Vitamin-K biomarkers associated with cognitive functions in Elders

Biomarkers indicating a low vitamin K status were associated with impaired cognitive function in a recent population-based observational study of 800 community-dwelling older adults. The study, published in *Frontiers in Nutrition*, recruited a population with a mean age of 75.9, and conducted a geriatric health examination, including a Mini-Mental State Examination (MMSE) along with a blood to specifically measure serum undercarboxylated osteocalcin (ucOC), which is considered a biomarker for low vitamin K status.

Using binary logistic regression analysis, there were significant differences in cognitive impairment risks for each tertile of ucOC that was examined. Specifically, those in the population who were in the highest tertile (having the highest ucOC concentrations) were 65% more likely to have impaired performances in measures of orientation, calculation, and language, as measured by the MMSE score.

This study signifies the association of single ucOC measurement and cognitive impairment. The analysis also suggests that vitamin K insufficiency could be associated with selected categories of cognitive function. The single measurement of ucOC could be useful as a biomarker of neurodegenerative diseases affecting the cognitive functions.

"We have worked with world-renowned researchers as Natto Pharma and that work continues at Gnosis by Lesaffre to confirm the safe and effective health benefits Vitamin K2. Elucidating the important mechanism of activating K-dependent proteins, including osteocalcin and Matrix Gla protein (MGP), was a foundational piece of work," said Dr. Hogne Vik, chief medical officer with Gnosis by Lesaffre.

While the present study specifically looked at a biomarker of vitamin K status, Gnosis by Lessafre noted that previous research has demonstrated supplementation with its K2 ingredient, marketed as MenaQ7, has improved vitamin K status as measured by ucOC.

6-12 prunes a day may lower inflammation and osteoporosis

Osteoporosis is the most common bone disease causing the bones to lose mass and become porous and fragile, especially in elders, older females, especially postmenopausal females as the estrogen levels also goes down causing inflammation. This increases the risk of fractures and lasting effects such as persistent pain and collapsed spine.

New research from the Integrative and Biomedical Physiology Program and the Departments of Nutritional Sciences and Kinesiology at The Pennsylvania State University (Penn State) discusses how prune consumption affects inflammatory markers associated with bone loss. This work suggests that women can lower inflammation by eating six to 12 prunes a day.

Lead author Janhavi Damani, MS, a graduate student at Penn State's Huck Institute of the Life Sciences, introduced her team's findings at the Experimental Biology meeting of the American Physiological Society in Philadelphia, PA.

Prunes, which are rich in polyphenols, have demonstrated their antioxidant and anti-inflammatory properties in other studies.

Damani and her team recruited women with age of 55-75 years with low bone mineral density scores, an indication of osteoporosis. The researchers aimed to evaluate how 12 months of prune consumption,

along with calcium and vitamin D could affect inflammation levels. They were segregated in 3 groups, with 6 prunes a day, 12 prunes a day and a control group with no prune consumption.

The researchers observed significant reductions in inflammatory markers in the participants who ate prunes compared to the control group. The study did not show any effects on the bone density.

Intake of Choline alone to improve Maternal DHA Status during pregnancy

According to a new study published in the *American Journal of Clinical Nutrition*, boosting the maternal intake of choline may improve a pregnant mother's DHA status, even when no additional DHA is consumed, Essentially, the study found that women consuming a fixed amount of supplemental DHA would have greater DHA status if they consume a greater amount of choline.

In the study, researchers at Cornell University led by Kevin Klatt sought to determine the impact of choline supplementation on DHA status during pregnancy. DHA is an omega-3 fatty acid which accumulates in the brain and eyes, which is evidenced to play a critical role in an infant's development and through the lifespan.

The Cornell researchers used VitaCholine from Balchem. The findings of the present study were particularly consequential, because this is the first time that elevated maternal DHA status was driven solely by increasing maternal choline intake. In the study, 30 pregnant participants were recruited during the second trimester of their

pregnancies who were given 200 mg/day DHA and were randomized to receive either 25 or 550 mg/day of supplemental choline, with maternal blood draws taken regularly until delivery, at which point, markers of DHA status in umbilical cord blood were assessed.

"Prenatal choline supplementation improves hepatic DHA export and biomarkers of DHA status by bolstering methyl group supply for PEMT activity among pregnant participants consuming supplemental DHA," the authors of the study concluded.

Recommended intake of choline increases during pregnancy, and the adequate intake of this nutrient is evidenced to support the growth and development of a child's brain and spinal cord. As a building block of phosphatidylcholine, it aids in the transport of lipids such as DHA to various tissues throughout the body, which, in pregnant women, includes the placenta.

Based on the synergistic interaction observed in this study, "existing clinical trials of prenatal DHA supplementation likely achieved non-maximal status, resulting from a limited methyl donor supply," the authors noted.

"Earlier we saw the positive impact of higher maternal VitaCholine intakes on cognitive processing speeds during infancy and the subsequent improvements to focus and sustained attention in the same kids at the age of seven. Now, this new research highlights a dual role for choline in early life – boosting cognitive performance and increasing DHA uptake to support growing brains. This powerful pairing is critical to enhancing brain development in both the short and long-term," said Shitij Chabba, vice president of minerals and nutrients, and human nutrition and health marketing at Balchem, the supplier of VitaCholine.

Tocotrienols to help in weight loss, cognitive performance

A recently-published animal study identified that tocotrienols, a specific family of vitamin E compounds, may play a role in inhibiting weight gain. The study also supported that this form of vitamin E is highly bioavailable to the brain, as it surpassed the blood brain barrier and inhibited the activity of reac-

tive oxygen species in the brains of mice fed a high-fat diet.

According to the authors, writing in the *Journal of Clinical Biochemistry and Nutrition*, current research widely suggests ties between obesity and cognitive deficiencies including neurodegenerative diseases such as Alzheimer's Disease (AD) among

other memory difficulties.

In the present study, conducted collaboratively by researchers from Shibaura Institute of Technology, Kyorin University, and Tokyo Metropolitan Institute of Gerontology, mice were separated into groups where they were either administered a control diet or a high-fat (HFD) with or without tocotrienols.

After the eight-week intervention period, it was found that tocotrienols significantly inhibited body weight gain in the HFD-treated mice. Further, tocotrienols also prevented the synthesis and accumulation of lipid droplets in liver tissue, both in the presence of HFD and the control diet.

Tocotrienols were elevated in various tissues including the liver, as well as the cortex and hippocampus areas of the brain. Tocotrienols were discovered in perfused brain samples which indicates that supplementation significantly increased brain alpha-tocotrienol levels considerably. This confirmed that tocotrienols reached the brain without blood brain barrier dysfunction, upon which they inhibited reactive oxygen species production in the brain, which is tied to improved cognitive function.

"Obesity appears to affect amyloid (Aβ) aggregation and tau phosphorylation, speeding up the etiology of Alzheimer's disease. This new finding suggests that T3s [tocotrienols] could be an effective approach in preventing obesity and cognitive dysfunction," Dr. Ariati Aris, scientific affairs specialist at PhytoGaia, a company that supplies tocotrienols said.

New gene-edited tomatoes could boost your vitamin D levels

Finding it hard to raise levels of Vitamin D, popularly known as the sunshine vitamin? Scientists have developed gene-edited tomatoes that could be a simple and sustainable innovation to address the global health problem. Researchers John Innes Centre in the UK used gene editing to turn off a specific molecule in the plant's genome which increased provitamin D3 in both the fruit and leaves of tomato plants. It was then converted to Vitamin D3 through exposure to Ultraviolet B light.

Vitamin D is created in our bodies after skin's exposure to UVB light, but the major source is food. This new biofortified crop could help millions of people with Vitamin D insufficiency, a growing issue linked to higher risk of cancer, dementia, and many leading causes of mortality, according to the study, which appears in the journal *Nature Plants*.

Tomatoes naturally contain one of the building blocks of Vitamin D3, called provitamin D3 or 7-dehydrocholesterol (7-DHC), in their leaves at very low levels. Provitamin D3, does not normally accumulate in ripe tomato fruits. Researchers used CRISPR-Cas9 gene editing to make revisions to the genetic code of tomato plants so that provitamin D3 accumulates in the tomato fruit. The leaves of the edited plants contained up to 600 microgram of provitamin D3 per gram of dry weight. The recommended daily intake of vitamin d is 10 micrograms for adults.

When growing tomatoes leaves are usually waste material, but those of the edited plants could be used for the manufacture of vegan-friendly Vitamin D3 supplements, or for food fortification. The study noted that the provitamin D enriched tomatoes could be much helpful for people adopting a plant-rich, vegetarian or vegan diet, and for the growing number of people worldwide suffering from the problem of vitamin D insufficiency.

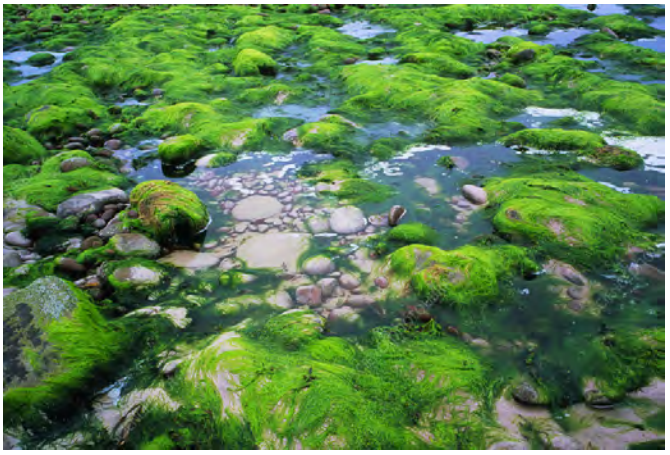
Algal metabolites as novel drugs against viruses

Bioactive metabolites extracted from natural resources serve as drugs for the treatment of various diseases. A new review article published in the *Journal of Biotechnology* has provided information on various nutraceutical metabolites extracted from algae. The authors also discussed the effectiveness of these bioactive metabolites to treat several diseases, including severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), the causal agent of the ongoing coronavirus disease 2019 (COVID-19) pandemic.

Algae, eukaryotic plants belonging to the kingdom Protista, originated around a billion years ago. Based

on their size, these photosynthetic organisms are classified as macroalgae (multicellular) and microalgae (unicellular). Additionally to maintaining carbon dioxide levels on earth and preventing climate change, algae contain various proteins and dietary fibers that can serve as anti-inflammatories, anti-microbes, and disease prevention agents. One of the key advantages of deriving drugs from microalgae is their metabolic plasticity. Pharmacologically significant algae can be cultivated on a large scale using photo-bioreactors.

The edible form of marine algae contains high-value compounds, like carotenoids and astaxanthin, which exhibit exceptional antioxidant properties. This is why algae have been widely used as a health supplement for humans, with its market value reaching 3.4 billion USD. Marine microalgae (seaweed) naturally produce carrageenans, sulfated polysaccharides composed of fucoidan, fucosterol, sodium alginate, and protein. In addition, spirulina, known as a super-



food, is extracted frosm the algae named, *Spirulina platensis.* Furthermore, several metabolites, such as cyanovirin, scytovirin, and microvirin, isolated from cyanobacteria, are effective against various viral, bacterial, and fungal diseases.

Diets high in fiber associated with less resistance in gut bacteria

Healthy adults who eat a diverse diet with at least 8-10 grams of soluble fiber a day have fewer antibiotic-resistant microbes in their guts, according to a study published by Agricultural Research Service scientists and their colleagues in *mBio.* Microbes that have resistance to various commonly used antibiotics such as tetracycline and aminoglycoside are a significant source of risk for people worldwide, with the widely held expectation that the problem of antimicrobial resistance (AMR)—the term that refers to bacteria, viruses, and fungi that are resistant to antibiotics—is likely to worsen throughout the coming decades.

Antimicrobial resistance in people is largely based in their gut microbiome, where the microbes are known to carry genetically encoded strategies to survive contact with antibiotics. "And the results lead directly to the idea that modifying the diet has the potential to be a new weapon in the fight against antimicrobial resistance. And we're not talking about eating some exotic diet either, but a diverse diet, adequate in fiber, that some Americans already eat," explained research molecular biologist Danielle Lemay with the ARS Western Human Nutrition Research Center in Davis, California, and leader of the study.

In this study, the researchers were looking for specific associations of the levels of antibiotic resistance genes in the microbes of the human gut with both fiber and animal protein in adult diets. The researchers found regularly eating a diet with higher levels of fiber and lower levels of protein, especially from beef and pork, was significantly correlated with lower levels of antimicrobial resistance genes (ARG) among their gut microbes. Those with the lowest levels of ARG in their gut microbiomes also had a greater abundance of strict anaerobic microbes, which are bacteria that do not thrive when oxygen is present and are a hallmark of a healthy gut with low inflammation. Bacterial species in the family Clostridiaceae were the most numerous anaerobes found.

On the other end of the data, those people who had the highest levels of ARG in their gut microbiomes were found to have significantly less diverse gut microbiomes compared to groups with low and medium levels of ARG. "Our diets provide food for gut microbes. This all suggests that what we eat might be a solution to reduce antimicrobial resistance by modifying the gut microbiome," Lemay said. In total, 290 healthy adults participated in the study.

"But this is still just a beginning

because what we did was an observational study rather than a study in which we provided a particular diet for subjects to eat, which would allow more head-to-head comparisons," Lemay said. "In the end, dietary interventions may be useful in lessening the burden of antimicrobial resistance and might ultimately motivate dietary guidelines that will consider how nutrition could reduce the risk of antibiotic-resistant infections."

Children on vegetarian diets have similar growth and nutrition compared to children who eat meat

A study of almost 9,000 children revealed that those who eat a vegetarian diet had similar measures of growth and nutrition compared to kid's who eat meat. The research also found that children with a vegetarian diet had increased odds of underweight weight status, emphasizing the need for special care when planning the diets of vegetarian kids. The study was published, in the journal *Pediatrics* and led by researchers at St. Michael's Hospital of Unity Health Toronto.

The findings come as a shift to consuming a plant-based diet accelerates in Canada. In 2019, updates to Canada's Food Guide urged Canadians to embrace plant-based proteins, such as beans, nuts, and tofu, instead of meat.

Dr. Jonathon Maguire, pediatrician at St. Michael's Hospital of Unity Health Toronto and a scientist at MAP Centre for Urban Health Solutions at St. Michael's Hospital. Credit: Unity Health Toronto "Over the last 20 years we have seen growing popularity of plant-based diets and a changing food environment with more access to plant-based alternatives, however we have not seen research into the nutritional outcomes of children following vegetarian diets in Canada," said Dr. Jonathon Maguire, lead author of the study and a pediatrician at St. Michael's Hospital of Unity Health Toronto.

"This study demonstrates that Canadian children following vegetarian diets had similar growth and biochemical measures of nutrition compared to children consuming non-vegetarian diets. A vegetarian diet was associated with higher odds of underweight weight status, underscoring the need for careful dietary planning for children with underweight when considering vegetarian diets."

Researchers evaluated 8,907 children aged six months to eight years. The children were all participants of the TARGet Kids! cohort study and data was collected between 2008 and 2019. Participants were categorized by vegetarian status – defined as a dietary pattern that excludes meat – or non-vegetarian status.

Researchers found children who had a vegetarian diet had similar mean body mass index (BMI), height, iron, vitamin D, and cholesterol levels compared to those who consumed meat. The findings showed evidence that children with a vegetarian diet had almost two-fold higher odds of having underweight, which is defined as below the third percentile for BMI. There was no evidence of an association with overweight or obesity.

Underweight is an indicator of undernutrition, and may be a sign that the quality of the child's diet is not meeting the child's nutritional needs to support normal growth. For children who eat a vegetarian diet, the researchers emphasized access to healthcare providers who can provide growth monitoring, education and guidance to support their growth and nutrition.