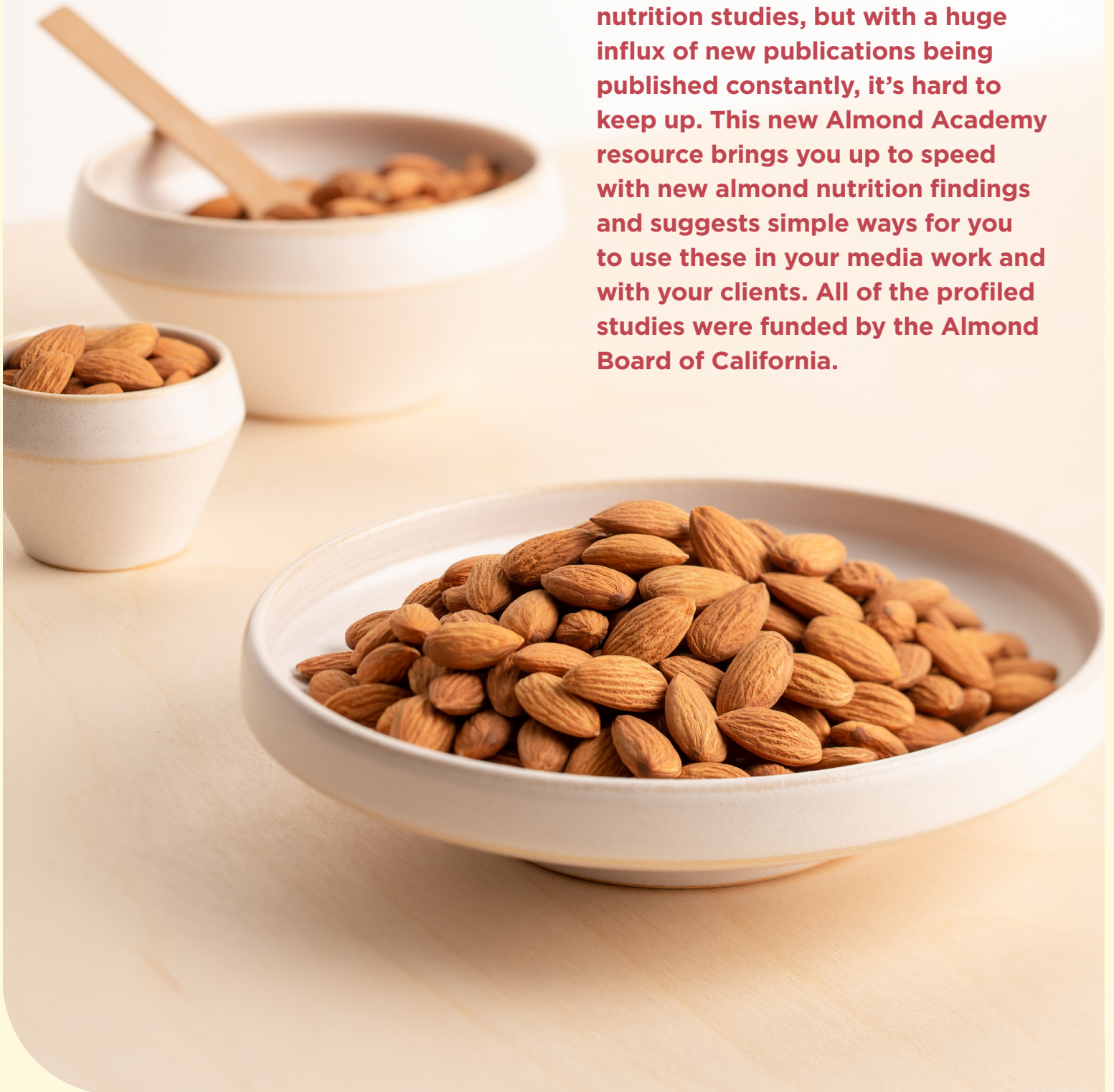


COMMUNICATING NEW ALMOND RESEARCH TO DIFFERENT AUDIENCES

Registered dietitians and nutritionists are expected to stay on top of recent nutrition studies, but with a huge influx of new publications being published constantly, it's hard to keep up. This new Almond Academy resource brings you up to speed with new almond nutrition findings and suggests simple ways for you to use these in your media work and with your clients. All of the profiled studies were funded by the Almond Board of California.

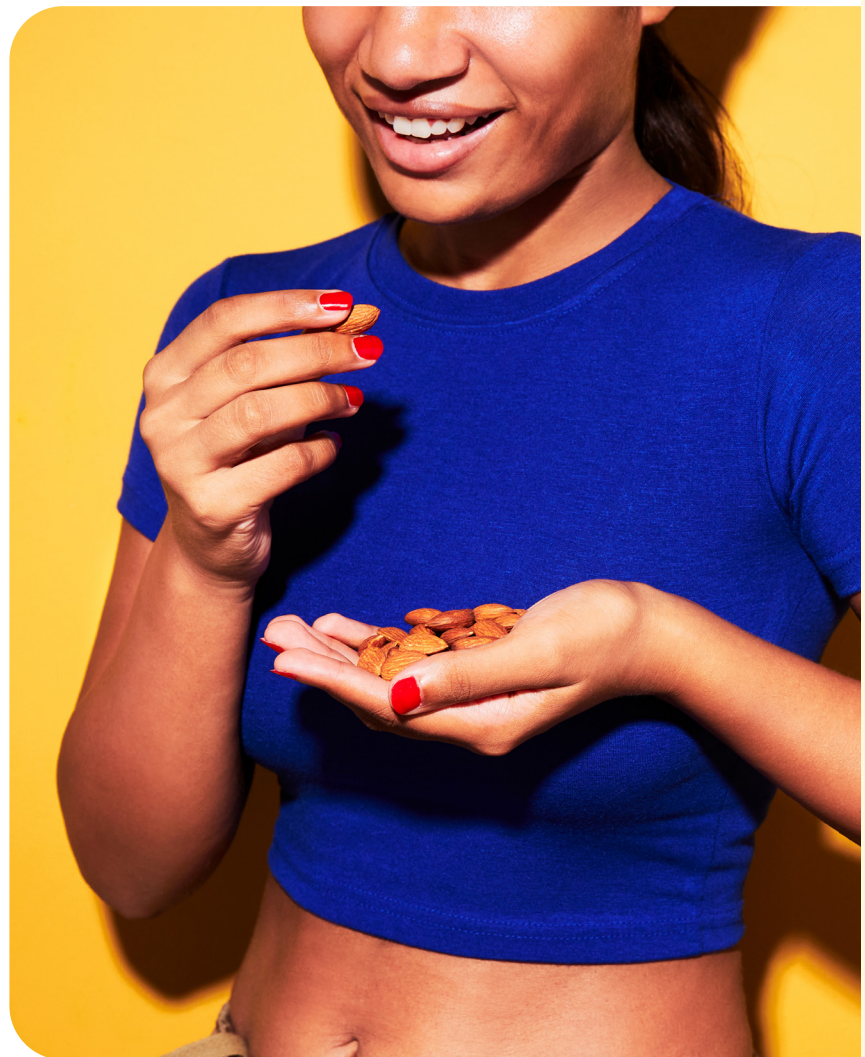


GUT HEALTH FINDINGS: BACTERIAL METABOLISM AND IMPROVED HEALTH

A team of researchers at King's College London, set out to determine the impact whole almonds and ground almonds have on the composition of gut microbiota, gut microbiota diversity and gut transit time.

New research found that consuming almonds significantly increases butyrate, a type of beneficial short-chain fatty acid (SCFA), in the colon. Butyrate, which is produced by microbes in the gut when they digest fibre, is the primary fuel source for colonocytes and may play a role in improving sleep quality, fighting inflammation, and has been associated with a lower risk of colon cancer.

In the study, almond consumption also significantly increased stool output, where regular stool output is associated with a well-functioning gastrointestinal system.



Study at a Glance

Researchers explored the prebiotic effect of almonds and the potential impact almond processing had on this effect in a free-living, four week, three arm, parallel-design randomized controlled trial.

Eighty-seven (87) healthy adults participated and received either 56 g/d whole almonds, 56 g/d ground almonds, or an isocaloric snack muffin as the control.

Baseline and endpoint measures included gut microbiota composition and diversity, short-chain fatty acids, volatile organic compounds (VOCs), gut transit time, stool output, and gut symptoms. A subgroup (n=31) was measured for the impact of almond form, ground or whole, on particle size distribution (PSD) along with predicted lipid release.



Results

- Researchers observed no significant differences in the abundance of fecal bifidobacteria following consumption of either form of almond or the control snack. Almond consumers (both ground and whole almonds), had higher butyrate (24.1 mol/g; SD 15.0 mol/g) compared to the control (18.2 mol/g, SD 9.1 mol/g; p=0.046).
- Ground almonds resulted in significantly smaller PSD and higher predicted lipid release (10.4%, SD 1.8%) in comparison to whole almonds (9.3%, SD 2.0%; p=0.017).
- There was no effect of almonds on gut microbiota at the phylum level or diversity, gut transit time, stool consistency, or gut symptoms. Three VOCs increased following almond consumption compared to control muffins, but this change was not statistically significant.
- Post-hoc testing showed whole almond participants had higher intakes of monounsaturated fatty acids, total fibre, potassium, along with other nutrients when compared to the control participants.
- Similarly, ground almond consumers had higher intakes of monounsaturated fatty acids, total fibre, and other micronutrients.

Conclusions

Participants who consumed almonds experienced small but significant differences in stool frequency as well as significant increases in butyrate in the colon. Researchers indicate that these findings suggest positive alterations to gut microbiota functionality. The impact of almond consumption on bacterial metabolism has the potential to influence human health.

These results have inspired thinking regarding how almonds may benefit older adults as well as those with constipation, as these populations are known to have lower levels of bifidobacteria than healthy, young adults as well as those without constipation.

Limitations

Limitations of this study are seen in both the sex distribution of volunteers, where more than 86% were female, as well as in age. Average age of participants was 27.5 years. The researchers recognize their findings are not necessarily generalizable to males or to older populations.

Consumer Messages:

In a new gut health study, researchers found that almonds are a way to increase fibre without concerns about gastrointestinal discomfort.

People who snacked on almonds experienced significant increases in an important marker for gut health called butyrate, which is a product of metabolism associated

with health benefits such as reduced risk of colon cancer.

Currently, a lot of us are missing our fibre target and almonds provide 4g per one 30-gram portion.

A new study found that eating almonds may benefit how gut bacteria metabolizes our food, which has potential to influence human health.

How to Put into Practice:

Media outreach: A new study is a great time to contact local and national journalists to see if they'd like any comments. You can share the new findings and offer tips on how to increase almond consumption with meals and snacks

Social media posts: In addition to posting news on breaking research to your channels, gut health has certain awareness days that offer timely opportunities to post about the research. Examples include Colorectal Cancer Awareness Month (March) and World Digestive Health Day (29 May)

Connecting with clients: In one-to-one consultations, be sure to talk about the importance of fibre and be prepared to talk about high-fibre foods and ways to increase intake without concerns about GI discomfort.

Study Citation

Creedon, A. C., Dimidi, E., Hung, E. S., Rossi, M., Probert, C., Grassby, T., Miguens-Blanco, J., Marchesi, J. R., Scott, S. M., Berry, S. E., & Whelan, K. (2022). The impact of almonds and almond processing on gastrointestinal physiology,

luminal microbiology and gastrointestinal symptoms: a randomized controlled trial and mastication study. *American Journal of Clinical Nutrition*, nqac265. <https://doi.org/10.1093/ajcn/nqac265>.

ALMONDS INFLUENCE APPETITE HORMONES



A study comprising adults with obesity or who were overweight showed almond consumption helped improve crucial appetite-regulating hormones and may help reduce energy intake, and supported better control insulin release and blood glucose regulation. Modulating appetite through better hormonal responses is a promising approach for assisting weight management. Knowledge continues to expand in support of almonds as a simple, effective addition to weight management plans. A paradox of these tasty treasures is that almonds' caloric density does not increase body weight, body mass index (BMI), or body fat and may decrease waist circumference. The C-peptide response was smaller with almonds compared to the carbohydrate snack and decreased C-peptide activity which indicates lower insulin response. A subset of the almond group consumed about 100 fewer calories at an ad libitum buffet, although the finding was not statistically significant.

Study at a Glance

The Study

The study involved 140 individuals with obesity or who were overweight (42 males, 98 females), aged 47.5 years (+10.8 years) consuming a snack and measuring levels of appetite-regulating hormones and subjects' self-reporting appetite ratings over a subsequent two hour period. Participants consumed unsalted, whole, natural almonds with skins (intervention) or an oven-baked fruit cereal bar (control).

The almond portion provided was approximately 30 to 50 grams (depending upon which calorie level the participant followed). A subset of participants was then invited individually to dine freely at a buffet over a 30-minute period. Appetite ratings were measured at the conclusion of the buffet experience. Researchers explored if almond consumption, when compared to the carbohydrate snack, influenced how much people would consume from the buffet.

Researchers measured appetite-regulating hormones: ghrelin, glucose-dependent insulinotropic polypeptide, glucagon-like peptide-1, leptin, pancreatic polypeptide, peptide YY, C-peptide, glucagon, and cholecystokinin.



Results

- **C-peptide response was 47% smaller with almonds compared to the carbohydrate snack ($p < 0.001$). Decreased C-peptide activity indicates lower insulin response, which has longer-term implications for preventing or delaying the development of diabetes and cardiovascular disease. Almonds may reduce the glucose response and help reduce insulin resistance. Additionally, glucose-dependent insulinotropic polypeptide, glucagon, and pancreatic polypeptide responses were larger with almonds versus the carbohydrate snack (17.8%, $p = 0.005$; 38.74%, $p < 0.001$; 44.5%, $p < 0.001$, respectively). [Glucagon promotes satiety and may encourage weight loss, while pancreatic polypeptide lowers appetite, reduces food intake, and helps food remain in the stomach longer.]**
- **Cholecystokinin, ghrelin, glucagon-like peptide-1, leptin, and peptide YY responses were not different between the almond or the snack bar groups. Neither did self-reported appetite ratings differ significantly between the groups. However, the group treated with almonds consumed about 100 fewer calories (72 calories) at the buffet, although the finding was not statistically significant.**
- **While several of the main appetite-regulating**

hormones for the almond group responded favorably, that did not translate to a decrease in self-reported appetite or to statistically significant reduced short-term energy consumption. But this is not surprising. “Published research tells us there’s often no direct correlation between appetite hormones, appetite ratings, and subsequent energy intake,” according to Dr. Alison Coates. Moreover, since obesity is characterized by a resistance to appetite-regulating hormones, there could be a misalignment between the body’s hormonal signals and perceptions of fullness in individuals with overweight and obesity.

Limitations

A COVID-19 overlay resulted in restrictions on the number of participants who could complete the buffet challenge. In addition, as noted before, all participants had elevated body weight. Future research could examine how healthy-weight individuals respond to almond snacks and provide insight into the possible prevention of overweight and obesity. Lastly, the research team says that future studies should investigate implications for longer-term appetite regulation.

Conclusions

- Almond consumption resulted in improved hormonal responses, which reflects better control of insulin release and better blood glucose regulation.
- Regular almond consumers may also be more likely to consume fewer calories and manage weight better.

Consumer Messages:

Weight management and appetite regulation are complex, but researchers are learning more about how the hormones that manage our appetite function. A new study in overweight and obese adults found snacking on almonds may regulate some of the hormones that suppress appetite.

As the obesity rates continue to rise, nutrition researchers are looking at foods that help regulate appetite. A new study of almonds found that snacking on these nutrient-dense nuts helped decrease some hormones that regulate our appetite. Almonds are high in fibre and good fats, plus a source of plant protein, which makes them a weight-smart snack.

How to Put into Practice:

Media outreach: Weight management is a perennial topic in the news and New Year’s is a great moment in time to highlight the importance of making small, sustainable changes for a healthy diet rather than dieting. Why not use these findings to counter fad diet articles in the media to rebalance the topic?

Social media posts: Post about healthy habits that can help with weight management highlighting that research shows an almond snack can be beneficial

Connecting with clients: The study gives an opportunity to talk in an informative and positive way about weight management.

Study Citation

Carter, S., Hill, A.M., Buckley, J.D. et al. Acute feeding with almonds compared to a carbohydrate-based snack improves appetite-regulating hormones with no effect on self-reported appetite sensations: a randomised controlled trial. *Eur J Nutr* (2022). <https://doi.org/10.1007/s00394-022-03027-2>

NOVEL PREDIABETES FINDINGS

Two new research studies where people with prediabetes ate a small portion of almonds before meals -- one conducted over the short term (three days) and the other lasting three months -- demonstrated benefits to blood sugar control. In fact, the three month almond intervention broke new ground, reversing prediabetes to normal blood sugar levels in nearly one quarter of the people studied. Moreover, the blood sugar improvements from almond consumption were as potent as taking prescription diabetes medication.

Study at a Glance

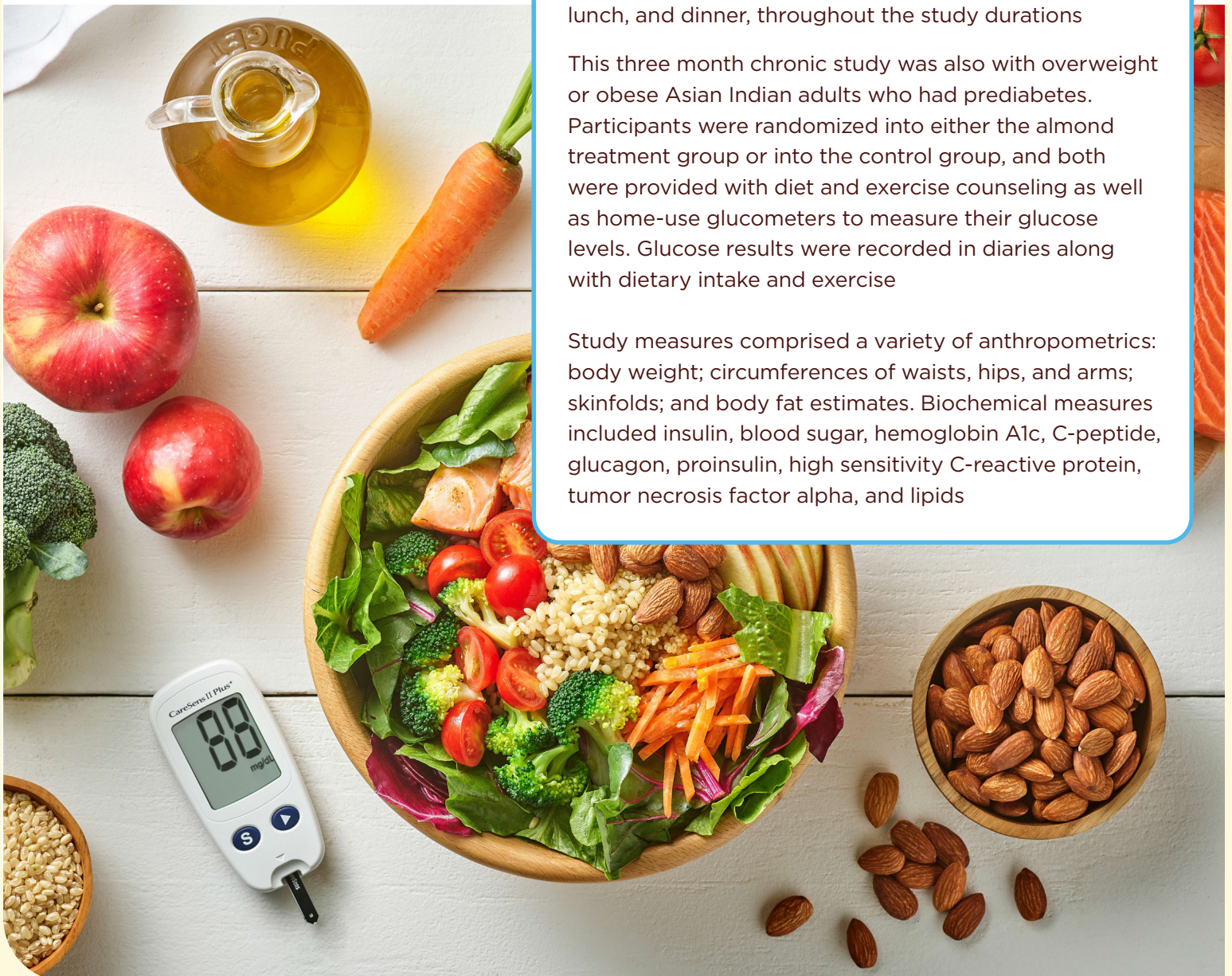
The Study

Both studies, which were randomized controlled trials were novel investigations involving overweight and obese Asian Indian participants with prediabetes. The researchers hypothesized that the almond snack before major meals, known as “preloading,” would reduce overall glycaemia and postprandial hyperglycemia (PPHG) compared to control diets.

The treatment in both studies comprised a small handful of 20g of almonds eaten 30 minutes before breakfast, lunch, and dinner, throughout the study durations

This three month chronic study was also with overweight or obese Asian Indian adults who had prediabetes. Participants were randomized into either the almond treatment group or into the control group, and both were provided with diet and exercise counseling as well as home-use glucometers to measure their glucose levels. Glucose results were recorded in diaries along with dietary intake and exercise

Study measures comprised a variety of anthropometrics: body weight; circumferences of waists, hips, and arms; skinfolds; and body fat estimates. Biochemical measures included insulin, blood sugar, hemoglobin A1c, C-peptide, glucagon, proinsulin, high sensitivity C-reactive protein, tumor necrosis factor alpha, and lipids



Results

- Upon conclusion of the acute one-day phase study, researchers found that indicators for hyperglycemia, such as blood glucose, serum insulin, C-peptide, and OGTT results, were lower for the almond group versus the control group, most notably an 18.05% decrease in PPHG levels, indicating improved regulation of glycemic responses among the almond consumers.
- During the three day study, results from the continual glucose monitoring system showed statistically significant improvement in glucose variability over the first 24 hours, indicating appropriate glucose control. Specifically, PPHG levels were lowered by 10.07%. Additionally, treatment with premeal almond loading significantly improved several indicators that reflect daily glycemic control compared to the control group, and the improved indicators included lower mean 24-hour blood glucose concentration, less time spent above an elevated blood glucose level of 140 mg/dL, lower peak 24-hour glucose levels, decreased post-prandial blood glucose levels, lower minimum glucose levels at night, and lower overall hyperglycaemia.
- For the chronic phase, eating 20g almonds ahead of breakfast, lunch, and dinner, for three months resulted in first-of-its kind statistically significant reductions for the treatment group with body weight, body mass index, waist circumference, hip circumference, skinfold tests for shoulder and hip areas, as well as improved handgrip strength.
- Reductions were seen for fasting glucose, postprandial insulin, hemoglobin A1c, proinsulin, total cholesterol, LDL-cholesterol, and very low-density lipoprotein. Importantly, no changes occurred with beneficial HDL-cholesterol.
- These substantial metabolic improvements lead to nearly one-fourth (23.3%) of the prediabetes study participants enjoying a return to normal blood glucose regulation and shows the potential for reversal of prediabetes to normal glucose regulation over three months. The blood glucose improvements seen in this longer-term study were consistent with the potency of prescription diabetes medication.

Conclusions

With both studies, Dr. Misra and his colleagues found that eating 20g of almonds 30 minutes before a meal showed significant improvements in glycemic control compared to not eating almonds before meals in both short term and long-term interventions.

Almonds can be part of a nutritious solution to help prevent or delay the development of diabetes in people with prediabetes and these findings support the potential of a return to normal blood sugar levels from elevated levels found in prediabetes through an almond preloading dietary approach.

Limitations

Limitations of the acute study include a smaller sample size comprising people with prediabetes and inability to generalize to a longer intervention duration. Also, nutritional intervention studies can trigger behavioral changes in both groups as the participants are made aware of their risk during the recruitment process and were given dietary instruction prior to the study. Generating more longer-term data as well as examining non-obese participants would be useful. Also, further investigation is needed in other ethnicities, and people with diabetes.

How to Put into Practice:

- **Media outreach:** Diabetes is a timely news topic as the rate keeps growing to record levels; however news about managing prediabetes to avoid diabetes may be a new concept to some. You can share further information on prediabetes and offer healthy eating tips to help manage it.
- **Social media posts:** There are several moments that lend themselves to talking about diabetes such as Diabetes Awareness Week (June - UK) and World Diabetes Month (November).
- **Connecting with clients:** Find out what your local dietetic association is organising to educate the public about diabetes. Offer to create a tip sheet on healthy food swaps which can include almonds to provide as a take-away. The same tip sheet can be shared with patients in clinic or used in media work.





Consumer Messages:

In this new study, eating a small handful (20g) of almonds before meals helped manage blood sugar as well as decrease BMI in people with prediabetes. The results show great promise in adding a nutrient-rich almond snack to help reverse the progression of prediabetes to diabetes.

Researchers think the nutrients in almonds may play a role in helping manage blood sugar regulation in prediabetes and even avoid the progression to diabetes. The natural combination of good fats and fibre could increase the feeling of fullness, which could help people ingest less food and fewer calories to promote weight management, which is important in helping reverse the course of prediabetes to diabetes.

Study Citation

Gulati, S., Misra, A., Tiwari, R., Sharma, M., Pandey, R. M., Upadhyay, A. D., & Sati, H. C. (2023). Beneficial effects of premeal almond load on glucose profile on oral glucose tolerance and continuous glucose monitoring: randomized crossover trials in Asian Indians with prediabetes. *European Journal of Clinical Nutrition*. <https://doi.org/10.1038/s41430-023-01263-1>

2 Gulati, S., Misra, A., Tiwari, R., Sharma, M., Pandey, R. M., Upadhyay, A. D., & Sati, H. C. (2023). Premeal almond load decreases postprandial glycaemia, adiposity and reversed prediabetes to normoglycemia: a randomized controlled trial. *Clinical Nutrition ESPEN*, 54, 12-22. <https://doi.org/10.1016/j.clnesp.2022.12.028>

TRANSFORMING A PEER-REVIEWED STUDY INTO BITE-SIZED NUTRITION

The latest breaking study is always exciting news to health professionals. Could this piece of research answer a tricky question about a particular food? Are findings going to contradict other dietary guidance? Did the scientists find a big or little piece of the puzzle to further early science of nutrition?

Now the excitement we feel as health professionals is often contrasted with the cool and the public at large. 'Does the study mean I can eat this food now?' 'I thought it for me, but now it's good?' 'Oh, it's another study that I don't understand so I'll just ignore it.' The gap between the two audiences has never been bigger, but it is surmountable - by breaking it down into smaller pieces. The purpose of this handout is to give you a complex study and make the results bite-sized and easier to understand.

THESE TECHNIQUES CAN MAKE RESULTS CLEAR AND MORE USEFUL

- **First explain one outcome of the study** - the important one.
- **Tell how a piece of research fits into other dietary advice** - use an analogy.
- **Don't go heavily into the design** - consider linking directly to a study (if appropriate).
- **Explain how the benefit fits** - within context of what we already know.
- **Give your opinion as an expert and assess the science critically** - if appropriate.
- **Provide a concrete piece of advice** - to enhance the relevance of the study.



IN THE SPOTLIGHT: EMERGING NUTRITION RESEARCH

The Almond Board of California has always been a leader in nutrition research with nearly 200 published studies to date. This module details three new nutrition research frontiers that we are investigating. Being on top of breaking science is important for topical media interviews as well as providing new content for stand-out speaking engagements.

Research Areas Covered in this Almond Academy Module

Skin Health

- How almond consumption supports the skin's natural defense against UVB rays
- How eating almonds improves both facial wrinkles and skin pigmentation

Vascular Health

- An increase in endothelium-dependent vasodilation from almond snacking - a new finding
- The resulting positive effect on cardiovascular disease relative risk

Diet Quality

- New analysis of almond consumption's impact on improved dietary intake
- New finding about positive benefits for heart health risk factors



More Research Resources at Your Fingertips

Almond Academy - we have created an entire suite of skills-building handouts to aid you in your communications. Resources to check out include:

- [Transforming a Peer-Reviewed Study into Bite-Sized Nutrition](#)
- [In the Spotlight: Emerging Nutrition Research](#)

This one-pager has all the latest nutritional data in one place: [Unleash the Crunch Power of Almonds](#)

PubMed - Be sure to sign up for alerts about new research topics that you care about or related to your specialty.

It's an easy way to stay connected without having to do independent searches.

