

# WINTER 2023

# NUTRITION BULLETIN

## IN THE LATEST EDITION OF THE ALMOND BOARD NUTRITION BULLETIN:

Happy New Year from the Almond Board of California! We are kicking off the year with some exciting new research about gut health and healthy weight management. We are also excited to share the annual social media calendar to inspire your channels as well as some tasty, warming recipes. Healthy Wishes for 2023!

# RESEARCH SPOTLIGHT



**New research, funded by the Almond Board of California, 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 multiple processes related to human health, including improving sleep quality and fighting inflammation, and has been associated with a lower risk of colon cancer. Almond consumption also significantly increases stool output.**

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*. *naac265*. <https://doi.org/10.1093/ajcn/naac265>

## STUDY DESIGN

A team of researchers, led by Professor Kevin Whelan from 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. In this trial, researchers recruited 87 healthy adult male and female participants, aged 18 to 45 years, who described themselves as regular snackers enjoying 2 or more snacks daily. Participants were consuming a typical diet that was lower in fibre than recommended and screened extensively for exclusion criteria. Each group comprised 29 participants; group one received 56 g/day of whole almonds, group two 56 g/day of ground almonds (almond flour), and the control group ate energy-matched snack muffins (2/day). Participants were required to eat their study snacks instead of customary snacks, and they did this twice daily for 4 weeks. They drank at least 100 mL water with each snack.

Measured outcomes included relative abundance of fecal bifidobacteria, fecal microbiota composition and diversity, fecal SCFAs, whole-gut transit time, gut pH, stool output (both frequency and consistency), and gut symptoms. A subgroup of 41 completed measurement of gut transit time, pH, and pressure with a wireless motility capsule for baseline. Another subgroup of 31 were in the mastication analysis of almond form (whole versus ground).

## RESULTS

- The fecal microbiota composition was analysed, and there were no significant differences in phyla or genera between bacterial groups at baseline. Moreover, almonds in either whole or ground state did not increase the abundance of fecal bifidobacteria when compared to the control snack. However, previous research study reported that almonds increased microbiome diversity, while decreasing relative levels of potentially harmful bacteria.
- For the gut microbiota metabolites, researchers found no significant differences between groups for total or individual SCFAs. In the statistical analysis performed, butyrate was significantly higher among all almond consumers compared to those who consumed the snack muffin. There was no significant difference in whole gut transit time, neither was a difference observed in small bowel pH or colonic pH. The whole almond consumers experienced a significant difference in stool frequency with an additional 1.5 bowel movements per week. There were no differences in any of the groups for incidence or severity of common gastrointestinal symptoms.

## LIMITATIONS

Include 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 recognise their findings are not necessarily generalisable to males or to older populations.

## IN CONCLUSION

Professor Whelan and his colleagues found that study participants who consumed almonds experienced significant increases in butyrate as well as increased stool frequency. Almonds were well tolerated and did not lead to gastrointestinal symptoms, which indicates almond consumption may be a way to increase fibre without causing any adverse effects. This is suggestive of positive alterations to microbiota functionality.

# RESEARCH SPOTLIGHT



**Dr. Alison Coates and her research team in Australia studied how almonds affected appetite and the hormones that help regulate appetite in a new study was funded by the Almond Board of California.**

Carter, S., Hill, A. M., Buckley, J. D., Tan, S., Rogers, G. B., & Coates, A. M. Acute feeding with almonds compared to a carbohydrate-based snack improves appetite-regulating hormones with no effect on self-reported appetite sensations: A randomized controlled trial. (2022). *European Journal of Nutrition*. <https://doi.org/10.1007/s00394-022-03027-2>

## STUDY DESIGN

The study involved 140 individuals with overweight or obesity (42 males, 98 females), aged 47.5 years (+ 10.8 years). Participants consumed unsalted, whole, natural almonds with skins (intervention) or an oven-baked fruit cereal bar (control) and had measured their levels of appetite-regulating hormones and self-reported appetite ratings over a subsequent 2-hour period. The almond portion provided was approximately 30 to 50 grams almonds (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 may have implications for the development of diabetes and cardiovascular disease. Almonds may reduce the glucose response and over time may help reduce insulin resistance when consumed with a high carbohydrate food or meal. 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 at the buffet, although the finding was not statistically significant.
- While several of the main appetite-regulating hormones for the almond group responded favourably, 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 as Dr. Coates explained, "Published research tells us there's often no direct correlation between appetite hormones, appetite ratings, and subsequent energy intake." 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. Regardless, almonds' nutritional profile may contribute to the satiating properties that explain why the buffet eaters consumed fewer calories. One 30-gram portion of almonds includes 6g of plant protein and 4g of fibre.

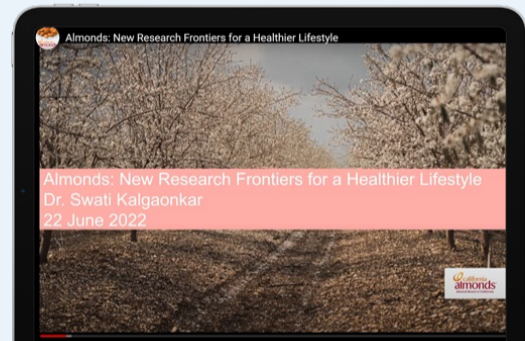
## LIMITATIONS

Include a COVID-19 overlay resulting 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. The research team recommends that future studies investigate implications for longer-term appetite regulation.

## IN CONCLUSION

The study indicates 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. Previous published research about almonds and weight management can be found in the current [State of the Science](#).

# HP CORNER



[The Almond Academy Social Media Calendar is back!](#)

This handy resource provides social post inspiration around popular health awareness days and cultural events. We hope you enjoy this guide full of great ideas underpinned with almond nutrition science to communicate meaningful health messages. Be sure to tag #almonds in your posts.

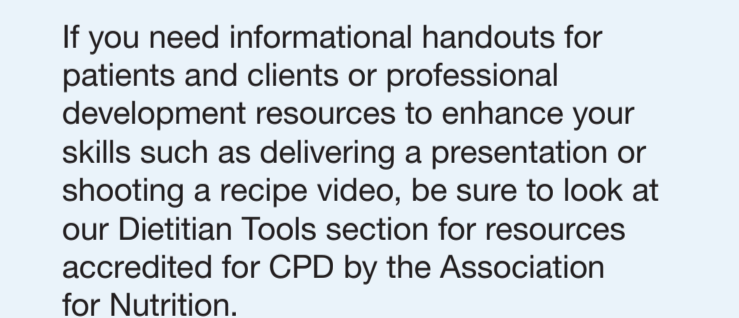
[Almond Research Webinar:](#)

This webinar, which is endorsed by the British Dietetic Association for self-study, provides an update on the latest scientific research on the benefits of almond consumption for skin health, blood glucose control, cardiovascular disease and more.

[More for Health Professionals:](#)

If you need informational handouts for patients and clients or professional development resources to enhance your skills such as delivering a presentation or shooting a recipe video, be sure to look at our Dietitian Tools section for resources accredited for CPDs by the Association for Nutrition.

# ALMOND ACADEMY WEBINARS 101



# RECIPE INSPIRATION

# HOT CHOCOLATE



This almond milk hot chocolate by Chef Dan Churchill is the perfect warming treat for chilly winter days.