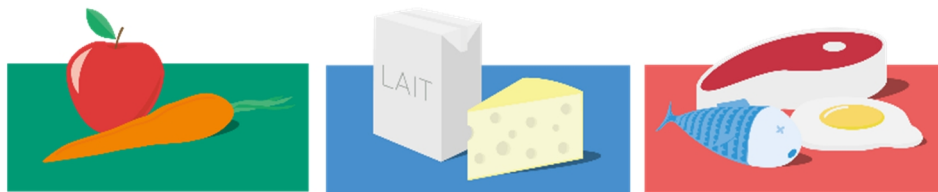


## The cold chain

### COLD

Cold is a well known means of preserving food, but it has only been used on a wide scale since the 19th century.

Cold plays its most major role in the long-distance **transportation** of food. It means that consumers have access to products which were not available before, such as fresh fruit and vegetables, dairy products and meat.



In the United States the first railway wagons chilled with natural ice appeared in 1880. Then boats fitted with cold storage rooms appeared. Rather than using natural ice, we very quickly looked for a way to create a cold atmosphere artificially. As a result, techniques for **artificially making a cold environment** developed from the middle of the 19<sup>th</sup> century. Such techniques use air, water, or gas such as ammonia to produce cold.

### WHAT IS THE DIFFERENCE BETWEEN FREEZING AND DEEP-FREEZING?

Freezing and deep-freezing are two preserving techniques using cold to lower the temperature of food. What is the difference between these two techniques?

**Freezing** gradually lowers temperature. Water within the food is then transformed into large ice crystals. These crystals alter the texture and flavour of food.

**Deep-freezing**, on the other hand, chills food quickly. This means that the water within food crystallises very finely, and this reduces cell destruction, meaning that food retains its texture and flavour.

Be careful! Once food has been deep-frozen, it needs to be stored at a temperature which is lower or equal to  $-18^{\circ}\text{C}$ . This temperature must be maintained all the way through the factory until the supermarket freezer. Only this process can guarantee the quality of the preserved product. Hence, refrigerated vehicles are needed for the transportation of deep-frozen food.

**Keywords > Maintaining a low temperature**

## THE COLD CHAIN

You may be wondering if this is what is meant by the cold chain. You are right. The cold chain refers to the stages needed in the production of frozen food, such as **conditioning**, **transportation** and **storage**. Throughout these stages, food needs to be maintained below a certain temperature. Bacterial development can only be avoided by respecting the cold chain.

## WHY SHOULD WE NEVER REFREEZE FOOD?

You may be wondering about one last question: Why should we never refreeze food? The answer is linked to the cold chain. When this chain is broken, this means that the product has been exposed to higher temperatures than it should have been. This break in the chain leads to rapid bacterial development and the shelf life of the food is shortened. When food is thawed out, it may be very dangerous health-wise to refreeze it. As soon as food has thawed, certain germs can start to develop. If these germs are ingested, they can cause food poisoning. This is the case with salmonella, staphylococcus and listeria. This can be fatal for people with lowered immune defences such as babies, pregnant women and elderly or sick people. Never take the risk of refreezing food!

**Never take the risk of refreezing food!**

## 3.2.3 The cold chain

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What is the purpose of chilling food?

- To preserve it
- To cook it
- To purify it

---

Since when has chilling been widely used as a means to preserve food?

- Since the 17th century
- Since the 18th century
- Since the 19th century

---

Chilling makes it easier to...

- transport meat
- eat vegetables
- make bread

---

Which was the first country to use natural ice to refrigerate train carriages?

- Germany
- United States
- United Kingdom

---

The first refrigerated train carriages appeared before 1850.

- True
- False

---

When was artificial cold first created?

- In the mid 19th century
- In the late 19th century
- In the early 20th century

---

Which technique rapidly reduces the temperature of food?

- Freezing
- Deep freezing
- Sublimation

---

Once food has been deep frozen, it must remain below...

- 0°C
- 4°C
- 18°C

---

What are the different stages of the cold chain? Packaging...

- transportation, storage
- transportation, defrosting
- defrosting, storage

---

We can freeze food again after it has been defrosted.

- True
- False

## Answers

### What is the purpose of chilling food?

- To preserve it**  
*Well done! That's right.*
- To cook it**  
*Wrong! Try again!*
- To purify it**  
*Wrong! That's not the right answer.*

### Since when has chilling been widely used as a means to preserve food?

- Since the 17th century**  
*Wrong! It is much later than that.*
- Since the 18th century**  
*Wrong! It is later than that.*
- Since the 19th century**  
*Well done! That's right!*

### Chilling makes it easier to...

- transport meat**  
*Well done! Chilling meat enables us to transport it without it going off, even over long distances.*
- eat vegetables**  
*Wrong! Try again!*
- make bread**  
*Wrong! Heat is required to make bread.*

### Which was the first country to use natural ice to refrigerate train carriages?

- Germany**  
*Wrong! It is further west.*
- United States**  
*Well done! That's right.*
- United Kingdom**  
*Wrong! It is further west.*

### The first refrigerated train carriages appeared before 1850.

- True**  
*Wrong! It was a little later than that.*
- False**  
*Well done! It was in 1880.*

### When was artificial cold first created?

- In the mid 19th century**  
*Well done! That's right!*
- In the late 19th century**  
*Wrong! It was prior to that.*
- In the early 20th century**  
*Wrong! It was well before that.*

### Which technique rapidly reduces the temperature of food?

- Freezing**  
*Wrong! During freezing, the temperature of food is reduced slowly.*
- Deep freezing**  
*Well done! A rapid decrease in temperature ensures that water is finely crystallised, thus preserving texture and flavours.*
- Sublimation**  
*Wrong! Sublimation is the transformation of a substance directly from a solid to the gaseous phase, without passing through an intermediate liquid phase.*

### Once food has been deep frozen, it must remain below...

- 0°C**  
*Wrong! It's much lower than that.*
- 4°C**  
*Wrong! It is lower than that.*
- 18°C**  
*Well done! That's right.*

### What are the different stages of the cold chain? Packaging...

- transportation, storage**  
*Well done! That's right.*
- transportation, defrosting**  
*Wrong! Try again!*
- defrosting, storage**  
*Wrong! Try again!*

### We can freeze food again after it has been defrosted.

- True**  
*Wrong! That's not the correct answer.*
- False**  
*Well done! When frozen food is defrosted, bacteria multiply rapidly. To avoid food poisoning, defrosted food should not be frozen again.*