INTRODUCTION
The dorsal cochlear nucleus (DCN) receives auditory information from the eighth cranial nerve. Its structure and physiology have been extensively studied in nonprimate mammals such as cat and rodent. Data from rodents suggest that the DCN may play a role in the generation of tinnitus, the perception of a phantom sound that is often debilitating. There have been many studies using a behavioral model of tinnitus in rodents to try to understand its neural substrate. However, there is a problem in extending the findings from the rodent models of tinnitus to humans, in that classic studies agree that the structure of the human DCN is substantially different from that of rodents, with a loss of laminar structure and several cell types.

NONPRIMATE DCN CELL TYPES AND LAMINAR ORGANIZATION

RESULTS
LAMINAR STRUCTURE IN THE HUMAN DCN
There are three distinct layers in the human DCN. A, cresyl violet stain, shows a distinct cell density region in layer 2. B, NPNFP immunoreactive neurons and processes in layer 2. C, nNOS immunoreactive neurons in layers 2 and 3.

CELL TYPES IN THE HUMAN DCN
Fusiform cells
A subset of cells in layer two was highly immunoreactive for nNOS (left) and NPNFP (right). The high magnification panels show examples of these cells, marked by arrowheads. Note the pyramidal/fusiform shape of the immunoreactive cells.

Cartwheel cells
A subset of cells in superficial layer 2 was immunoreactive for CB. The high magnification panels show examples of these cells (arrowheads).

Stellate cells
Star-shaped cells in layer 1 express nNOS. The high magnification panels show examples of these star-shaped cells (arrowheads).

DISCUSSION
Our data show that the human DCN has both laminar organization and multiple cell types, and is comparable to the organization of the cat and the rodent DCN (illustrated below).

Further, the presence of immunoreactive terminals to VGLUT1 and VGLUT2 is compatible with both somatosensory and auditory inputs to the human DCN. Contrary to earlier studies, our results suggest that the organization and inputs of the human DCN are not that different from the rodent DCN. Therefore our data support the use of rodent models for research on DCN involvement in tinnitus.

REFERENCES