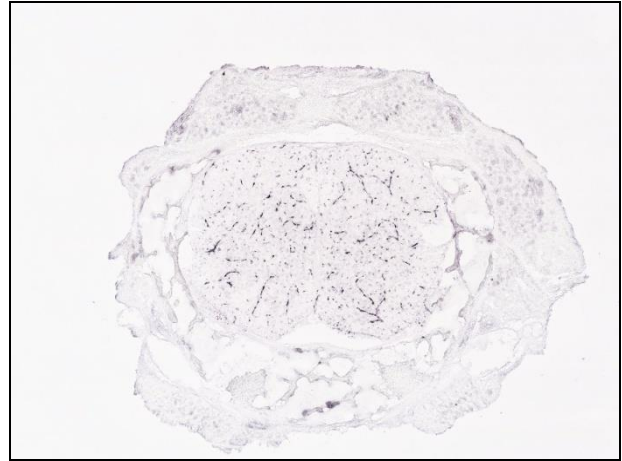


Figure 10. Gene expression for Vascular-like in Gray or White Matter. Expression was detected with Flt1 probe in P56 cervical segment (left panel), and with Mfsd2 probe in P4 lumbar segment (right panel).