Several theories of cigarette craving suggest that dopaminergic function in the ventral striatum plays an important role. The objective of this study was to determine correlations between craving-related brain activation and dopamine D1 receptor (D1R) binding in smokers. Twelve smokers and 12 nonsmoking controls underwent $[^{15}\text{O}]\text{H}_2\text{O}$-positron emission tomography (PET) activation study and D1R binding study using $[^{11}\text{C}]\text{SCH 23390}$, and the correlations between receptor binding and cue-induced regional cerebral blood flow (rCBF) changes were assessed. Consecutive D1R binding changes were examined during a period of 6 months of post-smoking abstinence in 5 smokers. Cue-induced activation was observed in the left ventral striatum including the nucleus accumbens in smokers. D1R binding in the ventral striatum showed a negative relationship with cue-induced craving and rCBF changes. D1R binding was significantly low in smokers, increasing again after smoking abstinence. D1R binding and cue-induced rCBF changes in the ventral striatum suggest the important role of D1R in this region in cigarette craving.