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The circulation of the cerebrospinal fluid (CSF) in the spinal canal ANTONIO L SANCHEZ, University of California San Diego, CARLOS MARTINEZ-BAZAN, Universidad de Jaen, JUAN C LASHERAS, University of California San Diego — Cerebrospinal Fluid (CSF) is secreted in the choroid plexus in the lateral sinuses of the brain and fills the subarachnoid space bathing the external surfaces of the brain and the spinal canal. Absence of CSF circulation has been shown to impede its physiological function that includes, among others, supplying nutrients to neuronal and glial cells and removing the waste products of cellular metabolism. Radionuclide scanning images published by Di Chiro in 1964 showed upward migration of particle tracers from the lumbar region of the spinal canal, thereby suggesting the presence of an active bulk circulation responsible for bringing fresh CSF into the spinal canal and returning a portion of it to the cranial vault. However, the existence of this slow moving bulk circulation in the spinal canal has been a subject of dispute for the last 50 years. To date, there has been no physical explanation for the mechanism responsible for the establishment of such a bulk motion. We present a perturbation analysis of the flow in an idealized model of the spinal canal and show how steady streaming could be responsible for the establishment of such a circulation. The results of this analysis are compared to flow measurements conducted on in-vitro models of the spinal canal of adult humans.

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