Chicken Nuggets: Daily Embryology Facts

Day 0

It takes 24-26 hours for a hen to make and lay each egg.

An egg starts as a tiny **ova** (oh-vuh), or cell, inside of a hen's body. The ova will be the yolk.

Next, the hen adds a thin **membrane** (mem-brain) called the **chalaza** (kuh-lay-zuh) to the yolk. The chalaza looks like a tiny white rope. It holds the yolk in the center of the egg.

The third step is to add layers of **albumen** (al-byoo-men) to make the egg whites.

Then, the hen will add another membrane around the albumen.

The egg shell goes on last. It can take 20 hours just to make the egg shell!

A hen will lay one egg at a time. She will rest for two hours after she lays her egg. Then she starts making a new egg.

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Day 1

An air cell forms inside the egg when it is laid.

The air cell forms because the temperature inside of a chicken (104° to 105°F) is much warmer than the temperature outside of a chicken (70°F).

As the egg cools, the **membrane** (mem-brain) inside the egg shrinks down and pulls away from the shell. This leaves a little space between the shell and the membrane. The space fills with air.

The air cell will be the chick's first breath of air when it is starting to hatch.

You can make a model to show how the membrane shrinks when it cools. You will need two balloons that are the same size. Blow up the balloons and tie them closed. Place one balloon on the countertop. This balloon is to remind you what the membrane looked like when it was inside of the warm chicken. Place the other balloon inside the freezer. This balloon will show you what happens to the membrane inside the egg after it is laid and cools off.

Leave the balloons alone overnight. The next morning, take the balloon out of the freezer and compare it to the balloon that was on the countertop. What do you notice?

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Day 2

After a chicken lays an egg, it takes 21 days for it to hatch. During that time, the egg is a perfect home for the embryo. The egg shell protects the embryo. The yolk gives it food. The membranes let in fresh air.

An egg is amazing, but an egg also needs a lot of care. Eggs need to be kept warm and moist. The mother hen sits on them in her nest. She loses all her feathers in a special spot on her underside. This bare spot is called a **brood patch** (brood pach). It is just for sitting on her eggs. Her warm, bare skin keeps her eggs warm and moist inside the nest.

The eggs also need to be turned. Turning the eggs helps the embryo grow properly. At the farm, the mother hen turns her eggs many times each day. She uses her beak to roll the eggs towards her.

We do not have a mother hen. We will need to take care of the eggs. We will put the eggs in a machine called an **incubator** (ink-you-bay-tor). The incubator will keep the eggs warm. We want to set the temperature at 99.5°F to 100°F. We will add water to the incubator to keep the eggs moist. We will also turn the eggs many times each day. We will keep careful records of how we care for our eggs.

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Day 3

The embryo's heart is beating. Its brain and its legs are just starting to form. An adult chicken's heart will beat between 200 and 300 times per minute. This is much faster than a human. An 8-year-old's heart usually beats between 52 and 123 times per minute. A chicken's heart can beat four times in the same amount of time that it takes a child's heart to beat once.

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Day 4

The embryo's eye can be seen by Day 4. It is so large that it takes up most of the space in the embryo's head. The brain has to develop outside of the embryo's head at first so there is enough room for the eyes.

Chickens need their eyes to stay safe. They have one eye on each side of their heads. This helps them to see danger, or dinner, coming from almost any direction. Each eye can pay attention to its own thing, so the chicken can always be looking for food and looking out for enemies at the same time. Chickens also can see more colors than people can, and they are very good at seeing things that are moving. The only thing that chicken eyes are not good for is seeing in the dark. Chickens can easily get lost in the dark, or worse. This is why it is important to make sure all of your chickens are home to roost before the sun goes down.

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Day 5

Beginning around day 5, the embryo starts to develop female or male body parts. Usually, about half of the eggs in a chicken's nest will have female embryos and half will have male embryos.

A male chicken is called a **cockerel** (kok-er-ul) until he is a year old. Then he is called a **rooster** (roo-stur). A female chicken is called a **pullet** (pull-it) until she is one year old. Then she is called a **hen**.

Male and female chicks can be hard to tell apart. In some breeds, the pullets and the cockerels have different colored down feathers. With other breeds, you will have to wait until the chicks are about 8 weeks old before you can tell which are cockerels and which are pullets.

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Day 6

Chickens do not have good table manners. They do not eat slowly. They do not chew their food carefully. It is not their fault. Chickens do not have teeth.

Chickens do not have time to chew, anyway. Lots of animals like chicken dinners. In the wild, chickens had to eat and run all the time so that nothing else ate them. This is why chickens gulp down their food.

When you eat food, you chew your food with your teeth. Your tongue pushes the food down into your esophagus. Then it goes into your stomach.

A chicken's body is different. Food does not go straight to its stomach. Instead, when a chicken swallows, the food goes into a special part of the chicken's esophagus called the **crop**. The crop develops around Day 5. You can think of the crop almost like a grocery bag inside the chicken's body. The chicken fills its crop with food during the day, just like shoppers fill grocery bags with food at the store. When the shoppers get home, they empty the food out of their grocery bags and eat dinner. At night, when the chicken is safe in its home, it empties the food out of its crop and into its stomach.

Just like your stomach, a chicken's stomach has juices that break down food. However, your stomach works with little pieces of food that you have already chewed. Chicken stomachs have to work with big pieces of food that the chicken swallows whole. These big pieces could get stuck in the rest of the chicken's guts.

Chickens have a special body part called a **gizzard** (gih-zerd) between their stomachs and the rest of their guts. The gizzard is a strong muscle that develops around Day 6. Chickens have to use their gizzards instead of teeth to grind their food, but muscles are not hard like teeth. Imagine if you had to chew your food just with your tongue. You might be okay eating some soft foods, but you would probably have a harder time eating a healthy diet.

To solve this problem, chickens swallow grit, sand, and very small pebbles to fill their gizzards, almost as if chickens make their very own sandpaper! Now, when food goes from the stomach into the gizzard, the gizzard muscles squeeze and twist the food around the "sandpaper." The "sandpaper" breaks the food apart into pieces that are tiny enough to fit through the rest of the gut.

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Day 7

By Day 7, the embryo's beak starts to form. A chicken's beak is made of **keratin** (care-uh-tin). This is the same stuff that makes up your fingernails and toenails. The embryo's beak will start to harden on Day 10. By the time the chick hatches, the beak will be very strong.

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Day 8

“Stop running around like a chicken with its head cut off!”

Has anyone ever said that to you? It means, “You are not working carefully right now. Stop and make a plan before you do anything else.” So how did this saying come to be?

Sometimes, farmers noticed that chickens could move their legs and flap their wings for a few minutes after they had been killed. This happens because there is a little bit of electricity still in their nerves. That electricity makes their muscles move, so it looks like they are running. When the electricity is gone, the movement stops.

Once, though, there was a chicken who really did run around without its head. In 1947, a farmer named Lloyd Olsen and his wife Clara killed a chicken named Mike for dinner. Or, at least, they tried to kill a chicken named Mike for dinner. They chopped off Mike’s head, and he ran around as chickens sometimes do. But then, a strange thing happened.

Instead of flopping to the ground, Mike kept running. He tried pecking. He tried scratching. He tried doing normal chicken things.

Farmer Olsen had never seen a headless chicken run for such a long time. He was curious. He tossed Mike into a box to keep him safe for the night, just to see what would happen. Sure enough, the next morning, Mike was still running around. He was still pecking, still scratching, still trying to do chicken things. He did not seem to miss his head in the least.

Farmer Olsen figured out how to feed Mike using an eyedropper, and “Miracle Mike” lived without a head for 18 more months.

So, how did this miracle happen? Chickens (and chicken embryos) have really big eyes. In fact, an embryo’s eyes are so large that its brain starts to develop outside of its skull. On the eighth day, the embryo’s head has grown enough for its brain to move inside where it belongs. However, an embryo’s eyes still take up so much space inside its skull that all of its brain will not fit; some of a chicken’s brain actually ends up in the top of its neck instead of its head! So, even though the Olsens chopped off Mike’s head, just enough of his brain remained in his neck to keep him alive and kicking.

Mike the Headless Chicken soon became a celebrity. He traveled in style all over the United States. His picture was in the newspapers and fancy magazines. He was even in the Guiness Book of World Records. Farmer Olsen charged people 25 cents to peek at Miracle Mike. Before Mike finally died, the Olsens earned enough money to buy a car, a tractor, and pay off the debt on their farm.

Today, you can visit Mike’s hometown of Fruita, Colorado, where they have a festival every year in his honor.

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Day 9

Your skin probably feels smooth to touch. Chickens, on the other hand, have rough, bumpy skin. Chicken skin feels rough because of the feather **follicles** (fall-ick-uhls). Feather follicles are special openings where the feathers grow out of the skin. An embryo develops its feather follicles around Day 9.

You have follicles on your skin, too. Your follicles do not grow feathers, though. Your follicles grow hair. Human hair is much thinner than chicken feathers, so human hair follicles are much, much smaller than chicken feather follicles.

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Day 10

The embryo starts to form an **egg tooth** on the end of its beak. The chick will need the egg tooth to **pip**, or crack, through the shell when it is ready to hatch.

Adult chickens do not have teeth. The egg tooth will fall off a few days after the chick hatches.

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Day 11

Chickens cannot sweat. They have to find other ways to cool off in warm weather.

A chicken's **comb** (coam) is one way it can cool off. You can see an embryo's comb easily by Day 11. The comb is the fleshy, bumpy thing on top of a chicken's head. It does not have feathers. Some breeds have purple or black combs, but most chickens have red combs. The color comes from all of the blood vessels that go to the comb.

When the chicken is hot, it pumps more blood. The warm blood goes to the comb. There are no feathers to trap the heat, so some of it escapes. Now, the blood is cooler as it moves through the rest of the chicken.

Chicken breeds that came from very warm places often have large combs to allow more heat to escape. Breeds that came from colder places often have small combs to keep them warmer and protect them from frostbite. Roosters also tend to have bigger combs than hens.

Different breeds of chickens have different shapes of combs. Most breeds have one comb, but some have two. Some combs lay flat against the chicken's head. Other combs stand up straight, while others still flop over to one side. However, all combs are cool!

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Day 12

By Day 12, chicken embryos can hear the world outside the egg. Mother hens make purring sounds to the eggs and the embryos can even peep back to their mothers!

Chickens have very good hearing. They use many different types of sounds to communicate with each other. Mother hens also use sounds to teach their chicks about how to find food and survive.

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Day 13

Many animals today love to eat chicken. But millions of years ago, all the way back in the **Cretaceous** (krih-tay-shus) period, the tables were turned. Today's chickens are the closest living relatives of one of the most feared hunters in all of history, the mighty Tyrannosaurus Rex! On Day 13, some of that family history shows up as the embryo develops leg scales and claws.

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Day 14

On Day 14, the embryo is covered with soft, fluffy feathers called **down** (down). Down feathers will keep the new chick warm after it hatches, like how a puffy jacket can keep you warm if you go outside in cold weather. The chick will start to grow its first “real” feathers when it is about seven days old. It will have all of its adult feathers about six weeks after hatching.

An adult chicken still has down feathers next to its skin, but it also has other kinds of feathers. The feathers that cover an adult chicken’s body are called **contour** (kahn-toor) feathers. Some other feather types are **flight** (flyte) feathers, **semiplume** (seh-mee-ploom), **filoplume** (fill-uh-ploom), and **bristle** (briss-el) feathers. Each type of feather does a different job.

Once a year, a chicken will **molt**, or shed, all of its feathers. It takes about seven weeks for a chicken to molt and regrow new feathers.

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Day 15

The embryo's lungs started developing on Day 4. Eleven days later, the lungs still are not ready for the chick to use. So how does the embryo get oxygen?

The embryo "breathes" through its shell. The shell is **porous** (poor-us), which means that it has many tiny holes in it. The tiny holes let air move in or out. A special **membrane** (mem-brain) helps the embryo to move oxygen in and carbon dioxide out of the egg.

This membrane grows with the embryo. By Day 15, it covers most of the inside of the egg shell because the embryo has gotten so big.

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Day 16

The embryo moves into position for hatching. The embryo turns its body so that its head is towards the air cell at the large end of the egg. It tucks its head under its right wing. In a few days, the chick will use its wing as a guide for **pipping** (pip-ing), or breaking out of the egg.

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Day 17

The embryo's **kidneys** (kid-neez) start to work. The kidneys will clean waste products out of the chick's blood and remove extra water from the chick's body.

People also have kidneys to clean their blood and remove extra water. However, people have something called a **bladder** (blah-dur) that chickens do not. When a person's kidneys clean their blood, the waste and extra water from the blood gets stored in the bladder. When their bladder is full, the person goes to the bathroom. The waste products and water come out of the body together as a **liquid** (li-kwid) called **urine** (your-in) or, more commonly, pee.

Chickens do not have a bladder, so they cannot store waste and extra water to make pee like humans do. After a chicken's kidneys clean the wastes out of its blood, the chicken's body will **reabsorb** (ree-ub-zorb) any extra water. Then, the chicken's body makes a paste out of the leftover waste products. The paste exits the chicken as the white part of chicken poop.

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Day 18

If you candle your egg on Day 18, it will mostly look dark. That is because the growing chick takes up most of the space inside of the egg. You will stop turning the eggs so the chicks can get ready to hatch.

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Day 19

The chicks **absorb** (ub-zorb) the yolk into their stomachs. The yolk will help the chicks survive without food or water while they are hatching.

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Day 20

The chicks break through the membrane to reach the air cell and take their first breaths of air. This is called **internal pipping** (in-turn-al pip-ing) because the chick is breaking through the inside of the egg.

Next, the chick will use its egg tooth to crack the shell. This is **external pipping** (eks-turn-al pip-ing) because the chick is breaking through the outside of the egg.

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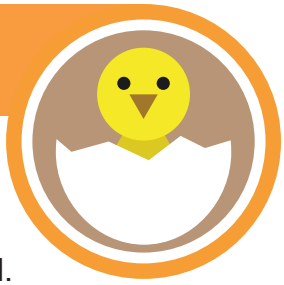

Day 21

After a chick has pipped, it will make a circle-shaped hole in the top of the shell. This step is called **zipping** (zip-ing). The chick will keep working until it can pop off the top of the egg.

It takes 12 to 18 hours for a chick to fully hatch out of an egg. The chick will be tired and wet. It will need to rest and dry.

We move the chicks to a **brooder box** (broo-dur box). The brooder box has a lamp to help them stay warm. It has food for them to eat and water to drink. They have room to run and play with the other baby chicks in a safe place.