

AGE's Products List & Categories

Advanced Glycated End Products (AGEs) form when reducing sugars (such as glucose and fructose) react with proteins, lipids, and nucleic acids. AGEs are found in many food and beverage products, especially those that are high in sugar, fat, or both, and those that undergo high-heat cooking methods such as grilling, frying, roasting, or baking. Below is a detailed list of food and beverage products, categorized by their potential AGE content, ranging from low to high levels.

1. Low-AGE Food and Beverage Products

These foods are less likely to contain AGEs due to their natural composition and minimal or gentle cooking methods. Foods that undergo minimal processing and avoid high-heat cooking processes tend to form fewer AGEs.

Fresh Fruits and Vegetables (Unprocessed)

Examples: Apples, pears, strawberries, blueberries, raspberries, bananas, oranges, spinach, lettuce, kale, carrots, cucumbers, tomatoes, bell peppers, broccoli, cauliflower, sweet potatoes.

AGE Formation: These foods are naturally low in sugar and usually undergo minimal processing, resulting in low AGE formation. Steaming or boiling these vegetables at moderate temperatures further minimizes AGE development.

Whole Grains (Unprocessed)

Examples: Brown rice, quinoa, whole oats, barley, bulgur wheat, whole wheat bread, and whole-grain pasta.

AGE Formation: Whole grains are not only rich in fiber and nutrients but also contain lower levels of sugar than refined grains, reducing the potential for AGE formation. Steaming, boiling, or slow-cooking these grains does not contribute significantly to AGE formation compared to frying or roasting.

Lean Proteins (Unprocessed, Lightly Cooked)

Examples: Fresh fish (e.g., salmon, trout), chicken breast, turkey breast, tofu, lean cuts of

beef (e.g., sirloin), pork (e.g., tenderloin), and shellfish (e.g., shrimp, crab).

AGE Formation: These proteins are low in sugars and fats, so they form fewer AGEs. When boiled, steamed, or poached, these proteins undergo minimal Maillard reaction, resulting in low AGE content.

Legumes and Pulses (Unprocessed)

Examples: Chickpeas, lentils, black beans, kidney beans, soybeans, peas, and fava beans.

AGE Formation: These plant-based proteins are nutrient-dense, low in sugar, and high in fiber. Cooking legumes at moderate temperatures (e.g., boiling or slow cooking) avoids high-AGE formation. They also have antioxidants that may help counteract AGE effects.

2. High-AGE Food and Beverage Products

These foods and beverages tend to be processed or ultra-processed, high in sugar and fat, and subject to high-heat cooking methods like frying, grilling, or roasting, all of which promote AGE formation.

A. Packaged and Ultra-Processed Foods

Snack Foods (Chips, Crackers, Cookies, and Baked Snacks)

Examples: Potato chips, tortilla chips, pretzels, commercial cookies, crackers (e.g., Ritz, Saltines), and puffed rice snacks.

AGE Formation: These snacks are often fried or baked at high temperatures, contributing to the Maillard reaction, which increases AGE content. The high sugar, fat, and refined flour content also enhance AGE formation.

Processed Meats

Examples: Hot dogs, sausages, bacon, deli meats (salami, ham, turkey slices, bologna), pepperoni, jerky.

AGE Formation: These meats are cured with sugars, salted, smoked, or cooked at high temperatures, all of which encourage the formation of AGEs. Smoking and grilling processed meats can also further increase AGE levels.

Packaged Breakfast Cereals

Examples: Frosted cereals (e.g., Frosted Flakes, Cocoa Pebbles), instant oatmeal (e.g., Quaker Instant Oats), granola bars (e.g., Nutri-Grain, Nature Valley), and some muesli.

AGE Formation: The roasting and baking processes used to prepare many breakfast cereals create AGEs, especially in sugary cereals. Additionally, sugary granola bars and pre-sweetened oatmeal packets are subject to AGE formation.

Baked Goods (Cakes, Pastries, Bread)

Examples: Commercial cakes, muffins, pastries (e.g., croissants, Danish pastries), doughnuts, cookies, packaged bread (e.g., white bread, bagels, rolls), pizza dough.

AGE Formation: These items are typically baked at high temperatures and are high in refined sugars and fats, leading to significant AGE formation. The caramelization of sugars during baking contributes to AGE accumulation.

Candy and Chocolate

Examples: Caramels, milk and white chocolate bars (e.g., Hershey's, Mars), gummies, licorice, hard candies, chocolate-covered nuts.

AGE Formation: High sugar content, especially in candies and milk chocolates, coupled with the heating processes used in their preparation, leads to the formation of AGEs. Candies like caramels, which are created by heating sugar, are particularly high in AGEs.

Frozen Foods

Examples: Frozen pizza (e.g., DiGiorno, Totino's), frozen meals (e.g., Hungry-Man, Marie Callender's), frozen French fries, frozen chicken tenders, frozen waffles.

AGE Formation: These foods are often pre-cooked or deep-fried before freezing, and they are frequently baked at high temperatures in an oven. The combination of high sugar and fat content further increases AGE formation when reheated.

Sugar-Sweetened Beverages

Examples: Regular sodas (e.g., Coca-Cola, Pepsi), sweetened iced tea, fruit juices with added sugar (e.g., SunnyD, Minute Maid), energy drinks (e.g., Red Bull, Monster), sweetened coffee beverages.

AGE Formation: Beverages like sodas and energy drinks contain high amounts of fructose or glucose, which accelerates the formation of AGEs. Prolonged consumption can contribute significantly to AGE buildup in the body.

Canned Foods (Especially Sweetened or Processed)

Examples: Canned fruits in syrup, canned vegetables (e.g., baked beans, peas, sweetcorn), ready-to-eat canned meals (e.g., canned chili, spaghetti), and canned soups (e.g., Campbell's).

AGE Formation: Canned foods undergo high-temperature cooking during processing, and sweetened canned fruits especially increase AGE content due to the added sugar. Many canned soups and meals are cooked with sugars and fats, which contribute to AGE formation.

B. Fast Food Industry Products

Fast food outlets are notorious for using high-heat cooking methods such as deep frying, grilling, and baking, all of which contribute to AGE formation. Here are examples of high-AGE products from major fast food chains:

Fried Foods

Examples: French fries, chicken nuggets, fried chicken (e.g., McDonald's, KFC, Popeyes), onion rings, fried fish (e.g., Long John Silver's).

AGE Formation: Deep frying, especially at high temperatures, results in the Maillard reaction, which forms AGEs on the surface of fried foods. The oils used in frying can also undergo oxidation, which exacerbates AGE formation.

Grilled Meats

Examples: Burgers (e.g., McDonald's Big Mac, Burger King Whopper), grilled chicken sandwiches, grilled steaks (e.g., from Outback Steakhouse), and barbecued chicken.

AGE Formation: Grilling or barbecuing meats exposes them to high heat, leading to surface browning and the formation of AGEs. Meat proteins and sugars react when grilled, causing AGE accumulation, particularly in fatty meats.

Pizza

Examples: Pizzas from chains like Domino's, Pizza Hut, Papa John's, Little Caesars, and frozen pizza brands (e.g., Red Baron, DiGiorno).

AGE Formation: Pizza dough is typically baked at high temperatures. The cheese and meats, such as pepperoni and sausage, are also cooked at high heat, contributing to AGE formation. The high fat and carbohydrate content also promotes AGE buildup.

Breakfast Items

Examples: Pancakes, waffles (e.g., from IHOP, Denny's), breakfast sandwiches (e.g., McDonald's Egg McMuffin), hash browns, and breakfast burritos.

AGE Formation: Many of these items are fried, grilled, or baked at high temperatures. Additionally, many contain significant sugar (in syrup or pastries) and fat, which contributes to AGE formation.

Sandwiches and Wraps

Examples: Fast food sandwiches (e.g., McDonald's McChicken, Subway subs, Chick-fil-A sandwiches), wraps (e.g., Taco Bell's Chicken Caesar Wrap, Chipotle burritos), and paninis.

AGE Formation: Sandwiches and wraps often contain refined grains and are either toasted, grilled, or fried, which increases AGE content. The high fat and sugar content in sauces and fillings further contribute to AGE accumulation.

3. Food and Beverage Categories Contributing to High AGE Levels

In addition to the specific products listed, there are certain food categories that are more likely to contain high levels of AGEs due to their ingredients and cooking methods.

Fried Foods

AGE Formation: Frying at high temperatures (above 170°C) accelerates the Maillard reaction, forming AGEs. Common examples include French fries, fried chicken, fried snacks (chips, crackers), and fast food fried products.

Grilled, Roasted, or Barbecued Foods

AGE Formation: Grilling, roasting, and barbecuing expose foods (particularly meats) to high direct heat, which causes browning and the formation of AGEs. Foods like grilled steaks,

burgers, chicken, and roasted vegetables can form substantial AGEs when prepared this way.

High-Sugar Foods and Beverages

AGE Formation: Added sugars like glucose, fructose, and sucrose react with proteins and fats to create AGEs. Soft drinks, pastries, and candy with high sugar content are particularly prone to producing AGEs during cooking or digestion.

High-Fat, Processed Foods

AGE Formation: Foods that are high in fats, especially trans fats and saturated fats, such as deep-fried foods, chips, and fatty processed meats, are more likely to form AGEs. Additionally, these fats can oxidize, further promoting AGE production.

Key Factors Influencing AGE Levels in Foods

Cooking Method: High-heat methods like frying, grilling, and roasting significantly increase AGE formation compared to steaming, boiling, or poaching.

Sugar Content: Foods with added sugars, such as baked goods, candies, and sweetened beverages, significantly increase AGE production.

Fat Content: Foods high in fat, particularly processed fats like trans fats, contribute to AGE formation when exposed to heat.

Protein Content: Animal-based proteins, particularly meats, are more likely to undergo AGE formation, especially when cooked at high temperatures.

Summary

Low-AGE foods: Fresh fruits, vegetables, whole grains, legumes, and lightly cooked lean proteins are naturally low in AGEs.

High-AGE foods: Ultra-processed foods like snacks, candy, packaged meats, sugary beverages, and fast food items (fried, grilled, or baked) contain higher AGE levels.

Key Food Categories: Fried foods, grilled or roasted meats, high-sugar foods, and high-fat processed foods are major contributors to AGE levels.

This detailed list provides a comprehensive understanding of which foods and beverages, both processed and natural, contain varying levels of AGEs, offering insights into how diet impacts health in relation to AGEs.