

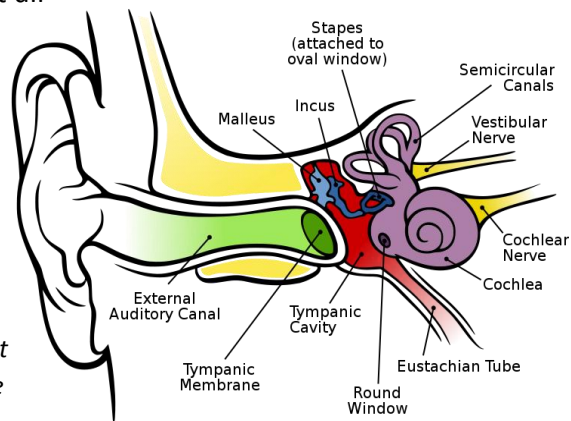
What Causes My Child's Hearing Loss? Sorting Out the 4 Types of Hearing Loss

A FIRST-TIMER'S SIMPLIFIED EXPLANATION*

_____ There is a blockage in the outer ear and/or the middle ear that makes sound quieter by the time it reaches my inner ear and my brain for understanding. *Picture a train going down a railroad track. The train is being conducted from one place to another by the railroad tracks. Sound follows a path to get to the brain. On the first part of this journey, sound must be conducted from the air, through the ear canal (that could be blocked with wax or from birth), through the **ear drum** (that could be damaged), and through the **middle ear space** (that could be filled with infection, the **tiny bones** could be having problems working together, cysts can occur, etc) until the sound reaches the **inner ear**. When sound travels from the outer ear until it is ready to enter the inner ear the body is actually changing the sound (acoustic) energy into mechanical energy. If there is any problem that blocks sound from getting from the outer ear to the inner ear it is called a **conductive hearing loss**.*

_____ There are some missing or damaged parts in the inner ear. Not all

of the sounds that come into the ears pass through the inner ear to the brain for understanding. *The next part of the sound pathway is through the **inner ear (cochlea)** which is considered the sensory organ of the hearing system. It is encased in bone and shaped like a snail shell. The tiny bone in the middle ear that is shaped like a **stirrup**, fits tightly into a window into the inner ear and moves back and forth to transfer the mechanical energy of the transformed sound into the inner ear. The **inner ear** has something like 3 tubes, one stacked on top of one other, each filled with a different fluid. Two of the tubes work so closely together that it is easiest to think of them as a single tube. Picture a hotdog bun that can be coiled up like a snail. There is a thin membrane between the two tubes. As the little stirrup bone (stapes) moves in and out, the fluid in the two tubes moves in waves down the length of the thin membrane. Picture the bottom part of the hotdog bun being smeared with thick, movable jelly. Under the jelly is the acoustic nerve that sends signals to the brain. There are thousands of hair cells that act as though they have their roots stuck in the jelly. The hair cells closest to the window register low pitches. Those at the top or end turn of the cochlea register the high pitches. When a wave moves through the jelly, it causes the hair cells to bend and cause an electrical impulse. There is a chemical reaction that lets the hearing nerve know that an electrical impulse is coming its way (like putting a plug into a wall outlet). The hearing nerve then transports the electrical impulse to the brain. If there are enough missing, deformed or damaged hair cells there will be a hearing loss. If the chemical reaction doesn't work right there can be a hearing loss (Connexin 26). Any problem that interferes with the hair cells in the cochlear passing on electrical impulses to the hearing nerve is called a **sensorineural hearing loss**.*



_____ The brain does not process sounds exactly, so the child does not understand all that of the sounds that he hears. *Picture the train moving along the railroad tracks, moving through different towns to reach its final destination. The train must stay on the tracks and there must not be anything on the tracks that could slow the train down if it is to get to each town on time and stay on schedule to pick up passengers or freight along the way. In some people, as the electrical impulses move to their destination in the auditory center of brain they become waylaid, preventing some from arriving or making others late. It is important for the impulses to pass through different sections of the brain in a certain way if all of the information is to be transported (think about a relay race where the next person to run has to be in the right spot at the right time to get the baton from the runner before he can finish the next part of the race). Impulses moving through the auditory pathways do so in synchronized manner. If there is a problem (auditory dysynchrony) then the information can be fragmented, causing great difficulty in understanding the meaning of sound/speech, especially if there is background noise. Any problem with how the electrical impulses move through the auditory pathways of the brain is called a **central or neural hearing loss**. Only in the last couple of decades have we had the testing equipment to be able to tell sensory hearing loss from central hearing loss. Sometimes the term sensorineural is used to mean that there is a problem in the cochlea and in the auditory pathways.*

_____ I have checked (✓) more than one if my child's hearing loss is caused by more than one problem. *People with permanent hearing loss from problems in their cochleas can also experience ear infections. They would then have two types of hearing loss: sensorineural and conductive. When this happens it is called a **mixed hearing loss**.*

***Talk to your hearing professional for more in-depth information.**

Karen L. Anderson, PhD, 2011