Abstract
Parallel processing, a fundamental feature of vertebrate sensory systems, is exemplified by the avian auditory brainstem, in which a pathway specialized for temporal processing is largely separate from pathways that process other aspects of sound. One unique exception to this parallel organization is in the inhibitory input provided by the superior olivary nucleus (SON). Previous studies have shown that the SON projects contralaterally to the nucleus magnocellularis (NM), nucleus laminaris (NL), and nucleus of the isthmus (NI). Here we address whether single SON neurons project to multiple targets, or alternatively whether separate neuronal populations project independently to individual target nuclei. We developed an in vitro dye electroporation method for retrograde labeling of neurons. Two fluorescent tracers were injected into each preparation: one via the proximal axonal pathway, and another dye into one of the other nuclei on the same side of the brain. A large number of double-labeled SON somata were observed in all cases where injections were made into pairs of ipsilateral targets in NA, NM, and NL (25% of all double-labeled cells were seen in each pair). Several possible SON output patterns were observed, including a projection to both NA and NL (mean = 24.1% of all labeled cells were double-labeled), suggesting that individual SON neurons project to all of its known brainstem targets. The SON provides prominent GABAergic input to NA, NM, and NL (mean = 24.1% of all labeled cells were double-labeled), suggesting that individual SON neurons project to all of its known brainstem targets. The SON provides prominent GABAergic input to NA, NM, and NL (mean = 24.1% of all labeled cells were double-labeled), suggesting that individual SON neurons project to all of its known brainstem targets. The SON provides prominent GABAergic input to NA, NM, and NL (mean = 24.1% of all labeled cells were double-labeled), suggesting that individual SON neurons project to all of its known brainstem targets. The SON provides prominent GABAergic input to NA, NM, and NL (mean = 24.1% of all labeled cells were double-labeled), suggesting that individual SON neurons project to all of its known brainstem targets. The SON provides prominent GABAergic input to NA, NM, and NL (mean = 24.1% of all labeled cells were double-labeled), suggesting that individual SON neurons project to all of its known brainstem targets. The SON provides prominent GABAergic input to NA, NM, and NL (mean = 24.1% of all labeled cells were double-labeled), suggesting that individual SON neurons project to all of its known brainstem targets. The SON provides prominent GABAergic input to NA, NM, and NL (mean = 24.1% of all labeled cells were double-labeled), suggesting that individual SON neurons project to all of its known brainstem targets.