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CAS 137

O'Hara

22 November 2017

# From Bog Butter to Bagel Bites

When people look back on the history and consider the most important inventions, they usually mention the printing press, electricity, light, automobiles, or telephones. Unfortunately, they do not mention one of the most necessary and revolutionary inventions of all time: the refrigerator. It is the most used appliance in American homes, one of the only perks of on-campus housing, and the go-to place people visit when they are hungry, or just bored. The purpose of the refrigerator has been used since the dawn of civilization, especially in the far north and south, where people could cut and store ice or use naturally cold places to preserve their food. In the past, many other methods of food preservation had to be employed to ensure ample food stores during the winter months, such as canning, smoking and curing, drying, and fermenting. Even so, some of these methods were often ineffective, questionable, or not enough to sustain families. Especially in changing climates, having enough food depended wholly on weather and agricultural conditions, and the uncertainty made daily life about getting enough food. However, the invention and spread of the refrigerator in the 1800s completely changed the way people lived and ate, as well as the societal standards for food quality. It is also partially responsible for many technological advances, like computers. The refrigerator, which relies on relatively simple technology, allowed food to globalize, changed the standards of diet and food

production, and more recently has become the source of some negative environmental and health consequences. Without the refrigerator, modern society may not exist as it does now.

The refrigerator, which operates on a basic scientific concept, was invented during the nineteenth century, but only widely implemented as home refrigerators in the twentieth century. Scientifically, it relies on the evaporation and condensation of a coolant, which in the first refrigerators was usually ammonia, but that was later found to be toxic (Krasner-Khait). Essentially, a liquid is evaporated at a very low temperature within the refrigerator, to draw heat out of the surroundings and make it freezing (Bellis). Then, the liquid is recondensed outside of the refrigerator, which gives off heat (Bellis). This cycle is responsible for keeping refrigerators and freezers cool even in oppressive summer heat, and is also found on a smaller scale in most laptops. The coolant used in modern refrigerators is called HFC, which replaced Freon, since studies began to show how Freon's chlorofluorocarbons damaged the ozone layer (Bellis).

Before the first refrigerator was invented, William Cullen demonstrated the vaporization/condensation cycle in the 1700s, but he did not practically implement it ("History"). During this time, ice cutting and shipping was the primary source of refrigeration, and it was a huge but unsustainable industry, which spurred inventors to try their hand at refrigeration machines. The refrigerator officially made an appearance with Thomas Moore in 1803, and then Oliver Evans in 1805 (Krasner-Khait). These refrigerators were not anywhere close to the sleek steel behemoths lurking in kitchens; they looked more like everyday cabinets with complicated mechanisms within. The warm winters of the late 1800s advocated for the use of mechanical refrigeration, and also the advent of refrigerated train cars, which completely revolutionized the way people acquired groceries ("History"). These train cars essentially allowed for cities and

towns to be developed in remote areas like the West. Most industries found uses for refrigeration, from florists and munitions to metalworking and textiles (Krasner-Khait). The refrigerator was undoubtedly an integral part to American industry by 1900, and continued to gain momentum with the invention of home refrigerators, the kind usually seen in households today. By the 1940s, most American households had refrigerators, and today, more than 99.5% of American homes use personal refrigerators ("History").

With the ubiquity of refrigerators in train cars, grocery stores, and houses, food became globalized like it had never been before. The Columbian Exchange and various other imperialist ventures allowed for much agricultural exchange between the continents, but being able to transport perishable goods with refrigerator cars connected countries and cultures like never before. With greater variety and amount of food available, such as fruit or produce from tropical areas being transported to the north, food prices dropped as food availability soared (Dean). People no longer had to rely on local crops, seasonal changes, good weather, and ice deliveries to have enough food in their homes. Large-chain supermarkets began to take over smaller businesses, with their greater ability to acquire produce and spread it over the country with refrigerated trucks (Dean). As more and more immigrants flooded America, the face of American food culture also changed, with increasing Chinese, Mexican, Italian, and Japanese restaurants opening up. Acquiring ingredients or goods from overseas or across the continent required refrigerated trucks, ships, and planes. In the past, traders got by with huge chunks of ice and various preservation methods, but because of the spectacular engineering of the refrigerator and its efficiency, food could now travel the globe without losing its original freshness.

Especially as the public became more concerned with health and safety, the refrigerator aided in raising food safety standards and dietary nutrition standards. As refrigeration became widespread, the societal standard for fresh, delicious, food rose. Gone were the days of stale bread and salty meat; here to stay was fresh greens and fruit during any season, fresh, pre-cut meat from the butcher, and edible, unspoiled leftovers.

During this time, exposés like Upton Sinclair's *The Jungle* drew the nation's attention to unsanitary conditions in the meatpacking industry (Costly). With the passage of federal food safety laws and regulations, food became safer and cleaner. The refrigerator aided these standards to be met, especially since keeping foods cold suppresses the growth of bacteria, and in order to preserve meats without harmful chemicals, it must be kept cold (Dean). The meat-packing industry reluctantly began to use refrigerators in all of their plants by 1914, ensuring the quality and safety of their product (Krasner-Khait). The early 1900s saw the invention of freezers, and that further elevated standards, since frozen food could be kept for even longer, which allowed for countless possibilities of food transport and storage (Bellis). Additionally, the meals everyone ate became more nutritious, and overall health of the population rose. This time was host to many medical and health-related discoveries and advances, such as vaccines and antibiotics, but a general self-awareness about health and wellness took hold as well. People no longer suffered from conditions like scurvy or rickets in the first world, since they got their essential nutrients from their diets. With fewer chemicals in foods, and less contamination from the food industry, and a greater availability of nutrients, the average person was now healthier, could afford food, and did not have to worry about the source of their next meal.

The rest of the 1900s were dedicated to the improvement of refrigeration and freezing technology and its implementation in more and more industries. The mid-1900s saw the invention of automated defrost and ice machines, and the rise of home refrigerators. Unfortunately, the food industry, during this time, began to add in harmful chemical preservatives yet again. These preservatives generally helped the product to remain "fresh" for longer, especially in frozen foods, which increased their convenience and attractiveness to customers (Simone). The health craze of the late 1900's drew attention to sugar and fat, and chemical alternatives to both were developed. However, the solutions to these issues, such as trans fat and artificial sweeteners, did more harm than good. The societal desire to have convenient and healthier food, which arose with the invention and usage of the refrigerator, backfired. Preservatives can often lead to health issues such as breathing problems, heart damage, behavioral changes, and cancer (Simpson). Trans fat, as most people know today, spikes cholesterol and greatly increases chances of heart diseases, and aspartame, a common artificial sweetener, can lead to neurological damage and disorders (Simone). Another common preservative, MSG, has been linked to Huntingdon's, Parkinson's, and Alzheimer's (Simone). The general improvement in health brought on by the refrigerator has now been countered by the effects of preservatives and chemical additives in food, but both the refrigerator and these chemicals have the same goals in mind: preservation, health, and safety. Society and industry today has misused the refrigerator, deviating from its original intentions. The original shift from poor preservation practices to the wondrous convenience of the refrigerator has now regressed slightly, to harming health for the sake of convenience and taste.

The long-term effects of refrigeration have also negatively impacted the environment. As mentioned before, the use of Freon or chlorofluorocarbons as refrigerator coolants caused great damage to the ozone layer, even though Freon was discovered and used because it was a better alternative to the more dangerous chemicals used in early refrigerators ("History"). These days, energy efficient and eco-friendly fridges are replacing these environmentally damaging fridges, in hope to prevent any more adverse effects.

However, a newer and more concerning issue has cropped up: food waste. The statistics say it all: Americans throw away 38 million tons of food every year, which is the weight of 104 Empire State Buildings, the size of 365 college football stadiums, and worth about 218 billion dollars ("How"). However, the sheer volume and weight of the food waste pales in comparison to the fact that this wasted food accounts for 25% of freshwater usage in America and for 4.4 billion tons of carbon dioxide emissions ("How"). With the threat of climate change due to greenhouse gases and global warming, reducing emissions is more vital than ever.

Because so much food is now available, often refrigerators become overly stocked, and neglected foods will expire or go bad. This food is usually thrown away. After large meals or events like parties, the leftover food tends to be thrown away as well, instead of saved and stored for a future meal. This callous treatment of food, which centuries ago was precious and hard to come by, shows how different society is today. Because of the refrigerator and how it provides so much food, food is now being wasted, which affects the environment and the economy, and signifies an underlying problem in our own eating habits. Especially while people still starve in third-world countries, the careless way Americans treat food shows an underappreciation for the technology available to them, like the refrigerator.

The refrigerator undeniably changed almost every aspect of the human lifestyle. From its simplest, original purpose of preserving food, to its presence in nearly every manufacturing industry imaginable, the refrigerator has allowed for modern civilization to flourish and develop the way it has. It cleaved through the limitations of climate, distance, and seasons to provide nutritious food safely for all. Bern Nagengast refers to the refrigerator as "one of the greatest unsung inventions," and notes its reliability and inexpensiveness (Krasner-Khait). In fact, when comparing life two hundred years ago to life now, the two have almost nothing in common, in part or wholly due to the impact of refrigerators. Back then, the greatest threats to humanity were starvation or bacterial disease. Today, the greatest threats are obesity, heart disease, and global warming, which were all made possible by society's use of refrigerators. This may not exactly glorify the refrigerator, but at its core it was invented to make life better for all.

The invention of the refrigerator constitutes a paradigm shift not only due to its impact on lifestyle, but also its hidden effect on cultural values. Centuries ago, getting enough food and nutrients was priority. Society only sought to fulfill the first few steps of Maslow's Hierarchy of Needs, and only the wealthy and well-fed members of society gave much thought to philosophy, technology, and discovery. With the invention of the refrigeration, society became on more equal footing in terms of health, and finding a source of nutrition became less of a priority and more of a given. This allowed for society to focus on the later steps of the hierarchy, and become more self-actualized and advanced. Without the refrigerator, we may not have the countless discoveries or complex technology of today's modern society. The refrigerator helped society to focus on bettering itself and the world rather than simply trying to survive.

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