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**The motor cortex communicates with the kidney.**

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**Source**

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**Abstract**

We used retrograde transneuronal transport of rabies virus from the rat kidney to identify the areas of the cerebral cortex that are potential sources of central commands for the neural regulation of this organ. Our results indicate that multiple motor and nonmotor areas of the cerebral cortex contain output neurons that indirectly influence kidney function. These cortical areas include the primary motor cortex (M1), the rostromedial motor area (M2), the primary somatosensory cortex, the insula and other regions surrounding the rhinal fissure, and the medial prefrontal cortex. The vast majority of the output neurons from the cerebral cortex were located in two cortical areas, M1 (68%) and M2 (15%). If the visceromotor functions of M1 and M2 reflect their skeletomotor functions, then the output to the kidney from each cortical area could make a unique contribution to autonomic control. The output from M1 could add precision and organ-specific regulation to descending visceromotor commands, whereas the output from M2 could add anticipatory processing which is essential for allostatic regulation. We also found that the output from M1 and M2 to the kidney originates predominantly from the trunk representations of these two cortical areas. Thus, a map of visceromotor representation appears to be embedded within the classic somatotopic map of skeletomotor representation.

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