Pediatric Clinical Support:
Connexin 26/GJB2 Mutation

A protein on the gap junction beta 2 (GJB2) gene, Connexin 26 can mutate due to the instruction provided by the GJB2 gene. The end result of this mutation can be non-syndromic hearing loss, believed to be caused by a disruption of potassium flow in the inner ear (see Figure 1).

Characterized by:
A Connexin 26 mutation results only in isolated, prelingual hearing loss. In a small number of cases, skin disorders are also present. Connexin is a particular type of protein that is considered a 'gap junction' protein. Gap junction proteins are necessary because they allow cells to communicate with each other.

Incidence Rate and Diagnosis:
Non-syndromic forms of hearing loss account for approximately 60% of prelingual deafness (Mukherjee, Phadke, & Mittal, 2003). Genetic testing can determine the mutation of the GJB2 gene.

Genetic Expression:
Connexin 26 is an autosomal recessive mutation, meaning that two abnormal copies of a gene must be present in order for the trait to be expressed (Figure 2).

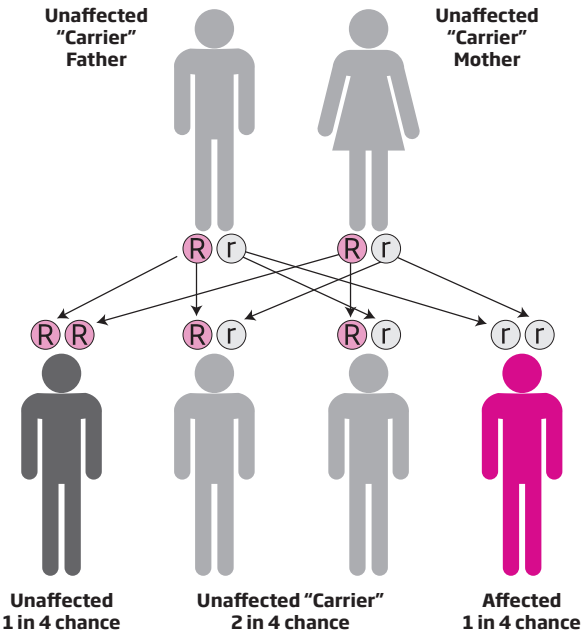

Figure 2. Gene expression for an autosomal recessive condition.

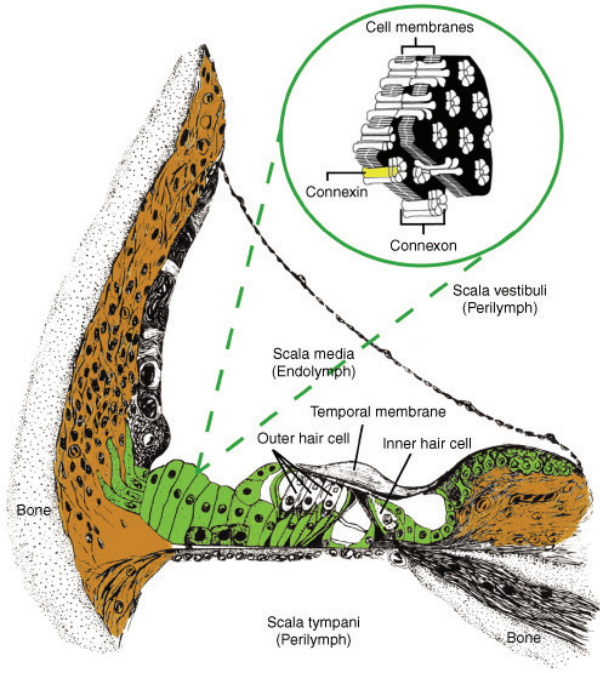

Figure 1. Location of Connexin 26 in the potassium recycling pathway of the cochlea (Hildebrand et al, 2007).

Audiological Considerations:
Hearing loss configuration related to Connexin 26 can have a wide variation, but it has been estimated to cause 50% of severe to profound recessive, non-syndromic sensorineural hearing loss, and 20% of childhood genetic deafness in certain populations*. Hearing screenings at birth may be the first indication to the parents that the infant has a hearing loss, but the cause of the loss will need to be further evaluated through other realms, such as genetic testing.

**Connexin 26 mutations are most commonly seen in Caucasian, some Asian (e.g., Japanese people), and Ashkenazi Jewish populations.*

Treatment:
Hearing evaluation to determine severity, which can determine appropriate amplification or cochlear implantation for profound losses. Assistive listening devices may be beneficial in addition to or in conjunction with amplification and/or cochlear implants. American Sign Language can be used as a communication method.

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Professional Considerations:
Parents, most likely, have not heard of Connexin 26/GJB2 gene mutation. Provide basic information, however, it is important for the parents to discuss any genetics-related questions with a geneticist who is familiar with this type of mutation. In terms of the hearing loss, encourage the parents to ask questions to help them determine the best course of treatment for the child. Speech-language pathologists and audiologists may interact with the child and assist in different aspects of habilitation, including speech/language therapy, use of hearing aid/cochlear implant and FM use.

Educational Considerations:
The severity of the child's hearing loss should be indicated and addressed in the child's IEP, once they become school-aged. This includes allowing access to information, and effective communication strategies in the different environments the child will be in while at school. Assistive listening devices may be beneficial to improve listening in complex listening environments.

Online Support Sources:
http://www.specialtylabs.com/education/download_PDF/tn_1215.pdf
http://www.ggc.org/diagnostic/tests-costs/test-finder/connexin-26-gjb2-sequencing.html
http://hearing.harvard.edu/info/Ins2_Connexin26.pdf
http://www.californiaearinstitute.com/ear-disorders-connexin-26-bay-area.php

Online and other References:
Hildebrand M, Newton S, Gubbels S, Sheffield A, Kochhar A, de Silva M, Dahl H, Rose S, Behlke M, Smith R (2007). Advances in Molecular and Cellular Therapies for Hearing Loss. Molecular Therapy, 16: 224-236.

Mukherjee M, Phadke S R, Mittal B. (2003). Connexin 26 and autosomal recessive non-syndromic hearing loss. Indian Journal of Human Genetics, 9:40-50.

Pandya A, Arnos K, Xia x, Welch K, Blanton S, Friedman T, Garcia Sanches G, Liu X, Morell R, & Nance W (2003).
Frequency and distribution of GJB2 (connexin 26) and GJB6 (connexin 30) mutations in a large North American repository of deaf probands. Genetics in Medicine, 5: 295-303.

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