
PULSES: THE HEART OF HEALTHY FOOD
DRY PEAS • LENTILS • CHICKPEAS

pulses

HAVE BEEN PART OF THE WORLD'S CUISINE FOR CENTURIES, dating back to the exotic spice trading days. But the ancients who first cultivated these soil-enriching crops as early as 6,000 B.C. wouldn't have guessed they were growing the world's first superfood. Pulses are the nutritionally-packed seeds of legumes and include dry peas, lentils and chickpeas. Today they continue to form the foundation of healthy diets in the Mediterranean, India, Africa, Australia, the Middle East and South America.

Today there's a gastronomical movement that is putting pulses on the American plate to meet growing consumer desires for healthier food that is both adventurous and familiar. Naturally high in protein and fiber, pulses are also packed with complex carbohydrates, antioxidants, vitamins, and minerals like calcium, iron, zinc, folate, potassium and magnesium. Research has confirmed that regular consumption of pulses reduces the risk of chronic diseases such as heart disease, diabetes and certain cancers and may even help combat obesity. But Americans are quite good at snubbing healthy choices if it means sacrificing the fun and flavor of food. Pulses provide a way to have it all.

Bringing the Mediterranean Diet home. The flavor profile of pulses is distinct, yet neutral enough to be exceedingly flexible—a true chameleon of foods. They perfectly adopt the flavor intention of the creative cook, be that sweet, savory or spicy. That also makes them a valuable R&D tool in the effort to put a healthy face on old favorites—from french fries to cereal, pasta to pizza crust—and still mirror traditional expectations of taste and texture.

What's more, pulses offer a way to address the growing demand for foods that fit special diets. Vegetarians, people with diabetes and celiac disease and the millions of Americans allergic to the top eight (milk, wheat, soy, egg, treenut, peanut, fish and shellfish) want more nutritious choices. Pulses deliver. Gluten-free, with high quality vegetarian protein, chickpeas, lentils and dry peas are low allergen and low-glycemic ingredients. Product innovators have a plethora

"IF YOU CAN LOOK INTO THE SEEDS OF TIME,
AND SAY WHICH GRAINS WILL GROW AND WHICH WILL NOT..."
— WILLIAM SHAKESPEARE

of pulse products to choose from: Use these powerful precooked seeds ground into flour or whole or enlist a component in the form of a starch, fiber or protein concentrate or isolate.

FIVE-STAR CULINARY TO THE CORNER DINER

There's no way around the obvious: Healthier diets dictate a change in ingredients. But whether you're trying to satisfy an adventurous palate or match familiar expectations of taste and texture, pulses can help meet the challenge of better nutrition.

WHAT STARTS AT THE CIA WHEN A WORLD-CLASS CHEF CREATES CHICKPEA FRITTERS WITH ROMESCO SAUCE EVENTUALLY RESULTS IN A HEALTHIER, PULSE-FORTIFIED PIZZA CRUST AT THE LOCAL QUICK-SERVE RESTAURANT (QSR).

U.S. culinary trends take root at white tablecloth restaurants then trickle down through the chains and other volume food service establishments. Chefs from these operations are influenced from events like the World of Healthy Flavors leadership retreat hosted by the Culinary Institute of America (CIA). With Chinese, Mexican and Italian fare now mainstream in America, classically-trained chefs at their Greystone, CA, headquarters stand ready to take Asian, Latin and Mediterranean cuisine to the next level. Of late, they've been highlighting the "healthy magic" in dry peas, lentils and chickpeas and the exciting potential of pulses for product innovation.

Great culinary history. Americans are more adventurous eaters today, growing in their understanding and appreciation for world-wide gastronomy and flavor profiles. With Old World flavors and textures again fashionable, chefs are rediscovering chickpeas, lentils and peas in classical Mediterranean dishes and whenever the influence is European, Middle Eastern, Latin, African or South-American.

"Feel good" story. Not only does the intrigue of exotic flavors and textures have fresh appeal, but so does the pulse story. Americans don't want to feel guilty about enjoying a great dining experience. Pulses are "feel good" ingredients, sourced from sustainable, soil-enriching legumes that pack a nutritional punch stronger than soybeans or whole grains. A fantastic source of high quality plant protein, pulses also help chefs meet the growing demand for gluten-free, low-allergen or vegetarian meals without resorting to highly processed protein or fiber additives.

Beyond Soup. Healthy Mediterranean foods needn't taste foreign, though. Pulses have the flexibility to help translate Mediterranean cuisine into American menu items and retail products.

TOP 10 REASONS TO USE PEAS, LENTILS AND CHICKPEAS IN MENU R&D AND PRODUCT INNOVATION

1. EXCELLENT SOURCES OF FIBER.
2. GOOD SOURCES OF PROTEIN.
3. PEAS AND LENTILS ARE FAT-FREE, CHICKPEAS ARE LOW FAT.
4. PEAS AND LENTILS ARE SODIUM-FREE, CHICKPEAS ARE VERY LOW SODIUM.
5. GOOD SOURCES OF IRON.
6. EXCELLENT SOURCES OF FOLATE.
7. LENTILS ARE A GOOD SOURCE OF POTASSIUM.
8. LOW GLYCEMIC INDEX/LOAD INGREDIENTS.
9. GLUTEN-FREE.
10. RICH CULINARY HISTORY; FOUND IN SO MANY FLAVORFUL, CRAVEABLE FOODS.

CULINARY TIPS

- Lightly dust a chicken breast with chickpea flour to give it a beautiful pan-seared crust with just the right hint of nuttiness and gorgeous color.
- Mix a pulse flour (lentil, pea or chickpea) with butter to make a flavorful roux to thicken a sauce or soup.
- Sauté chickpeas with heirloom tomatoes and pancetta and serve with a basil chiffonade.
- Stuff a squash or game hen with red lentils, sausage, garlic and onion.
- Serve up a main course salad by topping a colorful array of cool lentils with shallots, olives and lemon zest. Move over chicken breast—they're also a perfect protein option to the menu's mixed green and goat cheese salad.
- Add lentils to meatloaf. Or, crush them to make a healthy breading.
- Offer hummus or seasoned and sauced lentils as a baked potato topping in place of sour cream.
- Puree cooked yellow split peas, seasoned with oregano and red wine vinegar (the Greeks call this fava) and spread it on bread or thin into soup.
- Send the nutrition and flavor profile of your soups and stews through the roof by making pulses do double duty. Use chickpeas, lentils or split peas as a whole ingredient and puree some as part of the thickening agent.
- Keep that familiar crunch but add more healthy color to salads by replacing bread croutons with the delicious crispness of roasted peas and lentils.
- Try a hard-to-resist yet gluten-free treat of fried chickpea chips. Press cooked chickpeas flat and dust in chickpea flour, then fry deliciously crisp to add a great texture element to a special dish or salad.
- Use cooked green lentils to provide a satisfying protein punch to a thyme, cumin and garlic-seasoned sauté of spinach, onion and a rainbow of bell peppers. (This colorful veggie dish delivers 8g of protein, 11g of fiber and 150% DV of Vitamin C in a 220-calorie serving. Find this and other fabulous pulse recipes at *www.northernpulse.com*.)

MOVE OVER SWEET POTATO FRIES; COOKED LENTILS AND YELLOW PEAS ARE POISED TO BOOT THE POTATO COMPLETELY OUT OF THE FRENCH FRY. Sensory panelists liked the crunchy exterior and core texture of these "pulse" fries as well as conventional fries. With an excellent source of fiber and a good source of protein label, this product is perfect for the bistro and sports bar as well as QSR and the grocery frozen food aisle (see recipe section for formula).

Be it sweet or savory, they have an affinity for herbs and spice. They also handle temperature well, are as delicious cool as served warm, and offer a full range of textures from the crunch of a roasted chickpea to the rich smoothness of a lentil or pea puree. Chefs and product innovators will find it easy to use pulses with signature flavors and concepts to make approachable versions of traditional Old World dishes. Here are some general suggestions from the culinary experts:

- Experiment with pulses as a major component of the dish, rather than just an addition. Great as a major salad item, they can also carry a side dish or serve as a center-of-plate featured ingredient.
- Flaunt the flavor. Pulses deliver great nuttiness and complexity yet adapt well to herbs, heat and spice, rich sauces as well as light sauces, vinaigrettes, sherries and olive oils.
- Routinely reach for a pulse when creating soups, salads, purees and braises. They add a flavor component as well as texture and are a natural thickener.
- Discover the versatility of pulse flours. Beyond bakery goods and pastas, they deliciously dust a protein, flavor or thicken a sauce, or when flaked, create a crust no breadcrumb can match.
- Create healthier menu choices by using a pulse to add a perfect source of protein to a vegetarian dish or balance the nutrition and appeal of the overall meal.
- Pump up presentation with pulses by enlisting their amazing array of colors, shapes and textures.

OLD WORLD NUTRITION FOR MODERN MEALS

As the medical evidence for following the traditional plant-based diets of Asia, Latin America and the Mediterranean region mounts—namely longer life and lower chronic disease rates—the U.S. continues to modify its own dietary guidelines.

U.S. Dietary Guidelines specifically recommend more frequent consumption of lentils, dry peas and beans. People who check out *www.mypyramid.gov* will see that pulses count in both the Vegetable Group and/or Meat and Beans Group. Nutrition experts recommend 2.5 to 3.5 cups of pulses per week. Half of cup of raw pulses yields about a cup of cooked; a cup of cooked pulses equals a cup of vegetables.

MACRONUTRIENT CONTENT
OF 100g SAMPLES OF SELECT PULSES, RICE, AND GRAIN

FOOD	CALORIES(kcal)	TOTAL FAT(g)	CARBOHYDRATE(g)	FIBER(g)	PROTEIN(g)
Dry Peas	341	1	60	26	25
Lentils	353	1	60	31	26
Chickpeas	364	6	61	17	19
White Rice	*365*	*1*	*80*	*1*	*7*
Brown Rice	*370*	*3*	*77*	*4*	*8*
Wheat	*329*	*2*	*68*	*12*	*15*
Oats	*389*	*7*	*66*	*11*	*17*

**Source: USDA National Nutrient Database for Standard Reference*

Easy-to-meet serving sizes. A full serving of vegetables is provided by a mere ¼ cup of raw pulses because they cook up to a ½ cup serving. Half that or just a ¼ cup of cooked pulses provide a one-ounce equivalent in the meat or beans group, which has a daily requirement of 5 to 6 ounces.

Healthy plant protein. With 7 to 9 grams of protein per ½ cup serving, pulses are a good source of protein and a healthy alternative to meat, replacing saturated fat and cholesterol with a non- or low-fat blend of essential amino acids. Pulses improve the protein quality of cereal grains. Topping white or brown rice with chickpeas or lentils provides the full compliment of amino acids needed for growth.

More than cellulose. Pulses are fiber-rich with both the soluble kind that can reduce blood cholesterol levels and the insoluble kind that promotes digestive health. Most Americans fail to reach the recommended 25g of fiber per day. With 12.5g, 15.6g and 16.3g of fiber respectively, a single cup of chickpeas, lentils or split peas gets them half-way there.

Micronutrients, too. Pulses, especially lentils, are high in the important B vitamin folate, so crucial to reducing the risk of birth defects for women of childbearing age. A cup of lentils provides almost 90% of the daily folate requirement

ANTIOXIDANTS

FOOD	ORAC SCORE
Broccoli	1,362
Carrots	666
Chickpeas	847
Lentils	7,282
Peas (green)	524
Peas (yellow)	741
Oregano	200,129
Pomegranate Juice	2,341
Turmeric	159,277

of 400 mcg. Naturally low in sodium, pulses supply several key vitamins and minerals such as iron, magnesium, potassium, zinc and calcium.

Mega-antioxidant. Pulses are packed with beneficial antioxidants and lentils are an exceptional source. For example, the ORAC score (a test tube measure of the antioxidant level of a food) of lentils is 7,282, more than three times that of pomegranate juice. Research on this antioxidant effect in humans is ongoing.

JUST FOR KIDS

Isn't it time for a healthier "mac and cheese"? With pressure to improve the nutritional quality of kid's meals mounting from both within and outside the food industry, pulses offer a great opportunity to please palates and purses. Pulse protein, fiber and carbohydrates are both high quality and economical, offering easy solutions to meet school lunch guidelines and stay within cost-per-meal constraints.

Picky-eater pasta. Today's parents have a renewed desire to put better nutrition in front of their kids, but no time to cook or fight with picky eaters. Pulses make the process painless because they let restaurants offer nutritionally-enhanced versions of kid-friendly favorites.

- Like a bread stick or pizza crust that provides an excellent source of protein and triple the fiber of the traditional versions made without roasted pea flour.
- Or, how about a serving of pasta with enough protein to give Mom a break from pushing the meat sauce. Another option: Top that macaroni with a creamy puree of chickpeas, peas and/or lentils that colorfully hide other healthy additions like carrots or tomatoes.
- Ditch the bread crumbs on those chicken strips and replace them with a seasoned and baked crispy pea flake crust instead.
- Creamy mashed potatoes get a high-fiber boost (from 0g to 4g in an 80-g, 140-calorie serving) by replacing some of the potato flakes with roasted yellow pea flour. Even the finicky will be fooled: They retain the color, smoothness and aroma of traditional mashed potatoes.
- There's also the deliciously crisp "french fry" of cooked lentils and yellow peas with 5g of fiber and 6g of protein in a 71-g serving. Sensory panelists liked these "pulse fries" as well as conventional potato fries. (See recipe section for formula.)
- Don't forget the cereal. Commercial brands that enlist the nutrition of pulses yet retain the crunch and texture of conventional cereals are beginning to hit grocery store shelves.

Who Cares?

- The Institute of Medicine calls for the restructuring of school lunch guidelines to include more fruits and vegetables and more vegetarian options.
- Improving nutrition was a central theme of First Lady Michelle Obama's "Let's Move" initiative to combat childhood obesity.
- Harvard endocrinologist Dr. David Ludwig spearheads a nationally-recognized attack on childhood obesity for Children's Hospital in Boston, urging parents to decrease portion sizes of high glycemic load (GL) carbs while substituting healthy proteins and increasing consumption of vegetables and legumes like pulses.

HUMMUS: ENJOY A DIP IN DEMAND

- Smooth it over fish or chicken. Slather it on baked potato.
- Spread it on in place of the mayo and mustard.
- Give hummus headline status in that vegetarian sandwich.
- Pair it with raw veggies as well as pita or crackers.
- Create a sumptuous spread by mixing it with whipped cream cheese.
- Blend it with cayenne or cumin, cilantro, green chilies, even habaneros.
- Top it with roasted red peppers, eggplant, scallions or olives.

- "Nutritionally balanced children's dishes" ranks No. 6 out of 208 on a recent National Restaurant Association survey of chefs.
- "Healthy options on kids menus" ranks No. 1 with Quick Serve Restaurants (QSR).

THE HUBBUB OVER HUMMUS

There's no better proof that Americans want healthy to be tasty and convenient than the hummus phenomenon. From a $5M industry in the mid-1990's, hummus sales now top $350M a year. Recent double digit annual growth shows no signs of slowing. This soaring domestic demand explains why only 40% of the chickpeas grown in the U.S. are now exported compared with 90% ten years ago.

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SNACKS ARE MEALS

Busy lives mean Americans are consuming more of their daily calories in the form of snacks. That means a growing market for "guilt-free," more nutrient-dense snacks like hummus. With their deliciously nutty flavor, chickpeas are perfectly poised for other snack food applications. Perhaps crispy chickpea fritters will be next to spread from the fine dining appetizer menu to the grocery heat-and-eat frozen food category.

Like wasabi-laced peas, chickpeas and even lentils roast into a crunchy, hunger-satisfying snack that can stand alone or boost the protein and fiber in a snack bar or trail mix (see recipe section). Pulse flours can make crackers and flatbreads deliver more than just empty carbs and calories. Both pulse flakes and flours serve as a nutritiously crunchy coat for protein snacks like chicken strips or fish sticks.

Hummus is actually the Arabic name for chickpeas. With roots in ancient Egypt and India as well as the Mediterranean region, it's one of the first ever prepared foods. Fast forward to this country's love affair with the healthy spread. When American restaurants enlisted hummus as a pre-meal munchie it prompted their customers to seek the spread at their local supermarket.

Guilt-free snacking. There's no question that consumer interest in healthier eating has spurred hummus sales and promises to pave the way for other pulses as snack food ingredients. High fiber, high protein hummus is also cholesterol and gluten free, and, compared with other snack dips, low in calories. Consumers conscious of improving their diets know that hummus can help them reach their recommended vegetable intake. But taste, convenience and versatility is what put this healthy snack on the fast track. Available in anything from a squeeze tube to grab-and-go 2-ounce snack packs to large, multi-flavor variety packs, hummus makes healthy munching easy to find.

From impulse to staple. More Americans are entertaining at home. Be it a football game or a holiday party, they expect snacks to be heavy hitters. Hummus delivers meal-like nutrition in finger-food style. Touted as the "new salsa" by many in the industry, hummus is also typically paired with chips, but of the pita rather than tortilla variety. And now the traditional puree of chickpeas, tahini, lemon and garlic is giving ground to more adventurous flavors and partners.

Indeed, hummus is a perfect example of adapting an old world favorite to American tastes. It started with simply spicing up classic roasted garlic hummus, then came even spicier red pepper and savory dill-flavored versions. Today's Americanized hummus carries flavors from chipotle to sun-dried tomatoes; salsa to spinach and artichoke. There's even a kid-targeted peanut-butter hummus as well as a cocoa-flavored dessert hummus.

Despite the New World modifications, healthy hummus still basks in the popular Mediterranean Diet limelight. The largest hummus brand in America has seen skyrocketing sales growth by imploring consumers to "go Mediterranean," serving up samples of hummus with fresh toppings in a city-by-city tour that brings its own Mediterranean village to town.

A snack for large and small. While the warehouse giants stock shelves with popular brands or private label hummus, students, vegetarians, athletes and health-foodies are finding and supporting their local hummus bar. Many say the Quick-Serve Restaurant (QSR) is the next frontier.

Room to grow. Despite the impressive sales statistics, the hummus market is still in its infancy. Less than 20% of American homes have invited hummus to the table compared with over 95% household penetration in some Mediterranean countries.

SPECIAL DIET SOLUTIONS

Clean up that label and give special diet foods some real nutrition. Pulses bring boundless possibilities to the process of providing gluten-free, vegetarian, low-allergen and low GI and GL meals that help fight diabetes and obesity.

Vegetarian and Flexitarian. Vegetarian meals aren't just

LABEL-FRIENDLY FOODS

- Drop the allergens and cut the fat from that trail mix. A colorful and tasty peanut, tree-nut and soy-free trail mix awaits the college campus or snack bar category (see recipe section). Roasted red lentils, roasted yellow and green split peas, roasted sunflowers, dried cranberries, semi-sweet chocolate bits, some olive oil and sea salt deliver a deliciously nutty crunch that forced testers to cover and hide this trail mix from sensory panelists. With 60% less fat and 40 fewer calories than the peanut and soy-based control, the pulse trail mix still carried 6g of protein and 2g of fiber per 38-g serving.

- Spike the nutrition in a gluten-free cracker by adding chickpea and pea flour to provide 4g of protein and 2g of fiber in a 40-g serving. (See recipe section).

- Keep that nutty flavor in your basil-and-parmesan pesto by replacing the tree nuts with roasted red lentils. You'll get the same color and texture in a low-allergen pesto that sensory panelists liked as well as the control. Use it to top a salad of cherry tomato, mozzarella, chickpeas and red onion garnished with a crispy sprinkle of roasted lentils. This nutritionally powerful recipe (see *www.northernpulse.com* for recipe) delivers 6g of fiber, 13g of protein plus 60% DV of Vitamin A, 40% DV of Vitamin C, 15% DV of calcium and 15% DV of iron in a 250-calorie, 238-g serving.

- Replace those breadcrumbs with a pea flake coating. Seasoned with fresh herbs, pea flakes add a delicious gluten-free crust to halibut, cod or salmon pan-seared in olive oil. The great texture and flavor profile of crisp, baked pea-flake crusted chicken breast, tenders or strips are a healthy option for center-of-plate or snacks.

- Hold the soy in that veggie burger! Red lentils, split yellow and green peas and black beans clean up that allergen label and deliver a vegetarian burger that sensory liked as well or better than the most popular commercial brand. The pulse burger is perfect for frozen food applications, delivering 7g of protein and 4g of fiber in a 71-g serving.

- Please the vegetarians and flexitarians with a colorful dish that delivers 8g of protein, 11g of fiber and 150% DV of Vitamin C in a 220-calorie serving. A thyme, cumin and garlic-seasoned sauté of cooked green lentils liven up a rainbow of colored peppers, spinach and onion. (See *www.northernpulse.com* for recipe).

WHOLE PULSES, PULSE FLOURS, PULSE STARCHES, PROTEIN AND FIBER COMPONENTS OFFER GREAT OPPORTUNITIES TO MAKE GLUTEN-FREE FOODS MORE WHOLESOME.

for vegetarians anymore. Spurred by John Hopkins School of Public Health advocating "Meatless Mondays," non-vegetarians regularly seek out vegetarian meals. While many of these "flexitarians" are looking for new flavors and culinary adventure, vegetarian entrees are also associated with environmentally-sustainable food production.

Pulses are excellent protein sources for vegetarian meals, and come with an environmentally "green" story. Because they naturally enrich soil with nitrogen, thus reduce the need for petroleum-based fertilizers, pulses are as healthy to grow as they are to eat.

Gluten-free. People who must avoid gluten suffer from celiac disease, an autoimmune disorder. When a celiac-afflicted person eats gluten, it triggers an immune reaction that can damage the intestinal tract leading to poor absorption of nutrients. Gluten-free foods and meals are increasingly popular today, because even though many who avoid gluten aren't formerly diagnosed as celiacs, they have sensitivity to gluten.

Finding nutritious substitutes for gluten is a challenge for celiacs because gluten, a protein form in wheat and many other cereal grains, is found in a huge array of everyday foods. But growing consumer demand promises to fuel improved gluten-free products and pulses are poised to become a major player in this trend. Whole pulses, pulse flours, pulse starches, protein and fiber components offer great opportunity to make gluten-free foods more wholesome.

Low Allergen. With food allergies afflicting up to 4% of the U.S., some 12.2 million people are seeking sustenance that doesn't trigger an allergic reaction. Replacing common allergens with pulses is convenient because of the versatility of whole pulses, pulse flours and pulse components. From egg-replacing pea protein concentrate in baked products to chickpea and lentil flours that can stand in for wheat and soy, to the nut-free crunch of roasted peas, lentils and chickpeas, the opportunity for label-friendly foods is boundless.

Diabetes and Obesity. Because of their high quality complex carbohydrates, pulses digest slowly, meaning diabetics may find their blood glucose levels remain more stable after a meal that contains pulses. With their low-fat protein and fiber-rich carbs, pulses maintain that full feeling after eating longer—an attribute called satiety—which may make weight maintenance easier. It's these factors that make pulses perfect for the low glycemic diet that is being recognized as important in fighting both diabetes and obesity.

HIGH QUALITY CARBS: THE GI FACTOR

Pulses are rich in complex carbohydrates, but even more importantly, they are high quality carbs. Carbohydrates used to be either simple or complex, with the complex carbohydrates of starch and fiber deemed far healthier than simple sugars. But we now know it's more, dare we say, "complicated" than that because our bodies turn even some complex carbohydrates into blood sugar as fast as we do pure sugar. Case in point: potatoes. More than a marketing term, carb quality is a reflection

of the actual metabolic affects of a particular food on the body—namely blood sugar and insulin.

	GLYCEMIC INDEX (GI)	GLYCEMIC LOAD (GL)
Split Peas	25	5
Lentils	28	6
Chickpeas	33	7
Baked potato	98	13
Rice	69	19
Bagel	69	39
Carrots	92	6

The glycemic scale. Glycemic index (GI) and glycemic load (GL) are two measures that reflect the metabolic effect of foods on blood sugar and insulin. Glycemic index (GI) ranks a preset, equal amount of food from 0 to 100 based on how quick and high it boosts the two. Glycemic load makes that index practical by taking into account blood sugar and insulin changes after eating a typical serving size of that food. Bottom line: Pulses are both low GI and low GL foods.

Slow is better. That's because slowly digested carbohydrates, such as pulses, have lower, slower effects on blood sugar and insulin levels. The rapid digestion of refined white rice and white flour breads and pastas sends blood sugar levels soaring quick and fast but can be tempered by topping either with a pulse. In Australia, where the glycemic index is widely used, pulses are regularly employed to reduce the GI of food products. Indeed, the easy pace of pulse digestion may be one reason why pulses tend to combat hunger longer, making them a healthy weight management food.

The case for low GI foods

- One in four Americans is insulin resistant and at risk of developing type 2 diabetes. Low GI diets improve both glucose levels and lipid levels in people with diabetes (both type 1 and type 2).
- Low GI diets reduce insulin levels and improve insulin sensitivity.
- Two out of three Americans are overweight or obese. Low GI diets have weight control benefits because they help control appetite and delay hunger.
- Harvard School of Public Health studies indicate that the risk of chronic diseases such as type 2 diabetes and coronary heart disease are strongly related to the GI of the overall diet.

- In 1999, both the World Health Organization (WHO) and the Food and Agriculture Organization (FAO) recommended that people in industrialized countries base their diets on low-GI foods in order to prevent the most common diseases of affluence, such as coronary heart disease, diabetes and obesity.

PULSE FLOURS

The idea of grinding dry peas, chickpeas or lentils into a high-protein flour isn't a new one; our ancestors were doing it long before machinery was invented to make the process easier. Today, pre-cooked pulse or legume flours are finding a way into a wide variety of products to fortify fiber and protein and improve texture.

Pasta Reborn. The segment is called "better-for-you" pastas and

MACRONUTRIENT CONTENT
OF 100g SAMPLES OF VARIOUS FLOURS

FOOD	CALORIES(kcal)	TOTAL FAT(g)	CARBOHYDRATE(g)	FIBER(g)	PROTEIN(g)
Dry Pea Flour	**365**	**2**	**65**	**26**	**24**
Lentil Flour	**353**	**1**	**65**	**33**	**25**
Chickpea Flour	**387**	**7**	**58**	**11**	**22**
Peanut Flour	*428*	*22*	*31*	*16*	*34*
Potato Flour	*357*	*0*	*83*	*6*	*7*
Rice Flour	*366*	*1*	*80*	*2*	*6*
Corn Flour	*361*	*4*	*77*	*7*	*7*
AP Wheat Flour	*364*	*1*	*76*	*3*	*10*
Whole Wheat Flour	*339*	*2*	*73*	*12*	*14*

**Source: USDA National Nutrient Database for Standard Reference*

PULSE FLOUR R&D

- Add 7% cooked yellow dry pea flour to your breadstick formula and create one that offers 12g of protein (excellent source) and 3g of fiber (good source) per 106-gram serving. This adaptable recipe requires no adjustment in non-liquid ingredients and suits any bread stick application. Color and texture were as good as, if not better than, the control with sensory panelists praising the crunchy crust and soft crumb of the pea flour bread stick.

- Add 8% precooked yellow pea flour to pizza crust formulas and create a 94-gram serving that has 10g of protein (excellent source) and 3g of fiber (good source) and only 240 calories. Get more dough yield in the process because of the extra water absorbing properties of pea flour. Once again, sensory panelists liked the crust as well as or better than the control that had no pea flour in the formula.

- How about a traditional-looking pie crust undetectably fortified with roasted pea flour that delivers 8g of protein and 2g of fiber per 112-gram serving.

- Pump up the protein quality and fiber in white or brown rice without changing the texture by adding precooked pea flour to your pilaf (using a 5:1 ratio of rice to pea flour; see website for formula). The amino acid profile of pulses is a perfect complement to rice, making vegetarian or traditional entrees more nutritious. This pulse-fortified rice is well-suited for fresh or frozen heat-and-serve dishes.

- Fortify a 56-gram serving of semolina pasta with 4g of fiber and 8g of protein by adding chickpea and lentil flours to your formula. This combination gives the pasta a rich, golden color compared with the lighter yellow of straight semolina or the darker shade of whole wheat pasta.

GIVE LOW FAT CHOCOLATE ICE CREAM A SMOOTH, CREAMY TEXTURE BY USING ALL NATURAL PEA STARCH ISOLATE (90%-plus starch) in place of modified corn starch or low-fat gums. Pea starch is so proficient at binding water that it increases viscosity and promotes the smaller ice crystals associated with higher fat ice creams.

with the success of Barilla PLUS leading the way, most pasta brands are jumping on board. Pulses are a big player in Barilla PLUS bestowing it with twice the fiber and more than 40% more protein than traditional pasta.

Whether its pasta fortified with the flour of cooked, yellow split peas or from chickpeas and lentils like those in Barilla PLUS, pulses provide a natural way to preserve traditional taste and texture while bumping up both protein and fiber in grain-based pastas. Pastas with pulses deliver higher quality nutrients with more essential amino acids and complex carbohydrates than wheat-only pastas. The creamy color of roasted yellow pea flour is undetectable in pasta; lentil and chickpea flour will impart a deep golden shade that is still lighter than whole wheat pasta. Another plus: Pulse flours give pasta the added benefit of retaining an al dente texture even when slightly overcooked.

PULSES A'PLENTY

American farmers began a love affair with growing pulses when lentils and peas were included in the 2002 Farm Bill. They've renewed that commitment by planting more acres every year since. That's because pulses are as healthy to grow as they are to eat—replenishing soil nitrogen naturally. This ability to "fix" nitrogen—pull it from the air and put it back into the soil—makes legumes like pulses earn their "green" reputation. Indeed, farmers discovered that traditional crops such as wheat grow better and need less petro-based fertilizer when planted after a pulse crop. That's one reason why pulses have become a permanent player in today's sustainable crop rotations.

With dry peas and lentils leading the way, pulse acres in the U.S. more than quadrupled between 1990 and 2009 pushing 1.5 million acres; farmers are expected to double that again by 2015. This dramatic acreage expansion saw domestic pulse production exceed 1,100,000 metric tons by 2009—triple that produced in the year 2000.

Backed by bricks and mortar. Since the 1990's tens of millions of dollars have been invested in the infrastructure to grow, deliver and process pulse crops in the U.S. U.S. pulse processing has evolved to encompass several state-of-the-art facilities that offer "made to order" splitting, color sorting and packaging of raw pulses. Investment in value-added pulse processing and flour-making continues to escalate.

PULSES ARE AS HEALTHY TO GROW AS THEY ARE TO EAT—REPLENISHING SOIL NITROGEN NATURALLY.

VARIETY OF VARIETIES

It's getting easier all the time to find the right dry pea, lentil or chickpea for your food service application. Investment in plant breeding and testing is resulting in varieties specifically developed for the U.S. In the case of dry peas and chickpeas, varietal differences may influence the size of the seed and the hardness of the seed coat.

Lentils also come in a plethora of types: Reds, browns, greens—and shades in between. Skinless lentils are also called decorticated lentils after the process that removes the seed coat. They are often referred to as red lentils, but there are red lentils that have their outer seed coat intact. The coatless inner seed is called the cotyledon and can be a different color than the outer seed coat, depending on the variety. Skinless lentils absorb water quickly, thus have shorter cooking times and puree easier than intact lentils.

CRACKERS

Ingredient List	*Gram*	*Gluten Free Flours Base %*
Precooked pea flour	73	13
Precooked chickpea flour	73	13
Brown rice flour	125	22
Potato starch	121	21
Tapioca flour	172	30
Extra sharp cheddar cheese	80	14
Monterey Jack cheese	80	14
Xanthan gum	6.4	1.1
Shortening	70	12
Salt	7.8	1.4
White granulated sugar	5.5	1.0
Baking powder	4	0.7
High fructose corn syrup	19.4	3.4
Garlic powder	2.5	0.4

Nutrition Facts
Serving Size (40g)

Amount Per Serving	
Calories 150	Calories from Fat 50
	% Daily Value*
Total Fat 6g	**9%**
Saturated Fat 2.5g	**13%**
Trans Fat 0.5g	
Cholesterol 10mg	**3%**
Sodium 220mg	**9%**
Total Carbohydrate 22g	**7%**
Dietary Fiber 2g	**8%**
Sugars 1g	
Protein 4g	
Vitamin A 2% •	Vitamin C 0%
Calcium 6% •	Iron 4%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories	2,000	2,500
Total Fat	Less Than	65g	80g
Saturated Fat	Less Than	20g	25g
Cholesterol	Less Than	300mg	300mg
Sodium	Less Than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

Procedures

Mix dry. Cut shortening into dry. Flatten the mixture to 2mm thickness on a baking sheet. Bake for 8-10 minutes at 400°F, cut to shape and bake for another 6-8 minutes.

MASHED POTATOES

Ingredient List	*Gram*
Potato flakes	100
Milk (2% Fat)	60
Boiling water	180
Butter	30
Salt	5
Precooked pea flour	50

Procedures

Combine boiling water, milk, butter and salt. Add potato flakes and pea flour. Stir to moisten. Let stand for two minutes, then stir gently again.

Nutrition Facts
Serving Size (80g)

Amount Per Serving	
Calories 140	Calories from Fat 40
	% Daily Value*
Total Fat 4.5g	**7%**
Saturated Fat 3g	**15%**
Trans Fat 0g	
Cholesterol 15mg	**5%**
Sodium 750mg	**31%**
Total Carbohydrate 20g	**7%**
Dietary Fiber 4g	**16%**
Sugars 3g	
Protein 4g	
Vitamin A 4% •	Vitamin C 25%
Calcium 2% •	Iron 6%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories	2,000	2,500
Total Fat	Less Than	65g	80g
Saturated Fat	Less Than	20g	25g
Cholesterol	Less Than	300mg	300mg
Sodium	Less Than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

PULSE BURGER

Ingredient List	*Gram*
Cooked split yellow peas	370
Cooked red lentil	100
Cooked split green peas	100
Cooked black bean	200
Tapioca flour	30.6
Xanthan gum	0.9
Pea protein concentrate	10
Vital wheat gluten	20
Olive oil	20
Cumin powder	0.5
Garlic powder	1
Sea salt	3
Sugar	20
Steak seasoning	7.8
Italian seasoning	1.9
Cider vinegar	1.7
Chopped yellow onion	130
Corn starch	10

Nutrition Facts
Serving Size (71g)

Amount Per Serving	
Calories 110	Calories from Fat 15
	% Daily Value*
Total Fat 1.5g	**2%**
Saturated Fat 0g	**0%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 180mg	**8%**
Total Carbohydrate 18g	**6%**
Dietary Fiber 4g	**16%**
Sugars 3g	
Protein 7g	

Vitamin A 0%	•	Vitamin C 2%	
Calcium 2%	•	Iron 6%	

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories	2,000	2,500
Total Fat	Less Than	65g	80g
Saturated Fat	Less Than	20g	25g
Cholesterol	Less Than	300mg	300mg
Sodium	Less Than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

Procedures

Soak pulses for at least 30 minutes. Boil them in water until they are thoroughly cooked. Completely drain the water. Heat and mix all the ingredients. Run the mixture through a meat grinder. Add corn starch. Mix. Add onions and form thin patties. Fry with oil until golden brown on both sides.

PULSE FRIES

Ingredient List	*Gram*
Cooked red lentils	145
Cooked yellow peas	150
Dried onion	6.2
Salt seasoning	14
Dried parsley	0.18
All-purpose flour	60
Sugar	10
Corn starch	15
Water	8

Procedures

Combine all ingredients in a food processor. Sheet and cut the dough into desired shape. Blast freeze the fries. Fry the fries at 180°C for 1-2 minutes or until golden brown.

Nutrition Facts
Serving Size (71g)

Amount Per Serving	
Calories 110	Calories from Fat 0
	% Daily Value*
Total Fat 0g	**0%**
Saturated Fat 0g	**0%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 770mg	**32%**
Total Carbohydrate 23g	**8%**
Dietary Fiber 5g	**20%**
Sugars 4g	
Protein 6g	

Vitamin A 2%	•	Vitamin C 0%	
Calcium 0%	•	Iron 10%	

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories	2,000	2,500
Total Fat	Less Than	65g	80g
Saturated Fat	Less Than	20g	25g
Cholesterol	Less Than	300mg	300mg
Sodium	Less Than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

TRAIL MIX

Ingredient List	*Gram*
Red lentils	60
Split yellow peas	60
Split green peas	60
Roasted sunflower seeds	60
Sweetened dried cranberries	60
Semisweet chocolate chips	74
Olive oil	5
Sea salt	4

To roast peas: Soak 1 hour. Cook for 30 mins, drain and roast for 15 minutes at 360°F.

To roast lentils: Soak 1 hour. Drain water. Roast at 360°F for 18 minutes.

Procedures

Roast peas and lentils. Combine roasted lentils, peas, sunflower seeds, cranberry, and semisweet chocolate chips. Sprinkle with olive oil and sea salt. Mix well and serve.

Nutrition Facts
Serving Size (38g)

Amount Per Serving	
Calories 160	Calories from Fat 50
	% Daily Value*
Total Fat 6g	**9%**
Saturated Fat 1.5g	**8%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 22g	**7%**
Dietary Fiber 2g	**8%**
Sugars 10g	
Protein 6g	

Vitamin A 0%	•	Vitamin C 0%	
Calcium 0%	•	Iron 4%	

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories	2,000	2,500
Total Fat	Less Than	65g	80g
Saturated Fat	Less Than	20g	25g
Cholesterol	Less Than	300mg	300mg
Sodium	Less Than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

PIZZA CRUST

Ingredient List	*Gram*	*Baker's %*
High-gluten flour (15% protein)	700	100
Precooked pea flour	115	16
Instant yeast	7.0	1
White granulated sugar	36	5
Vital wheat gluten	21	3
Salt	11	2
Italian seasoning	1.3	0
Water (variable)	597	85
Shortening	14	2

Procedures

Mix the dough. Ferment for 1 hour at 95% R.H., 95°F. Scale to 345g, round, flour, and rest 15 minutes. Sheet the crust, dock top, and put on sauce and toppings. Bake at 390°F for 20 minutes on pizza pan.

Nutrition Facts
Serving Size (94g)

Amount Per Serving	
Calories 210	Calories from Fat 15
	% Daily Value*
Total Fat 1.5g	**2%**
Saturated Fat 0g	**0%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 270mg	**11%**
Total Carbohydrate 38g	**13%**
Dietary Fiber 3g	**12%**
Sugars 3g	
Protein 10g	

Vitamin A 0% • Vitamin C 2%
Calcium 2% • Iron 6%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories	2,000	2,500
Total Fat	Less Than	65g	80g
Saturated Fat	Less Than	20g	25g
Cholesterol	Less Than	300mg	300mg
Sodium	Less Than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

LOW-FAT CHOCOLATE ICE CREAM

Ingredient List	*Gram*	*Milk Base %*
Whole milk	770	100
Non-fat dry milk	50	6.5
Sugar	130	17
High-fructose corn syrup	45	5.8
Vanilla	10	1.3
Cocoa	34	4.4
Semisweet chocolate chips	80	10.4
Pea starch isolate	8.5	1.1
Water	44	5.7

Procedures

Dissolve pea starch in water. Blend all liquid and dry ingredients. Batch pasteurize (70°C for 30 minutes), homogenize, and cool the mixture. Freeze the ice cream mixture. Package and harden the ice cream in a blast freezer at -30°C.

Nutrition Facts
Serving Size (113g)

Amount Per Serving	
Calories 180	Calories from Fat 45
	% Daily Value*
Total Fat 5g	**8%**
Saturated Fat 3g	**15%**
Trans Fat 0g	
Cholesterol 10mg	**3%**
Sodium 60mg	**3%**
Total Carbohydrate 30g	**10%**
Dietary Fiber 1g	**4%**
Sugars 25g	
Protein 6g	

Vitamin A 4% • Vitamin C 0%
Calcium 15% • Iron 4%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories	2,000	2,500
Total Fat	Less Than	65g	80g
Saturated Fat	Less Than	20g	25g
Cholesterol	Less Than	300mg	300mg
Sodium	Less Than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

BREAD STICKS

Ingredient List	*Gram*	*Baker's %*
High-gluten flour	700	100
Pea flour	115	16
Gluten	21	3
Yeast	7	1
Sugar	36	5
Salt	11	2
Shortening	14	2
Italian seasoning	1.3	0
Water	597	85
Monterey Jack cheese	200	29

Procedures

Mix dry ingredients. Add water and mix. Ferment for one hour. Scale to 100g long sticks. Rest for 30-40 minutes in a fermentation cabinet at 85°C, 95% RH. Top with cheese. Bake at 390°F for 20 minutes.

Nutrition Facts
Serving Size (106g)

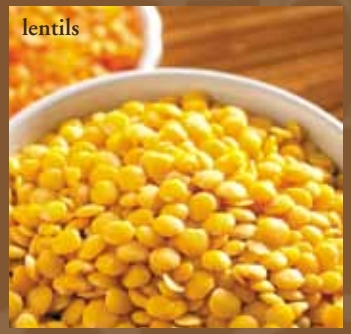
Amount Per Serving	
Calories 250	Calories from Fat 50
	% Daily Value*
Total Fat 6g	**9%**
Saturated Fat 2.5g	**13%**
Trans Fat 0g	
Cholesterol 15mg	**5%**
Sodium 360mg	**15%**
Total Carbohydrate 38g	**13%**
Dietary Fiber 3g	**12%**
Sugars 3g	
Protein 12g	

Vitamin A 2% • Vitamin C 2%
Calcium 10% • Iron 6%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories	2,000	2,500
Total Fat	Less Than	65g	80g
Saturated Fat	Less Than	20g	25g
Cholesterol	Less Than	300mg	300mg
Sodium	Less Than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4



Northern Pulse Growers Association
Bismarck, North Dakota
www.northernpulse.com

USA Dry Pea & Lentil Council
Moscow, Idaho
www.pea-lentil.com