Towards the brain vascular map

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The brain is a central organ present in all vertebrates. It is the information processing center, which translates the different signals received by the brain into a plethora of actions and functions, from muscle contraction, hormone release, to thoughts and consciousness. Scientists hope to understand how this organ functions, and initiatives have been launched hoping to unveil the molecular mechanisms of the brain. Here we show efforts to understand the molecular diversity of the brain vasculature, hoping to better understand how blood vessels contribute to its function. Using phage display *in vivo*, we screened the vasculature of the BALB/c laboratory mouse brain. Three rounds of selection were performed in specific brain regions (hemispheres, olfactory bulb and cerebellum) to identify peptides that target molecular markers present in these areas. Three rounds of selection were performed, after which was observed a significant enrichment in the number of phage bound to the vasculature. Randomly selected clones were then analyzed to identify the peptides displayed by individual phages. Interestingly, a peptide motif was present in approximately one third of the identified peptides present in the third round of selection. This peptide motif binds strongly to the vasculature of all brain regions analyzed and a 50-kDa protein has been identified as the putative vascular ligand for this peptide. Having shown that the biopanning was successful, all peptides present in the three rounds of selection in each brain region were identified by high throughput sequencing using the Illumina system. A bioinformatics platform is been developed to analyze and prioritize the identified peptides for further validation studies. Our efforts to map molecular addresses present in blood vessels of the brain may help scientist understand its function as well as the development of targeted therapeutic options for human diseases of the central nervous system.

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