sizes. It is important to remember that once the packaging has been opened, its shelf life decreases. Many retailers off er large cans that can be bought at bulk pricing. These may save money, but it is best not to purchase a can so large that it cannot be consumed within a reasonable amount of time once opened.

STORAGE CONDITIONS AND SHELF LIFE

Dried eggs need to be stored in clean, cool, and dry conditions. It is important to keep the food in as cool and temperature as possible, without freezing. A temperature range of 50° to 60°F is ideal, but probably not possible for most of our home storage conditions.

The shelf life for optimal quality and nutrition of dried eggs is 1 to 2 years, depending on storage temperature, and if left unopened. Th is not the shelf life guidelines being promoted from the manufacturers. Until further research is completed, the indicators for quality and acceptability of dried eggs are not in favor of long-term storage (Broderick, 2005).

The e recommendation of many manufacturers for dried eggs is to refrigerate after opening. Many people opt to NOT refrigerate the remaining portion after opening, and the remainder should be stored in air tight, cool, dry conditions. One option would be to re-package in a smaller air tight container with an oxygen absorber.

NUTRITION

Dried eggs maintain a fair amount of nutrients after drying, but as with all stored foods, the nutrient retention lowers the longer the food is stored.

Dried eggs are a good source of ribofl avin, Vitamin B12, and phosphorus, and a very good source of protein and selenium.

ALLERGIES: Eggs are a common allergen, and dried eggs are no diff erent than fresh eggs in regards to allergies. Individuals with albumen/protein intolerance, or any other egg allergies, will not be able to use dried egg products.

DRIED EGG, WHOLE 85G (1 CUP SIFTED POWDER)

Energy	505 kcal
Carbohydrates	4 g
Sodium	445 mg
Fat	35 g
Protein	40 g
Cholesterol	1458 mg
Dietary Fiber	0.0

Percentages are relative to US recommendations for adults.
Nutrient data for this listing was provided by USDA SR-21.
Nutrition Data. Available at: **http://nutritiondata.self.com/facts/**

USE FROM STORAGE

Even though dried egg products, by law, will have been pasteurized (American Egg Board, n.d.), it is still recommended that dried eggs be thoroughly cooked before consumption. Reaching a cooking temperature of 160 °F is recommended for all egg products. It is important to remember that water will be necessary to reconstitute dried eggs. Follow specifi c reconstitution instructions on the products labeling. Once reconstituted, dried eggs can replace fresh eggs in any recipe. Dried eggs are a great addition to homemade dry mixes, such as muffi n mixes, cake mixes, and cookie mixes.

Dried, whole eggs (powdered whole egg solids): Dried egg powder can be added right to the other dry ingredients in a recipe and the liquid in the recipe adjusted according to the number of eggs, making this a very convenient approach to baking. The ey can also be added to water and reconstituted before baking, or as an egg dish, such as an omelet.

On average, 1 pound of powdered dried whole eggs when added to water and reconstituted, is the equivalent of about 4 pounds of fresh eggs. For most dry whole egg powders, the reconstitution ratio is around 2 tbsp dried whole egg powder to 4 tbsp water stirred together to equal one large egg.

Dried, whites (powdered egg whites): Powdered egg whites are a “no hassle” way to get egg whites without having to separate the yolk from the white, and they are already pasteurized. Many powdered egg white manufacturers add sodium lauryl sulfate (an emulsifier and stabilizer) to the eggs, in very small amounts, to make the egg white more stable when beating or whipping, making them even more advantageous to use. Also: 2 tsp sifted dry egg white powder + 2 tbsp warm water = 1 egg white.

Dried, yolks (powdered egg yolks): Because there are some recipes that require the egg yolk only, the dried yolk powder is an easy solution to separating the white from the yolk. The reconstitution of the egg powder will vary from manufacturer to manufacturer, but usually requires only a small amount of powder for a couple of teaspoons of water in order to make one yolk equivalent.

Once a package is opened, put the unused portion into a container that has a tight-fitting lid; cover the container and store it in the refrigerator or other cool, dry place. Unless kept tightly covered, dried egg takes up moisture from the air and may absorb flavors from other foods. If dried egg takes up moisture in storage, it becomes lumpy and will not mix readily with liquid (USDA, 1956).

GRAINS, LENTILS, & CORN STORAGE

IN THIS SECTION

WHEAT

INTRODUCTION

Wheat is the cornerstone of any emergency storage supply. Approximately 150 lbs will supply an adult for 1 year. A 3-week emergency supply is approximately 5 to 10 lbs per adult. Children under 8 years old would need half that amount. Wheat has been separated into several commercial classes based on color, hardness of the kernel, and growing season. The hard wheat classes are produced in areas that have dry-temperate climates. The kernels are usually small, red, and have a hard texture. The white wheat classes are usually produced in areas where winters are relatively mild and there is adequate moisture. White wheat kernels are more plump and larger than red wheat kernels and have a softer texture than hard wheat. Wheat kernels are also known as wheat “berries.”

Gluten is a wheat protein that gives fl our ability to retain gases produced by bread yeast to permit dough leavening. The hard red wheat varieties are high in gluten and make the best bread fl our. Gluten will degrade during storage and lose half its raising power aft er several years. Gluten can be purchased and added to poor quality fl our to produce better quality bread.

QUALITY & PURCHASE

Whole wheat berries can be purchased from a producer (farmer). The ese grains are almost always not cleaned and may have been bulk stored for many months. Grains may also be purchased from a processor. In this case they may have been cleaned and packaged. Do not purchase “seed” wheat for storage, since these products may have had toxic chemical treatments. Lastly, grains may be purchased, cleaned, and packaged from a retailer. Please call your county Extension Office for local outlets to purchase grains for storage.

WHEAT CHART

Variety	Protein	Best Use(s)
Hard red spring, hard red winter & hard white spring	11-15 percent	Bread fl our (high gluten)
Soft red winter, soft white winter & soft white spring	9-12 percent	Pasta, cake, biscuit, cracker, and pastry fl ours (low gluten)

PACKAGING

Store wheat in moisture-proof, food-grade packaging, such as Mylar® type bags, polyethylene bags, plastic buckets, or No. 10 cans. Be aware that rodents can chew through plastic bags. Wheat stored in ~10 pound bags is easy to manipulate, facilitates rotation, allows easy inspection of the grain, and compartmentalizes the grain so contamination of one lot does not contaminate large quantities of stored grain. Several bags can be placed inside a 5-gallon plastic bucket. It is not necessary to store wheat in the absence of oxygen unless insects are present.

STORAGE CONDITIONS & SHELF LIFE

Storage at 40-60° F is optimal for most home-stored grains, but is usually impractical in most homes except during winter months. Freezing or sub-zero temperatures do not damage stored grains. Storage at temperatures above 60° F causes a more rapid decline in seed viability (ability to germinate) but only a slightly faster loss in food value. A moisture level over 12 percent encourages mold growth and chemical degradation of all grains (barley, corn, millets, oats, rice, rye, sorghum, triticale, and wheat). Moisture above 12 percent may allow grains to start to respire, causing chemical degradation. Moisture above 15 percent will allow molds to grow. When the moisture reaches 20 percent, some bacteria can start to grow. The result is spoiled grain unfinished for use. Store containers off the fl oor, especially concrete fl oors. Concrete can wick moisture to stored containers very easily. Inspect grain of interest for insect activity. Treat for insects (see below) or discard affected lots.

Develop a program to utilize stored wheat on a regular basis. As stored wheat is used, replace it with containers of new wheat. Identify each container for variety and storage date. A good rule of thumb is to rotate wheat so that no stored product is older than 5 years. However, older stored wheat can make acceptable bread. A BYU study indicated that, regardless of headspace oxygen level, wheat packaged in No. 10 cans throughout 32 years of storage at ambient or cooler temperatures made bread acceptable to a majority of consumers.

INSECT CONTROL RECOMMENDATIONS

Method	Insect Control Recommendation
Insecticides	NOT RECOMMENDED, may be toxic if not correctly used.
Heating	NOT RECOMMENDED, too diffi cult to control the correct amount of heat to apply.
Bay leaves, nails or salt	NOT RECOMMENDED, these have absolutely no effect on insects or insect eggs.
Freezing	Freeze 1-15 lb bags of wheat for 2-3 days. Allow to warm for 24 hours. Freezing kills live pests, but not insect eggs. Multiple freezing and warming cycles may be needed to kill all insects and hatching eggs.
Vacuum sealing	Seal wheat in vacuum bags following vacuum sealer instructions. Regular polyethylene bags are not suitable to maintain a vacuum.
Dry ice (CO_2)	Place 3-4 inches of grain in the bottom of a 5-gallon plastic bucket. Use gloves when handling dry ice. Add 2-3 oz crushed dry ice. Fill the container to the full height. Place the lid on top slightly askew. Aft er 30 minutes, seal the lid air-tight. Dry ice will control most adult and larval insects present, but usually will not destroy eggs or pupae. If properly applied, a single treatment with dry ice is sufficient for long-term storage. Annual dry ice treatments are not necessary unless an infestation is recognized in the stored grain. Treating grain with dry ice does not reduce its ability to sprout or its food value.
Oxygen absorbers	Seal wheat in Mylar®-type bags or No. 10 cans along with appropriate number of oxygen absorber packets to create an oxygen-free atmosphere. Th is will kill adult insects and prevent larval insects from surviving.
No treatment	Choose insect-free sources for wheat. Store wheat in clean and dry containers impermeable to insects.

* Polyethylene bags and 5-gallon plastic buckets will not maintain an oxygen-free environment aft er dry ice or oxygen absorber treatment. Over time, oxygen will re-enter the container and this may allow larvae to grow to adults and cause an infestation during storage.

WHEAT NUTRITION

16g Serving	Hard Ed	Hard White	Soft White	Soft Red
Calories	57	53	53	53
Calories from fat	3	1.5	3	2
Fat	0.35	0.15	0.35	0.25
Total carbohydrates	11	11	11	12
Dietary fiber	1.7	2	2	2
Protein	2.3	2	2.3	1.7

NUTRITION

A typical serving of whole wheat is 16 grams. It is recommended that adults get at least three servings (48g) per day. Wheat grain is high in protein, fiber, calcium, and iron. Spouting wheat can obtain small amounts of vitamins A, B, C, and E not present in whole grain wheat. Other health claims for sprouted wheat remain unsubstantiated and lack science-based credibility.

ALLERGIES: Some people are allergic to wheat proteins. The allergy can cause a variety of symptoms due to an autoimmune infl ammation of the digestive system, such as diarrhea, bloating, constipation, and pain. Ulcerative colitis and irritable bowel syndrome may be caused by a food allergy. A severe allergy can result in life-threatening anaphylactic shock. In some, the allergy is life-long and non-reversible and is called “celiac's disease.” Other people may be simply “intolerant” to wheat. In this case they suffice from symptoms, but there is not an immune response. People with minor allergic reactions or intolerances can lose them over time. Always seek the advice of a physician to help with any allergies. All varieties of wheat and processed wheat (fl our, germ, cracked, etc.) contain the allergy proteins.

USE FROM STORAGE

Stored wheat can be ground for fl our, popped (like popcorn), steamed, or cracked and cooked. Some like to germinate and sprout wheat for wheat grass.

WHITE RICE

INTRODUCTION

White rice (a name given to milled raw rice that has had the hull, bran, and germ removed) is a popular commodity found on the shelves of many food storage programs. Once the milling is complete, the rice is then polished. You will oft see the term “polished rice” associated with white rice as well. This process does alter the color, fl avor, and even nutrition of the rice, but results in a bright white rice that stores better for a longer time. Because the nutrients have been altered, manufacturer's in the United States are required by law to add nutrients back into the rice. This is rice is then known as “enriched” white rice. By law, manufacturer's must enrich with vitamins B1, B3, as well as mineral iron.

White rice is inexpensive, stores easily, is easy to prepare, versatile, and well liked by most people. Th is makes it a great food storage commodity.

The general recommendation for the amount of grain to store is about 300 lbs per person, per year. Part of that grain is oft en rice. Depending on personal preference, about 25 to 60 lbs of rice should be stored per person.

QUALITY & PURCHASE

Purchase quality rice grains from a trusted source. Inspect rice for insects or discoloration, prior to preparing for home storage. Do not buy rice with any visible signs of insect infestation.

There are three main types of white rice in the United States: long, medium, and short grain. In addition, there are several types of specialty rice available.

Long Grain: Long grain polished rice is about three times longer than it is wide. Aft er cooking, it is fi rm, fl uff y, and not sticky.

Medium Grain: Medium grain polished rice is between two and three times longer than it is wide. Cooked US medium grain rice is soft,moist, and sticky in texture.

Short Grain: Short grain rice is less than two times longer than it is wide. Short grain rice is very sticky and sometimes called sushi rice.

Specialty Rices: These include Arborio, Basmati, Della or Dellmont, Japanese premium, Jasmine, Toro, and Waxy. Analyzes on which variety stores best have not been done.

PACKAGING

Packaging for white rice varies, depending on the vendor. Grocery stores will typically carry the rice in plastic bags in weights up to 4 or 5 pounds. Many food storage suppliers (not grocery stores) package rice in cans or well-sealed pouches,

both of varying sizes. Big box, or “warehouse” type stores, typically carry rice in 25-50 lbs paper or mesh bags.

For long-term storage, it is important that the packaging prevent moisture and rodent/insect damage. This means that many consumers may need to transfer the white rice they purchase into diff erent containers for storage.

Store rice in a tightly sealed container. Food safe plastic (PETE) containers, glass jars, No. 10 cans (commercial size) lined with a food-grade enamel lining and Mylar®®-type bags work best for long-term storage. Use food-safe oxygen absorbers available from food storage supply stores to preserve rice quality and protect from insect infestation. Yeah. 10 cans will hold about 5.7 lbs (2.6 kgs) of polished rice.

One recommendation, used by many when purchasing rice in smaller quantities, is to place the bags of rice in the freezer for three days. Th is will kill any insect (or insect larvae) that might be present. Once removed from the freezer allow the rice to come to room temperature before placing in an airtight container.

STORAGE CONDITIONS AND SHELF LIFE

White rice, like so many of our other food storage items, does best stored in clean, cool, and dry conditions. It is important to keep the food in as cool and temperature as possible, without freezing. A temperature range of 40° to 60° F is ideal, but probably not possible for most home storage conditions. These cool conditions insure longevity of overall quality and nutrient retention.

The shelf life for optimal quality and nutrition of white rice is 25-30 years, depending on storage temperature, and if sealed in containers using oxygen absorber packets.

NUTRITION

White rice is low in sodium, contains no cholesterol, and has no fat.

WHITE RICE, COOKED, LONG GRAIN-ENRICHED (1 CUP)

Energy	206 kcal
Carbohydrates	45 g
Sodium	2 mg
Fat	0.0 g
Protein	4 g
Cholesterol	0.0 mg
Dietary Fiber	1 g

Percentages are relative to US recommendations for adults.
Nutrient data for this listing was provided by USDA SR-21.
Nutrition Data. Available at: **http://nutritiondata.self.com/facts/**

ALLERGIES: The are no known common allergens associated with rice, making it a good grain choice for so many people with wheat intolerance, Celiac, or other similar concerns

USE FROM STORAGE

Use white rice within 1-2 years after opening.

White rice, for the majority of cooking needs, does not require washing before cooking. Recipes using other types of rice (such as Basmati or Japanese) may suggest not only washing, but also soaking. Soaking removes some of the extra stars.

The most common preparation for white rice is to boil/steam it.

Place one cup of white rice in 1 ½ cups-2 cups of boiling water in a saucepan. Place a lid on the pan and reduce heat to maintain a low boil for 20 minutes. Remove from heat and let the rice sit another 5 minutes. Remove lid and fluff the rice with a fork. Serve. For food safety, refrigerate unused cooked rice within 2 hours.

BROWN RICE

INTRODUCTION

Brown rice refers to rice that is almost completely intact. This means that it has not been polished and only the hull has been removed. The germ and branch of the rice remain, which is not the case in white rice. Th is makes brown rice a whole grain.

According to the 2010 US Dietary Guidelines for Americans and My Pyramid, the recommendation is to eat half our grains whole, or at least three servings a day of whole grains. Brown rice is considered a 100 percent whole grain food, and because of its mild nutty fl avor and chewiness, it has become a popular rice choice.

QUALITY & PURCHASE

Brown rice is available pre-packaged, in both large and small quantities, and loose from bins. Purchase quality rice from a reputable source. Inspect rice for insects or discoloration prior to preparing for home storage. Do not buy rice with any visible signs of insect infestation.

Like white rice, brown rice is classified in three main types according to its size and texture: long grain, medium grain, and short grain.

Long Grain: Long grain rice is a slender kernel about three to four times longer than it is wide. Long grain brown rice, when cooked, is usually more light and fl uff y than the other types, and is less sticky because the kernels stay more separated in cooking.

Medium Grain: This is kernel of brown rice is about two to three times longer than it is wide. The ese grains are moist and tender when cooked, but do have a tendency to stick together.

Short Grain: This type of brown rice has a short, almost round kernel, and looks a little plump. When cooked these grains are tender, but stick together, and are usually chewy.

Specialty Rices: These are red, black, and purple rice. Each of these has a little diff erent nutrient content and pigmentation, but all are very similar to brown rice in fiber.

The general recommendation for the amount of grains to store is about 300 lbs of grains per person/year. Part of that grain recommendation is oft en rice. The one challenge for long-term storage of brown rice is the shelf life…brown rice goes rancid quickly. (See Storage Conditions and Shelf Life Sections for more details.)

PACKAGING

Packaging for brown rice varies, depending on the vendor. Grocery stores will typically carry the rice pre-packaged in

plastic bags in weights up to 4 or 5 pounds. Many food storage suppliers of rice (not grocery stores) package rice in cans or well-sealed pouches, both of varying sizes.

For long-term storage it is important that the packaging must prevent moisture and rodent/insect damage. This means that many consumers may need to transfer the brown rice into diff containers for storage.

Store rice in a tightly sealed container. Food safe plastic (PETE) containers, glass jars, No. 10 cans (commercial size) lined with a food-grade enamel lining and Mylar®®-type bags work best for long-term storage. Use food-safe oxygen absorbers available from food storage supply stores to preserve rice quality and protect from insect infestation. A No. 10 can hold about 5.7 lbs (2.6 kgs) of polished or brown rice.

One recommendation used by many, when purchasing rice in smaller quantities, is to place the bags of rice in the freezer for 3 days. Th is will kill any insect (or insect larvae) that might be present.

STORAGE CONDITIONS AND SHELF LIFE

The e bran layer of brown rice contains a small amount of oil, and it is this oil that can go rancid in storage, so the shelf life for brown rice is only a few months. Brown rice should be stored in a dry, cool, and dark environment; preferably in temperatures of 40ÿ For or below to lengthen shelf life. Brown rice stored at 70ÿF (room temperature) can be stored for up to 6 months (Boyer, 2009). Another way to extend shelf life is to store the rice in the refrigerator or freezer.

NUTRITION

Brown rice has more fiber than white rice, due to the diff erence in the way the two are processed. Brown rice does not have the husk removed so the bran is kept intact, providing more fiber. White rice is polished, is either pre-cooked or parboiled, removing the bran.

Brown rice is the only form of rice that contains vitamin E. It also contains magnesium, manganese (88 percent of our daily value), selenium, and zinc. While white rice also contains these nutrients, brown rice has a higher amount.

BROWN RICE, COOKED, LONG GRAIN (1 CUP)

Energy	206 kcal
Carbohydrates	45 g
Sodium	2 mg
Fat	0.0 g
Protein	4 g
Cholesterol	0.0 g
Dietary Fiber	1 g

Percentages are relative to US recommendations for adults.
Nutrient data for this listing was provided by USDA SR-21.
Nutrition Data. Available at: **http://nutritiondata.self.com/facts/**

ALLERGIES: Like white rice, brown rice is gluten free, so is not a commonly allergenic food and is actually a great alternative for individuals with gluten or wheat allergies.

USE FROM STORAGE

Brown rice takes longer to cook than white rice. Plan on about 45-60 minutes. The bran layer hinders water from soaking into the kernel (Filipic, 2010). Brown rice can be used in place of white rice in most recipes and gives a nutty fl avor and more chewy texture.

Cooked rice is a potentially hazardous food and should be held at proper temperatures. Hot rice should be held at 135° F or above. Cool rice to 70° F within 2 hours; cool from 70º F to 40º F within an additional 4 hours. Cold rice should be held at 41° F or below (USDA, n.d.). In each storage container, limit the depth of rice to 2 inches and cover loosely in the refrigerator. Once the rice has cooled completely, seal the container (Crum, 2011). Large amounts of brown rice can be cooked, repackaged into smaller containers, and placed in a freezer for storage. These smaller amounts of rice can be easily reheated in the microwave (Dinstel, n.d.).

A rice cooker makes fl uff y brown rice. Fluff y brown rice can also be made in the oven if there is no rice cooker available (Crum, 2011).

OATS

INTRODUCTION

Oats have been around for hundreds of years, and while mostly used for animal feed even today, we have learned they are a remarkably healthy food. Oats are a hardy cereal grain able to withstand poor soil conditions in which other crops are unable to thrive. Oats get part of their distinctive flavor from the roasting process that they undergo aft er being harvested and cleaned. Although oats are then hulled, this process does not strip away their bran and germ, thus allowing them to retain a concentrated source of fiber and nutrients. Oats come in a variety of forms, each having benefits.

Oat groats: are the whole oat grain, with only the hard unpalatable outer hull removed. The ey are good for using as a breakfast cereal or for stuffing.

Steel-cut oats (also called Scotch or Irish oats): featuring a dense and chewy texture, are produced by running the groats through steel blades that thinly slices them.

Rolled oats: sometimes called old-fashioned oats, have a fl atter shape that is the result of the groats being lightly steamed and then rolled.

Quick-cooking oats: are the steel-cut oats that are processed like old-fashioned or rolled oats.

Instant oatmeal: produced by partially cooking the grains and then rolling them very thin. Oft times, sugar, salt, and other ingredients are added to make the finished product.

Oat bran: the outer layer of the grain that resides under the hull. While oat bran is found in rolled oats and steel-cut oats, it may also be purchased as a separate product that can be added to recipes or cooked to make a hot cereal.

Oat fl our: used in baking, it is oft times combined with wheat or other gluten-containing fl ours to make leavened bread.

QUALITY AND PURCHASE

Oats are generally available for purchase in prepackaged containers as well as bulk bins. Just as with any other food from bulk bins, make sure that the bins containing the oats are covered and free from debris. Whether purchasing oats in bulk or in a packaged container, make sure there is no evidence of moisture. As with all grains, store oats in airtight containers in a cool, dry, dark place, and protect oats from insects and rodents.

PACKAGING

Rolled oats (both regular and quick cooking) and steel cut oats are available in retail stores in sealed cans with oxygen removed. Oat groats and all other forms of oats may also come packaged in sturdy cardboard canisters, plastic bags, and heavy

burlap or brown paper bags. While these packages are fi ne for transporting, they are not intended to be sufficient protection from moisture, rodents, or other elements for long-term storage.

STORAGE CONDITIONS AND SHELF LIFE

Store oats in a cool, dark, dry place. Store them in airtight containers, which include Mylar® bags, food storage buckets, and sealed cans. Use oxygen absorber packets for long-term storage. Th is aids in extending shelf life, but more importantly keeps insects from surviving if present in the food.

Grains purchased for short-term storage can be heat/cold treated to help reduce the risk of insect infestation. Heat in a shallow pan in the oven at 120° F for 1 hour or at 130° F for 30 minutes, place in a deep freezer at 0° F for 4 days, or heat in the microwave for 5 minutes. However, seeds saved for planting may have the germination reduced by super heating, cooling, or microwave methods (Lyon, 1997).

Properly stored oats can have a shelf life of up to 30 years. A recent BYU study found that oats stored in No. 10 cans for up to 28 years had little change in the nutritional value and taste (McEwan, 2003).

Develop a plan to use stored oats on a regular basis. As stored oats are used, replace them with new purchases that have been labeled with the date of purchase. A good rule of thumb is to rotate oats regularly so that your stored oats do not get too old and your family gets used to eat them on a regular basis. Aft er opening, store oats and oatmeal in airtight containers.

NUTRITION

Oats have been referred to as a cleansing grain because of their relatively high soluble and insoluble fiber content. The ey cleanse both your blood and your intestinal track. Eating high-fiber foods, such as oats, can help reduce high cholesterol, can help reduce the risk of breast cancer, can help lower blood sugar for people with type II diabetes, and can help prevent heart disease. Antioxidant compounds unique to oats, called avenanthramides, help prevent free radicals from harmful LDL cholesterol, which can reduce the risk of cardiovascular disease.

Oats are a very good source of manganese and selenium, as well as a good source of dietary fiber, magnesium, zinc, and phosphorus. Oats are also rich in the B vitamins and contain the antioxidant E.

OATS, REGULAR AND QUICK, NOT FORTIFIED 1 CUP (81G)

Energy	307 kcal
Carbohydrates	56 g
Sodium	5 mg
Fat	5 g
Protein	11 g
Cholesterol	0.0 mg
Dietary Fiber	8 g

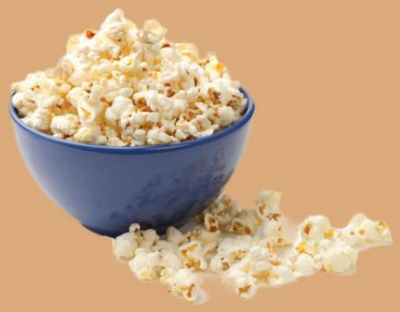
Percentages are relative to US recommendations for adults.
Nutrient data for this listing was provided by USDA SR-21.
Nutrition Data. Available at: **http://nutritiondata.self.com/facts/**

ALLERGIES: An oat allergy, commonly referred to as “oat sensitivity,” is a condition in which a person's body is intolerant to a protein found in oats called avena sativa. A person can be sensitive to the oat protein internally or externally. Oat allergies are relatively rare, and mostly occur in young children who oft en outgrow it.

USE FROM STORAGE

The cooking and use of oats from storage will depend on its form. Quick cooking oats can be cooked for cereal in just a couple of minutes, and even regular rolled oats only take about 10-15 minutes.

Rolled oats are oft en added to meat loaf to not only help serve as a binder, but as a meat extender. Oats can be ground to make oat fl our, which is good in baking muffins, cookies, and breads, but also as a thickener for soups, gravies, and stews. When used in baking, substitute 1/3 of the all purpose fl our called for in a recipe with the oat/oatmeal fl our (Dickson, 2008).



POPCORN

INTRODUCTION

Popcorn, a whole grain product, has been around for thousands of years. The oldest discovered ears of popcorn were in a bat cave west of central New Mexico in 1948, and they are more than 5,500 years old. Popcorn has also been excavated out of tombs in South America; and it was so well preserved, that it still popped. (Grain Information, 2012). During WWII popcorn was sold as a “candy” replacement for the lack of sugar in America. Today the average American will consume 49 quarts of popped corn a year (Popcorn Board, 2013).

QUALITY & PURCHASE

Popcorn is sold either as a plain or fl avor-added popped product or as an unpopped product in moisture-proof containers ranging from plastic bags and sealed jars to ready-to-use containers both for conventional and microwave popping. Popcorn flavor is enhanced to individual tastes with the addition of salt and butter (Carter, 1989).

According to the Gale Research of 1996 for encyclopedia.com, popcorn is the only corn that pops; it is not dried kernels of sweet corn. The are several popular varieties of popcorn and thousands of hybrids.

White hull-less and yellow hull-less are the varieties sold most commonly and packaged in microwave bags.

Rice popcorn is a variety with kernels that are pointed at both ends.

Pearl popcorn produces round, compact kernels.

Strawberry popcorn has tiny red ears that are shaped like strawberries and produce red kernels.

Black and blue varieties of popcorn have colored grains that pop as white kernels.

Rainbow or Calico corn has white, yellow, red, and blue kernels.

STORAGE CONDITIONS & SHELF LIFE

Store popcorn the same as most grains. Keep the kernels in a cool, dry location. Choose containers that protect the popcorn from insects, rodents, and moisture. When popcorn is stored in ideal conditions, it has an indefi nite shelf life. however, for best results, store in airtight containers and use within 1 year of purchase.

NUTRITION

Popcorn, a whole grain, can be a healthy snack. Popcorn contains substantial amounts of carbohydrates, fiber, many of the B vitamins, potassium, phosphorus, magnesium, iron, zinc, pantothenic acid, copper, manganese, linoleic acid,

polypheonls (anitoxidants), and all the essential amino acids. When air popped or served with light butter, it is low in calories and high in nutrition (McAdams, 2011).

POPCORN POPPED NUTRITION VALUE PER 100 g (3.5 oz)

Calories 1 cup	31
Carbohydrates	6 g
Sodium	1 mg
Fat	1 g
Protein	1 g
Sugars	1 mg
Dietary Fiber	1 g

Percentages are relative to US recommendations for adults. Nutrient data for this listing was provided by USDA SR-21. Nutrition Data. Available at: **http://nutritiondata.self.com/facts/snacks/5659/2**

USE FROM STORAGE

Popcorn can be ground into corn fl our, leaving the germ intact. The grinding process exposes the oils to air and they break down quickly. Only grind as much as you need for a recipe since ground popcorn does not store well (Rose, 2011).

Another use for popcorn is to make fl our out of popped kernels. To make this fl our, place popped popcorn into a blender and blend until it resembles fl our. A medium texture takes about 20 seconds, but continue blending 40 to 50 seconds for fi ne fl our. During World War II, when wheat was in short supply, people combined popcorn fl our (25 percent) and wheat fl our (75 percent) for use in their recipes.

Popcorn that pops poorly with many unpopped kernels is probably too dry and needs moisture. Start by adding one tablespoon of water to a quart of popcorn, mix well a couple of times that day, then aft er 2-3 days, try popping another sample. Continue this procedure until the popcorn pops well (Carter, 1989).

LENTILS

INTRODUCTION

Lentils are seeds of plants that are classifi ed as legumes. The ey grow in pods that contain round and oval small seeds. The ey are cousins to the bean plants. Lentils are a dried legume oft en called a pulse and are various colors of reds, yellows, with green and brown. Lentils are sold whole or oft en split in half.

Lentils are easy and quick to prepare (10-30 minutes to rehydrate). The ey absorb water quickly and also absorb the fl avors of seasonings and foods they are combined with. Th is makes lentils useful for soups, meats, breads, and other foods.

The origin of lentils is central Asia. Lentils are one of the earliest foods to be grown and harvested. Seeds as old as 8,000 years have been dated when found in archaeological digs in the Middle East. The leading producers of lentils today include India, Turkey, Canada, Syria, and China. Lentils are also grown in several northwestern states in America.

QUALITY & PURCHASE

Lentils are available year round in prepackaged containers and in bulk packaging. When purchasing, check containers for lack of evidence of insects or moisture. Lentils should be whole and not cracked, though they may be halved. Canned lentils have the same nutritional value as dry.

STORAGE CONDITIONS & SHELF LIFE

Lentils should be stored in airtight containers in cool, dark, dry conditions. For best color and fl avor, use lentils within 12 months. Storing lentils in temperatures within 50-70

degrees and in moisture-free areas will lengthen their shelf life. Research indicates that lentils are an ideal long-term (20-30 years) food storage product. Lentils may have an indefi nite shelf life, when stored in No. 10 cans or airtight containers and in ideal cool, dry, and dark conditions.

Cooked lentils will keep in the refrigerator in a sealed container for 3-5 days and may be frozen for 6 months.

NUTRITION

Lentils are high in nutritional value, low in fat, high in fiber, (both soluble and insoluble) and a good source of protein. They are also rich in folate and a good source of potassium. Legumes are recognized for their role in promoting good health. Researchers fi nd that they may reduce heart disease, diabetes, and some cancers.

LENTILS, RAW (DRY WEIGHT)
NUTRITION VALUE PER 100 g (3.5 oz)

Energy	353 kcal
Carbohydrates	60 g
Sugars	2 g
Fat	1 g
Protein	26 g
Folate	479 mg (120 percent)
Dietary Fiber	31 g

Percentages are relative to US recommendations for adults.
Nutrient data for this listing was provided by USDA SR-21.
Nutrition Data. Available at: **http://nutritiondata.self.com/facts/legumes-and-legume products/4439/2#ixzz2RW9oJQSc**

USE FROM STORAGE

Lentil preparation: Lentils do not need to be presoaked. Prior to cooking, spread lentils out and remove any stones or debris. Lentils can then be washed under cool water and put with water for cooking. Bring lentils to a boil, then simmer. Red lentils will rehydrate faster than green. Lentils require 10-30 minutes to rehydrate.

The following measurements will be helpful in rehydration, usage, and storage:

- 1 cup dry lentils + 1 cup water = 2 to 2 1/2 cups cooked
- 1 pound dried lentils = 2 1/4 cups dry
- 1 pound dried lentils = 5 cups cooked

Lentils can also be very useful when ground into fl our. They are gluten free.

Note: Lentils with husk remain whole with moderate cooking; lentils without husk tend to disintegrate into a thick purée, which makes quite interesting dishes.

BARLEY

INTRODUCTION

Barley is grown in the US and commonly used as a grain for human consumption, for malt in alcoholic beverages, and for animal feed. Whole grain barley consists of the bran, endosperm, and germ, which are still connected. Hulled and hullless are two forms of whole grain barley. Hulled barley goes through little processing with only the outer hull removed and is the most nutritious. With hulless barley, the hull is loosely connected and usually falls off aft er being harvested. Th is requires little to no processing to remove the outer hull, leaving most of the bran, endosperm, and germ still intact (Conway, 2006).

Varieties: The varieties of barley that can be purchased for human consumption are pearled barley, quick barley, barley fl our, barley fl akes, and barley grits. The process that pearled barley goes through consists of the removal of the inedible hull and bran layers; the quantity of layers removed determines if the pearled barley is regular, medium, fi ne, or baby pearl (Lemaux, 2007). This process causes the barley to lose a lot of nutrients; however, it cooks faster and the taste and texture is usually preferred (Beck, 2013). Quick barley is the instant form of pearled barley that is steamed before packaging, and it has the same nutritional content as pearled barley. Flour can be made from pearled grain through milling. Flakes are made from pearled barley but are steam rolled and dried. Grits are the small pieces of pearled barley.

QUALITY & PURCHASE

Barley can be purchased in the forms of pearled, hulled, and fl aked. Purchase barley that is clean, dry, free from debris,

and fresh smelling. Pearled barley may be the easiest form of barley to fi n.a. All varieties may be found at health food stores.

PACKAGING

Barley should be stored in food-grade packaging, that is moisture-proof, like Mylar® bags, polyethylene bags, plastic buckets, or No. 10 cans.

STORAGE CONDITIONS & SHELF LIFE

The recommended shelf life of barley is 2 years. Barley should be stored in temperatures below 60° F with moisture content of less than 12 percent (Barley Facts, 2007).
For a longer duration of storage, barley should be kept at even cooler temperatures and lower moisture content. A long-term shelf life would be for only 8 years because of the softness of the outer shell (Portela, 1999).

NUTRITION

Barley contains gluten, so it should be avoided by those individuals with celiac disease and gluten intolerance. In ¼ cup of uncooked pearl barley, there is on average 2.5 g of beta-

glucan soluble fiber; but individual barley labels should be referred to for specifi c soluble fiber contents (Barley Facts, 2007).

BARLEY NUTRITION

Calories (1 cup)	193
Carbohydrates	44 g
Sugars	0 g
Fat	2 g
Protein	4 g
Sodium	5 mg
Dietary Fiber	6 g

Percentages are relative to US recommendations for adults.
Nutrient data for this listing was provided by USDA SR-21.
Nutrition Data. Available at: http://nutritiondata.self.com/facts/cereal-grains-and-pasta/5680/2

ALLERGIES: Compared to oats and wheat, barley has a higher percentage of beta-glucan content because beta-glucan is throughout the whole barley kernel. The beta-glucan in other grains is only in the bran layer and is removed when the bran is removed. Even products that are refined, like barley fl our, contain beta-glucan (Conway, 2006).

Barley Nutrtion: Barley is high in fiber, selenium, iron, and niacin. Studies have shown that barley is more effective in lowering blood cholesterol than wheat or rice because of its beta-glucan content. For best health benefits from barley, 3 grams of beta-glucan should be consumed each day.

USE FROM STORAGE

Barley should be rinsed before cooking. Hulled barley will take longer to cook than pearled barley. Barley fl our can be combined with wheat fl our to make baked goods. It can't be substituted on its own, because it doesn't have a strong enough gluten content. Barley fl akes and cracked barley can be used for hot cereal. Barley can also be added to salads and stews.

QUINOA

INTRODUCTION

Quinoa originally came from the Andes Mountains of Bolivia, Chile, and Peru and is pronounced KEEN-WAH, known as Incan rice. Quinoa is in the same family as sugar and table beets and spinach (Oelke, 1992). Quinoa is known as a pseudocereal grain, because it produces fruits and seeds but is not of the grass family.

The are more than 120 diff erent varieties of quinoa, but the most commonly known types are white, brown or red, and black quinoa (Whole Grains Council, 2013). Quinoa has a reputation of being superior to other cereal grains because of its nutritional value and taste. Quinoa has a nutty fl avor and a fl uff y and chewy texture (Whole Grains Council, 2013).

QUALITY & PURCHASE

The quinoa seeds have a bitter taste that comes from the saponin in the outer coat, but that coat is removed before consumption by either rinsing or mechanically removed by manufacturers (Grain Information, 2012). Quinoa can be purchased at grocery stores, health food stores, and online.

STORAGE CONDITIONS & SHELF LIFE

There does not seem to be any specifi c temperature requirements for quinoa, but the USDA suggests the following guidelines for storing cereals: cereals should be stored at 50° F. for maximum shelf life, but 70° F is also acceptable for dry storage of most products (Department of California Education, 2013).

Quinoa is a soft grain with high amounts of polyunsaturated fat compared to other grains. Because of this, there is much speculation on how the fat affects the shelf life of quinoa because of lipid oxidation. It is believed that the high levels of vitamin E, an antioxidant in quinoa, may counteract the lipid oxidation; however, there is limited information on the shelf life and lipid oxidation of quinoa (Jancurova, 2009).

NUTRITION

Compared to other common grains like wheat, rice, corn, and barley, quinoa is higher in protein and fat content (Ng, 2003). The high fat content is due to the high amounts of the polyunsaturated fatty acid, linoleic acid, which is a health-promoting fatty acid.

All ten of the essential amino acids are found in quinoa. Amino acids are building blocks to proteins in the human body. Essential amino acids are those that can't be made in the body, so they have to be consumed through the diet. Because of the high essential amino acid content in quinoa, it can be compared to casein, the protein in milk. The amount of amino acids in quinoa is higher than other common cereals (Vega-Galvez, 2010).

QUINOA, COOKED
NUTRITION VALUE PER 185 g

Calories 1 cup	222
Carbohydrates	39 g
Sodium	2 g
Fat	4 g
Protein	8 g
Folate	479 mg (120 percent)
Dietary Fiber	5 g

Percentages are relative to US recommendations for adults. Nutrient data for this listing was provided by USDA SR-21. Nutrition Data. Available at: http://nutritiondata.self.com/facts/cereal-grains-and-pasta/10352/2

Quinoa is high in calcium, magnesium, iron, copper, and zinc; higher than most grain crops. However, the amount of mineral content depends on the soil that it is planted in. Some soils produce a higher mineral content. It is also high in vitamins C and E, thiamin, ribofl avin, and niacin (Vega-Galvez, 2010).

Quinoa is high in the polyunsaturated fatty acid, linoleic acid, which is an essential fatty acid, meaning that it can't be made in the body. Polyunsaturated fatty acids help to prevent cardiovascular disease and improve insulin sensitivity. It has a low glycemic index, which is a great alternative for those with diabetes (Vega-Galvez, 2010).

ALLERGIES: Quinoa is generally considered gluten-free. However, new research indicates that it may contain other protein properties that activate the immune system. So this may be one to avoid if you have celiac disease (American Journal of Clinical Nutrition, 2012).

USE FROM STORAGE

Quinoa can be toasted, used as a substitute for rice and other grains, or ground into fl our to make pasta, breads, pancakes, crackers, and other baked goods. Also, the seeds can be sprouted or popped like popcorn (Jancurova, 2009).

SPELT

INTRODUCTION

Spelt is a whole grain that comes from the wheat family. It has been around for thousands of years but was introduced to the United States in the 1890s. Its grain contains the bran, the outer covering of the kernel, the germ, which contains oil, and the endosperm, which is the starchy part of the kernel. Spelt is similar to wheat in taste and texture but has a sweeter and nuttier fl avor and is heavier and denser than wheat (Lamb, 2010). When it comes to identifying the diff erent varieties of spelt, there has been a lot of confusion because there are so many diff erent types and because the soil and the environment that it is grown in impacts its quality and profile (Roth, 2008) .

QUALITY & PURCHASE

When harvested, spelt stays attached to its protective covering, the hull, until right before milling. The hull protects against soil-borne pathogens (Wilson, 2008). Spelt can be purchased through organic and health food stores in bin containers or prepackaged.

STORAGE CONDITIONS & SHELF LIFE

Spelt is a hard grain much like winter wheat. It should be stored in a dry area with the moisture level no greater than 14 percent and a temperature below 55ÿ F. Spelt fl our should be refrigerated to preserve the nutritional value and freshness. If the temperature of the grain is kept below 55ÿ F., and in optimal conditions, spelt can be stored for up to 30 years (BYU study, 2008).

NUTRITION

The e nutrition of spelt is similar to wheat fl our except that spelt contains more ribofl avin and niacin (B vitamins) than wheat.

1 CUP UNCOOKED SPELT

Calories 174g	558
Carbohydrates	124 g
Sodium	14 mg
Fat	4 g
Protein	25 g
Sugars	12 g
Dietary Fiber	19 g

Percentages are relative to US recommendations for adults.
Nutrient data for this listing was provided by USDA SR-21. Nutrition Data. Available at: http://nutritiondata.self.com/facts/legumes-and-legumeproducts/4439/2#ixzz2RW9oJQSc

ALLERGIES: Because spelt contains gluten, individuals with celiac disease are not able to safely consume it. However, spelt may be an alternative to those allergic to wheat; but individuals should check with their physician fi rst before substituting it for wheat. Also, research has shown that spelt may be easier for humans to digest than wheat (Bastin, 2010).

USE FROM STORAGE

Spelt fl our can be used instead of, or in conjunction with, wheat fl our in recipes such as breads, pastas, cookies, crackers, cakes, muffi ns, and waffl es. Rolled or fl aked spelt can be cooked and eaten like a hot cereal.

SPLIT PEAS

INTRODUCTION

Dried peas, also known as pulses, are nutrition packed. Pulses are the dried seed from a plant grown from the legume family. Dried peas have been consumed since prehistoric times with the remains of peas being found at fossilized archaeological sites. The cultivation of dried peas dates back to 2,000 BC where they were consumed by the Chinese. Modern day split peas are thought to have originated from the fi eld pea, native to Europe and Asia. Dried peas were introduced to the Americas with the early colonists.

Dried peas are a starchy, hardy legume available year round. Dried peas are harvested from a fully mature peapod that has been dried. When the skin of the dried pea is removed, the seed splits.

QUALITY & PURCHASE

Two varieties of dried peas are available, green and yellow. Yellow peas have a milder fl avor than green peas which are richer and stronger.

Dried peas can be purchased as split or whole in prepackaged bags as well as in bulk containers. Choose peas that are free of cracks and debris.

STORAGE CONDITIONS & SHELF LIFE

Dried peas that are stored in the plastic bags they were purchased in will have a shelf life of only about 1 year. But if properly stored in an airtight sealed container with oxygen absorbers, the shelf-life can be extended to 20 years or more.

Dried peas need to be stored in cool, dark conditions to prevent them from losing their yellow and green colors and turning a light gray.

NUTRITION

Dried peas, like other legumes, are rich in soluble fiber and insoluble fiber. Soluble fiber forms a gel-like substance in the digestive tract that binds bile (which contains cholesterol) and carries it out of the body. Dried peas are a very good source of cholesterol-lowering soluble fiber (Bazzano et al., 2003).

Research studies have shown that insoluble fiber not only helps to increase stool bulk and prevent constipation, but also helps prevent digestive disorders like irritable bowel syndrome and diverticulitis (Liu, 2004). A single cup of cooked dried peas provides 65 percent of the daily value for fiber.

ALLERGIES: Not only can dried peas help lower cholesterol, they are also of special benefit in managing blood-sugar disorders since their high fiber content prevents blood sugar levels from rising rapidly after a meal (McIntosh and Miller, 2001).

DRIED PEAS RAW (DRY WEIGHT) NUTRITION VALUE PER 145 g (1 CUP)

Energy	376 kcal
Carbohydrates	21 g
Sugars	8 g
Fat	1 g
Protein	8 g
Folate	94.3 mcg
Dietary Fiber	7 g

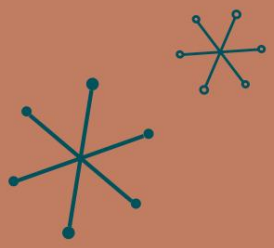
Percentages are relative to US recommendations for adults.
Nutrient data for this listing was provided by USDA SR-21.
Nutrition Data. Available at: **http://nutritiondata.self.com/facts/legumes-and-legume products/4439/2#ixzz2RW9oJQSc**

USE FROM STORAGE

Before using dried split peas, inspect and remove any debris or dirt. Split peas will not need to be presoaked like other dry legumes. Simply put peas into the soup or stew you are making and they will cook in a reasonable amount of time. To prepare split peas that are not part of a soup or stew, place the legumes in a saucepan using 3 cups of fresh water for each cup of peas. Bring to a boil, then reduce to a simmer and cover. Usually split peas only take about 30 minutes to cook. Foam may form during the first 15 minutes of cooking. It can simply be skimmed off .

Split peas may also be ground into pea fl our to use as the basis for some pea soup recipes. Th is allows the peas to cook faster and will thicken the soup as it cooks. Peas are an excellent protein substitute for egg products.

MISCELLANEOUS FOOD STORAGE



IN THIS SECTION

SUGARS

INTRODUCTION

Sugars are simple carbohydrates that provide an excellent source of calories for energy. Sugars also add the sweet taste to many of our most delicious foods. Sugar can be stored in dry form (crystals) or in a liquid form (syrup –including maple syrup). Sugar from beets or sugarcane (sucrose), corn (dextrose), and honey (fructose) are most commonly used for long-term food storage. The use of sugarcane for sugars dates back cultures BC Some of the earliest cultures grew the canes and squeezed the sweet juice from them aft er harvest. Even in those days, the juice was allowed to dry and was used as a solid. Centuries later the juice would be dried in a manner that resulted in crystals. Th ese crystals would store indefi nitely. Sugar beets are another source of sucrose. The sugar beet was named the historic state vegetable in Utah in 2002. From the 1880s until 1980, sugar beets have significantly contributed to the Utah economy.

QUALITY & PURCHASE

Pure cane or beet granulated sucrose (table sugar) stores the best. Powdered sugar is simply table sugar ground to a fi ner powder. It can be stored the same as granulated sugar. Brown sugar is either white sugar with caramel coloring or white sugar with some molasses residue. It oft en has a little higher moisture content than table sugar, making it sticky. Purchase top quality refined sugar from trusted commercial sources. Raw sugars and honey that are less “pure” will have a shorter quality shelf life. Commercial, fi ltered liquid honey will last the longest in storage. Select fi ltered, top quality syrups or honey for storage. Comb honey, unfi ltered honey, or raw sugar syrups do not store as well. Brown sugars that have natural moisture do not store as well long-term.

PACKAGING

Storage containers should be opaque, airtight, and moisture/odor proof. The typical retail paper package for crystal sugars is not suitable for long-term storage. Polyethylene bags, Mylar®-type bags, food-grade plastic buckets, glass canning jars, and No. 10 cans are all suitable for dry sugar storage. Glass canning jars and No. 10 cans work best for liquid syrups and honey. However, honey is acidic and can acquire a metallic taste from the metal can aft er many years of storage. The main metal in food cans is tin. Tin, when ingested in enough quantities, can cause gastric irritation, nausea, vomiting, abdominal discomfort, and diarrhea. However, these symptoms should not prevent someone from using metallic tasting sugars during emergency situations. However, if sugar acquires a metallic flavor during storage, it should be discarded and replaced (European Commission Health & Consumer Protection Directorate-General, 2001).

STORAGE CONDITIONS & SHELF LIFE

Store sugar in a cool, dry location (not the refrigerator). Moisture makes granulated sugar hard and lumpy. Once this happens, it creates problems in usage and there is no easy method to restore lumpy sugar. Always store all sugars in an odor-free area. Sugar can absorb strong odors – even through plastic packaging. Sugar syrups should not be allowed to get too hot or freeze – this will encourage crystallization. Heat will also darken color and alter flavor in sugar syrups and honey. Sugars are not susceptible to oxidation and therefore do not need oxygen absorbers. Some say that oxygen absorber use in granulated sugar promotes solidification.

Commercial sugars (granular, syrup, and honey) have an indefinite shelf life due to their resistance to microbial growth, including molds. These include dried sugar crystals, sugar syrups, honey, molasses, and pure maple syrup. However, commercial packaged sugars have a best-if-used by date of approximately 2 years for quality concerns. This is due to lumpiness or hardening in granulated sugars and crystallization of sugars in honey and syrup. Sugar is still safe to use even when lumps or crystals are present. The color and flavor of liquid sugars may change over time, but again, they remain safe to eat. Pure granulated sugars retain quality during storage the best. These may have an emergency storage shelf life from 2 to 10 years. After that time, they are usable, but flavor may be affected. Syrups do not store as well as the dried granulated sugars or honey. An estimated emergency shelf life is 2 to 5 years for molasses, corn syrup, and maple syrup.

NUTRITION

Sugars have approximately 15-20 calories per teaspoon, all in carbohydrates. Sugars will have no fat, cholesterol, fiber, vitamins, etc. Raw versions of sugars may have a few additional nutritive items, but nothing that would make them stand out.

ALLERGIES: Since sugars are carbohydrates and do not have protein, they do not cause any known allergies. They also do not cause any food intolerance.

USE FROM STORAGE

Once opened, sugars can easily be resealed or simply closed in their packaging. If granulated sugar is lumpy or hard, chop lumps in a food processor. If crystallization occurs in syrups or honey, re-liquefy them by placing the container in a larger container of hot water until the crystals have dissolved. Honey stored in metal containers that has become tainted with a metallic flavor can be consumed, but should be discarded and replaced when possible (Molan, 1992). There are some that advocate use of honey as a topical antibacterial agent. It does have antibacterial properties, but it also has properties that could promote bacterial infections and is not recommended for medical use.

VITAmINS

INTRODUCTION

Until the 18th century, the pirate and sailor diet included primarily dried meats and grains during extended voyages. In just a short period of time at sea, sailors would exhibit symptoms of malaise and lethargy (tiredness). Aft er 3 months of voyage, they would suff er gum disease, lose teeth, have open wounds, and suff er emotional distress. Not much to sing about anymore. Today, we know they were suffering from scurvy, an absence of ascorbic acid (vitamin C) in their diet.

Scurvy is a form of malnutrition. Malnutrition is the absence of one or more critical nutrition needs. In most cases malnutrition involves the absence of calories and protein (think starvation). However, in emergency food storage each and every food stored will have calories and many will have proteins. Other malnutrition causes are vitamin defi ciencies like scurvy, including beriberi, and pellagra. Beriberi is the absence of thiamine and pellagra is the absence of niacin. Beriberi is mostly seen in cultures that consumed only rice for their diet, while pellagra is mostly seen in cultures consuming only corn for their diet.

Th iamine and niacin are readily found in meats, poultry, seafood, eggs, grains, and legumes and in many of the foods stored for emergencies. And, as a consequence of beriberi and pellagra, white fl our is enriched with both thiamine and niacin to replace that lost by removing the bran. Therefore, the only potential malnutrition of someone living on emergency stores of food might be scurvy.

Vitamin C is found in many fruits, especially citrus. However, food processing and storage rapidly deteriorate vitamin C to an unusable form. The heat during canning or drying fruits can destroy 10-90 percent of vitamin C. More vitamin C can be lost during storage. For example dried apple rings lost approximately 40 percent ascorbic acid over 9 months stored at room temperature in foil pouches. For that reason vitamin C (ascorbic acid) is recommended as the main supplement to have in emergency food stores. Vitamin C can also be addressed by consuming sprouts of wheat or other grasses and in fresh (short-term stored) fruits.

QUALITY & PURCHASE

Purchase vitamin C from a reputable pharmacy or health food store. There is no real need for multi-vitamins, but they certainly cannot hurt. Avoid products making unverified claims such as “emergency storage” vitamins that last 10 years. Rarely are these claims backed with evidence and most likely they are no better than the normal generic brand.

PACKAGING

Storage containers should be opaque, airtight, and moisture/odor proof. Store vitamins in their original packaging, unless that packaging looks insufficient to preclude air and moisture. It would be acceptable to overpackage vitamins in a Mylar®-type bag for added protection from the elements.

STORAGE CONDITIONS & SHELF LIFE

Store vitamins in a cool, dry location (not the refrigerator or freezer). Moisture will find its way through packaging to accelerate the break-down of vitamins. Moisture is the biggest enemy of vitamin C stability during storage (Hiatt et al., 2010).

One manufacturer, that packages vitamin C in blister packs overwrapped in foil, has a 2-year shelf life. Another manufacturer that packages pills in a plastic bottle has just a 1-year shelf life indicated. Keep in mind that the shelf life mentioned is usually where the entire dose remains (essentially 100 percent). So, vitamin C is most likely still good beyond its expiration date, but the problem is that the true percentage of remaining vitamin C is unknown. But expired vitamin C is better than none at all. There are no toxic by-products or any reason not to consume out-of-date vitamin C.

NUTRITION

The Recommended Dietary Allowance (RDA) for Vitamin C is 90 mg/day for adult males and 75 mg/day for adult females. The maximum dose is 2,000 mg/day for adults (Bellows, et al., 2012).

ALLERGIES: There are no allergen ingredients in any standard vitamin formulation.

USE FROM STORAGE

Once opened, use vitamins from that container in a few weeks or months. If not needed, reseal vitamins in a manner to preclude oxygen, light, and moisture.

SPICES & SEASONINGS

INTRODUCTION

The addition of spices and seasonings to a long-term food storage program is to enhance palatability and edibility of food storage commodities. The ese ingredients added to cooking and baking allow us the option of variety and keeps food from being dull and mundane.

Spices are dried seeds, fruit, roots, or bark of plants that are used for fl avoring or coloring foods. Herbs are considered leafy parts of plants used for the same purpose (What's Cooking, n.d.). Most spices and herbs contain essential oils that are responsible for the fantastic flavors and aromas they provide. Spices are considered a comfort food with respect to an emergency food supply. The ey are certainly not a priority, but they can add needed fl avors and colors to foods during a long-term emergency replicating the foods cooked on a daily basis.

Two of the most basic seasonings are salt and pepper. Salt is not only used to enhance flavor, but in the case of yeast products, a necessary ingredient to help in proper dough formation.

QUALITY & PURCHASE

Purchase plain iodized salt for long-term storage. Spices and herbs are available in several forms: fresh, whole dried, or dried and ground. Only dried spices are used in emergency food storage. Purchase commercial grade spice at the grocery store. Keep in mind that spices on sale are oft en already old. Some spices can be stored in oil, but these products should be commercially purchased or be dried spices or herbs added to oils. Fresh spices or herbs added to oils may be a risk for botulism. Spices or herbs can be purchased as single varieties

or blends. Generally screw-cap containers are better than fl ip tops because they have a tighter seal (Spice Barn, 2009). Exotic seasonings are available at most international markets or can be ordered online.

PACKAGING

The majority of the active components of spices and herbs are plant oils. And as oils, they can oxidize to lose fl avor and color. Th us, spices and herbs should be stored in air tight containers, such as jars or Mylar®™-type foil bags. Oft the entire spice container can be sealed in jars or foil lined bags. Oxygen absorbers should be used to remove oxygen and prevent oxidation.

STORAGE CONDITIONS & SHELF LIFE

The best place to store spices or herbs is the freezer. Frozen spices or herbs will last considerably longer than those cold or at room temperature provided they are packaged to prevent moisture intrusion. Storing spices or herbs in a hot place will signifiably shorten their quality shelf life. Expect to reduce shelf life by at least 50 percent in hot environments (eg, garages or attics). Whole spices store best. Both ground spices and herbs

(whole or ground) have a much shorter shelf life. Ground spices are exposed to air and tend to lose their quality much faster than the whole variety. When possible, whole, intact seasoning should be purchased and crushed just prior to using. This is easily done with a mortar and pestle or everyday coffee grinder. Ground spices and herbs should be checked for freshness every year, at least once. If there is no apparent aroma then the seasoning should be replaced (Spice Barn, 2009).

Iodized salt and baking powder have an indefinite shelf life when kept free of moisture and contamination. Salt can absorb odors from the storage area, even through the packaging. Salt can be poured into a canning jar and sealed with oxygen absorbers.

NUTRITION

Table salt and seasoning salts will obviously contribute sodium to the diet.

ALLERGIES: Spices offer little nutritive value as a food source and allergies are generally rare. However, if they do occur they are usually fairly mild. Spices that cause the most reactions are mustard, coriander, caraway, fennel, paprika, and saffron. Less frequently do people react to onions, garlic, and chives (Foods Standards Agency, n.d.).
The US Food and Drug Administration does not regulate spices, meaning they are often not noted on food labels, making spices possibly the most difficult allergen to identify or avoid. According to rough estimates, spice allergy is responsible for 2 percent of food allergies. However, it is under-diagnosed, particularly due to the lack of reliable allergy skin tests or blood tests (ACAAI, 2012).

USE FROM STORAGE

Stored spices should be used exactly the same as spice for regular meals. If stored for long periods some of the potency may have diminished and adding more of that spice may compensate. Once opened and exposed to air, use the spice quickly within 1 to 4 months.

PROCESSES FOR HIGHER QUALITY STORED FOODS

IN THIS SECTION

INSECT TREATMENTS

INTRODUCTION

Indian meal moth, fl our beetles, saw-toothed grain beetles and carpet beetles are just some of the insects that can fi nd their way into food storage. There is nothing like the surprise of opening stored wheat to fi nd either an active infestation of weevils or the results of a past infestation. So the big question is what can be done? The fi rst and most important factor is to purchase high quality supplies that are not already infested with visible insects or their larvae. The second layer of defense is to choose one of the methods below.

OXYGEN ABSORBERS OR VACUUM SEALING (RECOMmENDED)

Some believe that oxygen absorbers are the easiest and most effective method for destroying insects in stored foods (Th ompson, 2009). Insects require oxygen to survive, so removing that oxygen is an effective insect prevention measure. The oxygen content must be lowered to below 1 percent and held it there for at least 12 days to kill insects in all stages (Th ompson, 2009). The same level of oxygen absorber packets for removal of oxygen is recommended for simultaneous destruction of insects. Basically, 100 cc packets will work for quarts and pint containers, 300 cc packets for gallon containers, and 500 cc packets for 5 gallon containers.

DRY ICE (RECOMmENDED)

Dry ice is frozen CO2. Treatment with dry ice may improve storage life of the grain, but it is not the most effective fumigant for controlling pests in stored grain. The main obstacle is ensuring that the food container is filled to 99 percent CO2 or more. At this level, all insects in all stages do not survive. If the percentage of CO2 is lower, the effectiveness of the treatment is reduced. A single treatment with dry ice may be sufficient for long-term storage. Annual dry ice treatments are not necessary unless an infestation is found in the stored grain.

HEATING

To control insects by heating, preheat oven to 130° F, place grain in a pan and heat for 30 minutes. Grain may also be placed in the microwave and heated on high for 10 minutes. Heating in the oven and the microwave at these settings will both prevent germination (Glogoza, 2005). Heating may work for some dried foods, but others may be changed organoleptically.

FREEZING (RECOMmENDED)

To control insects by freezing, 1-15 pounds of grain should be placed in a medium to heavy plastic bag or double bagged and stored in a freezer for 2 to 3 days. Eggs of insect pests, if present, will not be affected by freezing. Warm grain for 24 hours to allow some eggs to hatch. Repeat freezing cycle. Multiple freeze-thaw cycles may be required.

Diatomaceous Earth (DE) (not recommended)

The use of diatomaceous earth (DE) as an insecticide is a “commercial” alternative to traditional chemical insecticides. DE is of natural origin, leaves minimal residues on the product, and has low mammalian toxicity. DE “inactivates” the waterproof lipids of insects causing them to die through desiccation. While overall, DE's work well as an insecticide, specific DE formulations must be tested for activity in each product and against each insect species. In addition, while DE is not a chemical hazard, it is an inhalation hazard. Thus, the nature of the silica powder in DE determines the risk. This makes home insecticidal use impractical and potentially harmful (Subramanyam, 2000).

Garlic (not recommended)

Garlic has been studied as a method of insect control. Studies showed some success, but the insect destruction was not complete (Thompson, 2009). Garlic would naturally add flavor and odor to dried foods. For that reason it is not recommended.

Bay leaves, chewing gum (mint flavored or otherwise), 10-penny nails, or salt (not recommended)

These treatments are considered old wives tales and there is no research-based evidence that they work.

OXYGEN REMOVAL

INTRODUCTION

Oxygen is vital to life, but it can be quite destructive to some foods, especially over time. This is reaction in foods is called oxidation. In fats or oils, oxidation leads to rancidity. In other foods, oxidation destroys natural color (think browning of fresh cut apples). Nature protects many susceptible foods by providing a skin or peel. However, once we start to process these foods we oft remove their protections. Normal air is approximately 21 percent oxygen or O2. So storage of foods in air susceptible to oxidation results in poor quality storage over time. Oxygen removal from food storage containers is beneficial in several ways. It prevents food deterioration from oxidation, prevents growth of some microorganisms, and minimizes insects (Charles et al., 2006). When oxygen levels are maintained less than 1 percent, weevils, moths, and fl our beetles are eliminated (Broderick et al., 2010). The are several methods to remove oxygen from dry food packages.

VACUUm PACKAGING

Vacuum packaging is used to fi rst remove air from a package by a vacuum and then seal the bag before any air can re-enter. Generally, the longer the food storage shelf life, the greater the vacuum needed. No credible research could be found related to vacuum packaging machines and food storage. Vacuum food savers are usually priced in relation to their ability to create a better vacuum. Models costing less than $100 will suffice for shorter term food storage (1-2 years) and models costing $300-$1500 may be needed to remove enough oxygen for quality storage over 5-30 years.

Be aware that vacuum sealing high moisture foods and subsequent storage at room temperature can lead to deadly foodborne illnesses like botulism. Vacuum packaging for emergency storage should be confi ned to dried foods with no moisture or only small residual moisture (less than 10 percent).

mODIFIED ATmOSPHERE PACKAGING

This is a more complicated method of vacuum packaging where a replacement gas is added aft er vacuum removal of air. The replacement gas can be any mixture of nitrogen or carbon dioxide. Since this method requires specialized equipment not typically available to the consumer, it is not further discussed here. Like vacuum packaging, this method should only be used for completely dry foods for emergency food supplies.

OXYGEN ABSORBERS/SCAVENGERS

Oxygen absorbers are packages of iron powder or fi lings. The iron combines with residual moisture and oxygen in the food package to cause rusting or oxidation of the iron (Th ompson, 2009). In this event, the oxygen is bound to the iron and can

no longer oxidize foods. With the use of oxygen absorbers, oxygen is removed throughout the product and package being stored. Oxygen absorbers can reduce the levels of oxygen in packaging to less than 0.01 percent. However, this low oxygen level can only be maintained in packaging specifically designed to prevent the transfer of oxygen across it. Examples are metal cans or Mylar®-style metal foil-plastic bags.

Oxygen absorbers are not edible (Korn, 2011). In addition to this iron, most will contain some activated charcoal and salt. All of the ingredients are encased in a paper wrapper that can be placed in contact with foods.

Oxygen absorber packets are made for different moisture levels of foods. Select one made specifically for use in dried foods (assuming emergency food storage is mostly dried foods). Once purchased, store them unopened in their original package. Once opened they will begin absorbing oxygen in 20 minutes and quickly lose effectiveness and may be spent in approximately 5 hours (Thompson, 2009).

Packets usually come in cubic centimeter (cc) sizes of 100 cc, 300 cc, or 500 cc. These are meant to absorb oxygen in that number of cubic centimeters. Typically one 100 cc packet is used for pint or quart jars and small foil bags of the same size. One gallon foil-lined bags or No. 10 cans may need the 300 cc size. Five gallon buckets will need 500 cc. One 500 cc pack or 5 – 100 cc packs will work (Andrade et al., 2007). Keep in mind that plastic buckets will permit oxygen to penetrate over time (Thompson, 2009). So, oxygen absorbers will work to kill insects, but over time will not prevent food oxidation. Oxygen absorbers cannot be reused.

DRY ICE

Dry ice is frozen carbon dioxide. It is an economical method of removing oxygen for home stored foods. It may be used for grains, legume, powdered milk, etc. It is also used as an insect treatment. Place the dry ice in the bottom of the food storage container. Use 4 oz. (1/4 lb) of dry ice per 5 gallon bucket. Use dry ice that is not covered in frost as that adds moisture to the process. Put the lid loosely on the container, and it will take about 4 to 6 hours for the dry ice to sublimate the oxygen, then seal the lid completely. This process will prevent bugs or bacteria from growing. Use caution in handling dry ice.

HAND WARMERS

At least a few people are recommending hand warmers for oxygen absorption. They theorize that the ingredients are the same. However, this is akin to using a toilet plunger for a baseball bat. They both are wood. Yes, it will “technically” work somewhat, but it may not work well. And, the product is simply not made for that use.

MISCELLANEOUS EQUIPMENT

IN THIS SECTION

GRAIN MILLS

INTRODUCTION

Grains are excellent food for storage.The ey provide many essential nutrients and are a staple of a balanced diet. Grain fl our is used in preparing bread and countless other baked goods. The are a number of available types of grains that can be purchased and stored including wheat, oats, rye, and more. All of these grains need to be milled into fl our before they can be used for human consumption. Milled grains can be stored as fl our, but their shelf life is limited to under a year. As milled grains are stored, they are subject to loss of nutrient content and quality due to oxidation. Th is loss of quality will not occur if grains are stored unmilled in their whole kernel. Whole kernel grains can last for up to 25 years in a proper food storage container. A very long shelf life and maintained quality make whole kernel grains ideal food storage items. However, it does require the purchase of a personal grain mill.

QUALITY & PURCHASE

There are numerous types of personal grain mills available. Mainly, they are divided into two categories, electric and hand-powered. Th is should be taken into account since power may not be available in an emergency. Not only will hand-powered mills work without power, but they are also significantly more aff ordable. Consumers could easily spend much more on a grain mill than is necessary for their needs, but a reliable mill will be needed to provide adequate results. Therefore, consumers should be advised to shop around and fi nd a mill that fits their needs and budget. Oft en, personal grain mills have additional attachments that can be purchased to aid in preparing other types of foods. The essay should be considered if the attachment would provide aid in using other food storage items. Reasonable judgment is advised, as many of these

attachments are unnecessary, especially in an emergency. There are several types of grinders within the mills that are available. Mainly, they determine how fi ne or coarse the fl our product will be. Many health food and nutrition-based grocery stores carry grain mills. The are also available through many emergency preparedness stores and online suppliers.

USE FROM STORAGE

As mentioned earlier, grains store much better unmilled. The fore, grain from storage should be milled on an “as needed” basis. A person using a basic hand-powered grain mill has the ability of grinding at the rate of about 1/2 cup per minute. Th is is enough fl our to make a few loaves of bread in less than half an hour. Once purchased, it would be wise to become familiar with the grain mill before placing it in storage. It should be used before an emergency situation requires it.

CARE & MAINTENANCE

Care instructions provided by the manufacturer should be followed. Many grain mills cannot be washed without causing damage to the mill. It is important to become family with the proper care and handling of the machine before use.

HEAT (ImPULSE) SEALERS

INTRODUCTION

Heat sealing is accomplished by applying pressure and heat to melt fi lms and bond them together, providing a safe environment for the food contents inside (Kun-xiu & Sheng-hai, 2013).

When working with foil pouches, heat impulse sealers should be used. One theory of heat sealing is to use an iron to seal a package instead of a heat impulse sealer. However, using an iron will not seal the package properly, especially for powdered products (Korn, 2013).

Heat impulse sealers are available at most home storage centers.

CRITICAL FACTORS IN SEALING

Critical factors in heat sealing include the seal bar temperature, the pressure put on the seal by the sealing bars, and the time seal bar pressure is applied on the seal (FDA, 2009). Increasing seal pressure above the amount required will not improve the sealing and may result in thinning of fi lms at the seal (Baer et al., 1998). Instructions provided with the sealing unit should be followed.

It is important to make sure that the seal area is not contaminated with food, grease, moisture, or some other contaminant that may weaken or prevent the seal. The sealing surface should be smooth, parallel, and wrinkle and contaminant free.

SEALS TESTING

Aft er the process of sealing, look over seams to make sure they are adequate and don't have burn spots. If seams are burned, decrease the sealing setting by one quarter step. You should not be able to pull the seam apart. If seam can be pulled apart, the seam area of the machine may need to be cleaned or the pouch may be too full. If needed, the sealing setting may be increased by one quarter step, then reseal the pouch. Pressing on the package should not cause leaks (Kropf, 2004).

mETAL CAN SEALERS

INTRODUCTION

How does the metal can sealer work? Metal can sealers are used to attach the can lid to the can body through a double seam. The can sealer fi rst connects the lid edge, sealing material, and the can body by curling them together. Th is fi rst step needs to be done correctly because it cannot be corrected on the second step. The second step presses the layers of metal tightly together, resulting in a fl attened and smoothed seam. Both ends of the can should be fl at or slightly concave at the end of the process. Always follow instructions that come with the metal can sealer. This process makes the container air tight and protects the food items inside it from the entry of microorganisms during and aft er processing (Long, 2009).

Can size: The size of the can will determine the chuck size, position of seaming rollers, number, and size of spacers used with the turntable spring and turntable, and the turntable extension (University of Alaska, 2007).

BEFORE SEALING

Before sealing, check all cans, lids and sealing material. Cans or lids that are bent or dented are unacceptable for use. Make sure that the sealing material goes all the way around the lid sealing edge. Do not wash, boil, or heat lids before use. The sealing material is different on cans than it is on jars. Cans may be rinsed or wiped with a damp cloth if they are dusty (Long, 2009).

The type of food item being canned determines the method of processing. For instance, when canning meats, there are specific guidelines that need to be followed as far as processing before and after sealing. The University of Alaska Fairbanks: Cooperative Extension Service gives instructions on how to can meat and fish in cans at this website: **http://www.uaf.edu/ces/preservingalaskasbounty/**

Defects: Defects are possible during the sealing process. The y include: droop, vee, sharp seam, cut seam, incomplete seam, and false seam. Cans with defects should not be used because the defects can prevent the seam from being airtight, can promote spoilage, and may allow the botulism bacteria through the defective seam. Running the can through the sealer again will not fix the defects. If the can is defective, the contents must be put into a new can and reprocessed (Long, 2009).

Problems	Solutions
Turntable pressure too high	Decrease pressure - check number of spacers for can size
First seam roller operation too loose	Tighten
Food trapped in seam	Clean can edge before seaming
Defective cans	Inspect cans before use
First seam roller worn out	Replace seam roller
First/second seam roller operation too tight	Loosen
Worn seam rollers and/or chuck	Replace rollers and/or chuck
Seam rollers not rotating freely	Clean, oil, or repair seam rollers so they rotate freely
Oil or grease on seaming chuck or on turntable	Clean seaming chuck and/or turntable
Can be overfilled	Check fill of can

CHECKING THE CAN SEALER

To make sure that it is working properly, the metal can sealer can be tested. First put a small amount of cold water in a can and seal it. Th en pick up the can with tongs, with the newly sealed end up, and submerge the can in boiling water for 1-2 minutes. If there are air bubbles around the seam, it is not tight enough. To adjust the sealer, follow the manufacturer's instruction (Hughes, 2000).

WARNING

Cans that are leaking, bulging, badly dented, have a foul odor, or spurt liquid when opened should NEVER be used. These are all signs of botulism. Consuming even an extremely small amount of the botulism toxin can be deadly (FSIS, 1009).

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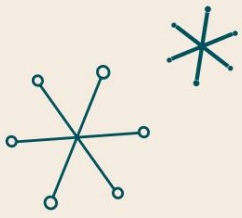

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