



Bi-directional immune-brain communication: Implications for understanding stress, pain, and cognition.

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The immune system and the central nervous system form a bi-directional communication network. The critical roles of pro-inflammatory cytokines in both the periphery and the nervous system are discussed. In the periphery, these cytokines initiate the processes that signal the brain that immune activation has occurred, and communicate this information over both neural and blood-borne routes. The arrival of these signals in the central nervous system induces a neural cascade that includes the de novo induction of pro-inflammatory cytokines. The functions of these cytokines in the nervous system are discussed, and it is argued that they play a key role in regulating the neural control of immune processes in the periphery. In addition, it is argued that these cytokines play a variety of other roles, and some implications of the cytokine network for understanding stress, behavior, sensory processing, mood, and cognition are described. The overall argument is that because brain-mediated host defense involves behavioral, sensory, mood, and cognitive alterations, immune activation, and immune products such as the cytokines can have a pervasive effect on these functions. Finally, these phenomena are placed in an evolutionary perspective.

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