Facial differences can arise while a baby is still growing inside the mother. Two common examples include cleft lip and cleft palate. Most of the body’s cells contain DNA, which serves as the instructions for creating all the features of the body, such as the parts of the face. Cells use DNA’s instructions to form the face from five big “puzzle pieces” called prominences. Sometimes the DNA instructions get changed or steps are skipped, which can change how the puzzle pieces, or prominences, connect. This results in facial differences like cleft lip, in which there is a gap in the lip and cleft palate, in which there is a gap in the roof of the mouth. Most cases of cleft lip and cleft palate can be fixed with surgery, and children go on to live long, healthy lives.

WHAT ARE CLEFT LIP AND CLEFT PALATE?

The human face is made up of millions of cells. Cells come together to form clumps called tissues that create the various parts of the face, including the eyes, ears, nose, and mouth. When a baby is growing...
inside the mother, the parts of the face are formed. Sometimes, however, the parts of the face can grow in unusual ways. When this happens, people can be born with facial differences. Two common examples of facial differences are called cleft lip and cleft palate.

Look at your reflection and imagine that your top lip was not connected at the center. It does not hurt like a cut, but there is an open space. You can see inside your mouth, the tops of your teeth, and inside your nose. This is called cleft lip, and it happens when a baby’s lips form differently before they are born. Now, use your tongue to feel the shape of the roof of your mouth, going from your two front teeth to the teeth all the way to the back. This part of your mouth is called your palate. When there is a space on the roof of the mouth, where it would usually be solid, this is called a cleft palate. Cleft palate happens when the roof of a baby’s mouth forms differently before they are born (Figure 1).

Cleft lip and palate are relatively common—every 3 min, a child is born with a cleft lip, cleft palate, or both. Cleft lip is more common than cleft palate. For every 1,000 new babies born, there is 1 baby born with a cleft lip [1]. You may know a friend or family member who had a cleft lip or palate. Despite being so common, these conditions are generally not seen very often because they are usually fixed when children are very young.

**HOW DO CLEFTS FORM?**

Nearly every cell in the human body contains instructions in the form of DNA. If you imagine the body as a puzzle, the instructions in the DNA help the body know where to put the pieces as it grows. There are sections of DNA that specifically tell the body’s cells where parts of the face should go.
A baby spends about 9 months inside the mom, growing from a single cell. Groups of cells use the DNA’s instructions to come together and form five major prominences, which are like the puzzle pieces that eventually form the face. The first piece is the forehead, which grows and supports the rest of the features. The second piece forms the lower part of the mouth and chin. The third piece forms both sides of the upper lip and cheeks. Finally, the fourth and fifth small pieces connect to form each half of the nose (Figure 2). Inside the mouth, these pieces also connect to form the palate, which separates the inside of the mouth from the inside of the nose [2]. Sometimes these pieces get the wrong instructions about where to go or how to connect. They come together differently, or fail to connect at all, leaving a gap called a cleft. Clefts can be on one side of the face or on both sides. The gaps can be big or small and can include just the lips, just the palate, or both (Figure 1) [3].

**Figure 2**

(A) The parts of the human face can be thought of as puzzle pieces that must come together to make a whole picture. In an unborn baby, the original pieces, called prominences, connect to form the forehead (green), the cheeks (blue), both halves of the nose (yellow and pink) and the chin (purple). (B) When there is a mismatch in the puzzle pieces and they do not come together properly, a cleft can form.
WHAT CAUSES CLEFT LIP AND CLEFT PALATE?

There are many ways that the facial prominences can connect differently, forming a cleft lip or cleft palate. Some kids have a family history of cleft lip or palate, which makes them more likely to have it, too [4]. Everyone inherits features from their parents, and this is because we inherit our parents’ DNA. Perhaps you have been told that you have your mother’s eyes, your father’s hair, or your grandmother’s nose. Sometimes, people can inherit facial differences too, and this can be due to changes in the DNA called mutations. DNA mutations can change the way cells move and grow, like a list of instructions with some steps missing or changed. When there are certain DNA mutations, some of the puzzle pieces might not know where to go or how to connect to each other.

Cleft lip and palate can also be caused by things the mother is exposed to during pregnancy. A growing baby gets all its oxygen, water, and nutrients from the mother. Therefore, if a pregnant woman is exposed to a certain substance, it may affect the baby’s growth, even if the mother does not know it [5]. Sometimes women need to take medicine for their own health, and the medicine can cause a cleft lip or palate in their child. One example is the drug carbamazepine, which many people take to prevent seizures. When women taking such medications want to get pregnant, their doctors must keep a very close eye on the baby before and after it is born, to see if it is growing properly. If the baby appears to have a cleft lip or cleft palate, surgeons can make plans to repair it.

HOW DO DOCTORS REPAIR CLEFT LIP AND CLEFT PALATE?

People born with cleft lip or palate need to be watched closely by many doctors, because the clefts can have a big impact on how they grow up. The mouth, nose, and ears are all connected, so when one part develops differently, it can affect the rest. People with cleft lips or palates can grow up with difficulties eating, sleeping, hearing, and even breathing. Large clefts can create a pathway from the mouth to the nose where one should not be, so food and drinks can go down the wrong way from the nose to the throat and lungs instead of to the stomach! Some people with a cleft lip or palate can eat or drink normally, but others might have difficulty. Doctors might give parents special equipment to help their children eat, such as special bottles that cover the cleft and make sure the milk goes down to the stomach.

Some people spend their whole lives with open clefts, but today, many people get their clefts closed through surgery when they are less than a year old. The operation is performed by a plastic surgeon—a surgeon who specialize in repairing and rebuilding all parts of the human body, including the face. During the surgery, the child is put to sleep for
1–3 h. To repair a cleft lip, the surgeon carefully cuts into the skin and muscles around the space, pulls them together, and sews them tight. There is enough surrounding skin and muscle to fill in the missing puzzle pieces of the lip. This leaves a small scar between the person’s lip and nose (Figure 3). To repair a cleft palate, the surgeon makes the cut on the palate and pulls the pieces together to close the cleft. In this case, the scar is inside the mouth and not outwardly visible.

Although cleft lip and palate surgeries only leave a small scar that is not always seen on the outside, people with cleft lip and palate may need other care throughout childhood. After surgery, a person born with a cleft lip or palate may find that their face develops differently as they grow up, and they might need interventions such as braces and follow-up surgeries. They might see a speech therapist if their mouth cannot make certain sounds. They may even need to see a counselor if they get teased or bullied.

CONCLUSION

The human face is made of millions of cells that grow, rearrange themselves, and combine to form the pieces that become the eyes, ears, nose, and mouth. When the pieces of the lips and mouth come together differently or do not connect at all, a person is left with facial differences such as cleft lip or cleft palate. This can happen for a few reasons, including DNA mutations and exposure to certain substances during pregnancy. People who are born with clefts often get surgery to close them and will be monitored by doctors for a long time. But regardless, they will go on to lead long, healthy lives. All puzzles are different, and faces can be, too! Regardless of their differences, the pieces come together to create something beautiful that should be appreciated and respected.
REFERENCES


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YOUNG REVIEWERS

CARINA, AGE: 13
My name is Carina and I am 13 years old. I have many interests including soccer, music, reading, math, and science. I find science very fascinating, especially biology. My dream is to work in medicine. I am very interested in how our bodies work well and malfunction; I want to help people in the future achieve their best health. I am quite intrigued about how technology will improve our abilities to detect illness earlier and track how well therapies are working.
ERICA, AGE: 12
My name is Erica and I am 12 years old. I love video games, science and judo. My favorite game is Zelda, and I want to become a game director someday. In science, I like questioning new information and trying to figure out things I do not know based on what I do know. I also play judo, and I am currently an orange belt.

KALLIE, AGE: 13
My name is Kallie and I am 13 years old. I enjoy playing lacrosse on my team! I enjoy learning about neuroscience and I am interested in iPS cells. I participate in debate workshops. Some of my other hobbies are painting, reading, using Pinterest, and creating digital art! I am fascinated by butterflies, and all cats big and small. I am a member of my school’s student council and school council. I love writing poetry and even won an award for one of my poems.

SCIENCE CLUB OF ESCOLA CONCEPT RIBEIRÃO PRETO, AGE: 10
We are the Science Club of Escola Concept Ribeirão Preto! Our names are Carolina, Catarina, Lívia, Nicolas, Pedro 1, and Pedro 2. We are proud 5th and 6th-grade students passionate about science. Chosen for our excellent results in science assessments and competitions, we are curious, avid readers of the magazine, and excited to dive into the article review process. We are thrilled about this scientific journey full of discoveries and laughter!

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