

## EFFECTS OF LONG-TERM DEAFNESS AND DELAYED CHRONIC INTRACOCHLEAR ELECTRICAL STIMULATION ON THE PRIMARY AUDITORY CORTEX

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Cochlear implant use from a young age is known to alter spectral (spatial) and temporal processing in the auditory system. Whether these effects are limited to electrical stimulation (ES) that is initiated during the early critical periods, or also occurs when ES is commenced after long-term deafness, is less clear. Five cats were neonatally deafened via daily neomycin injections, and at two months of age implanted a multi-channel scala tympani electrode array. Behaviorally relevant ES from a cochlear implant was delivered from *eight* to *fourteen* months of age. Neuronal clusters ( $n = 300$ ) were recorded in the primary auditory cortex (AI) using a combination of single tungsten and multi-channel silicon electrode arrays. Spectral processing in AI was assessed by measuring the cochlea-to-cortex mapping and temporal resolution was quantified as the jitter in response latency and the maximum rate at which clusters could be driven. Similar to chronic ES initiated early in life, delayed ES had little effect on the basic response properties of AI neurons, but did reverse the disruption of the cochlea-to-cortex mapping and reduction in maximum driven rate (Mann-Whitney;  $p < 0.05$ ) resulting from long-term deafness in the absence of CI use. The late initiation of ES did not, however, reverse the increase in the jitter in response latency seen with long-term deafness. We hypothesize that the inability of electrical activation of the cochlea, after the closure of the normal critical period, to reverse the increased jitter in response latency contributes to the poorer performance observed among congenitally deaf human patients implanted later in life.