

Cerealier

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Lantmännen
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THESIS

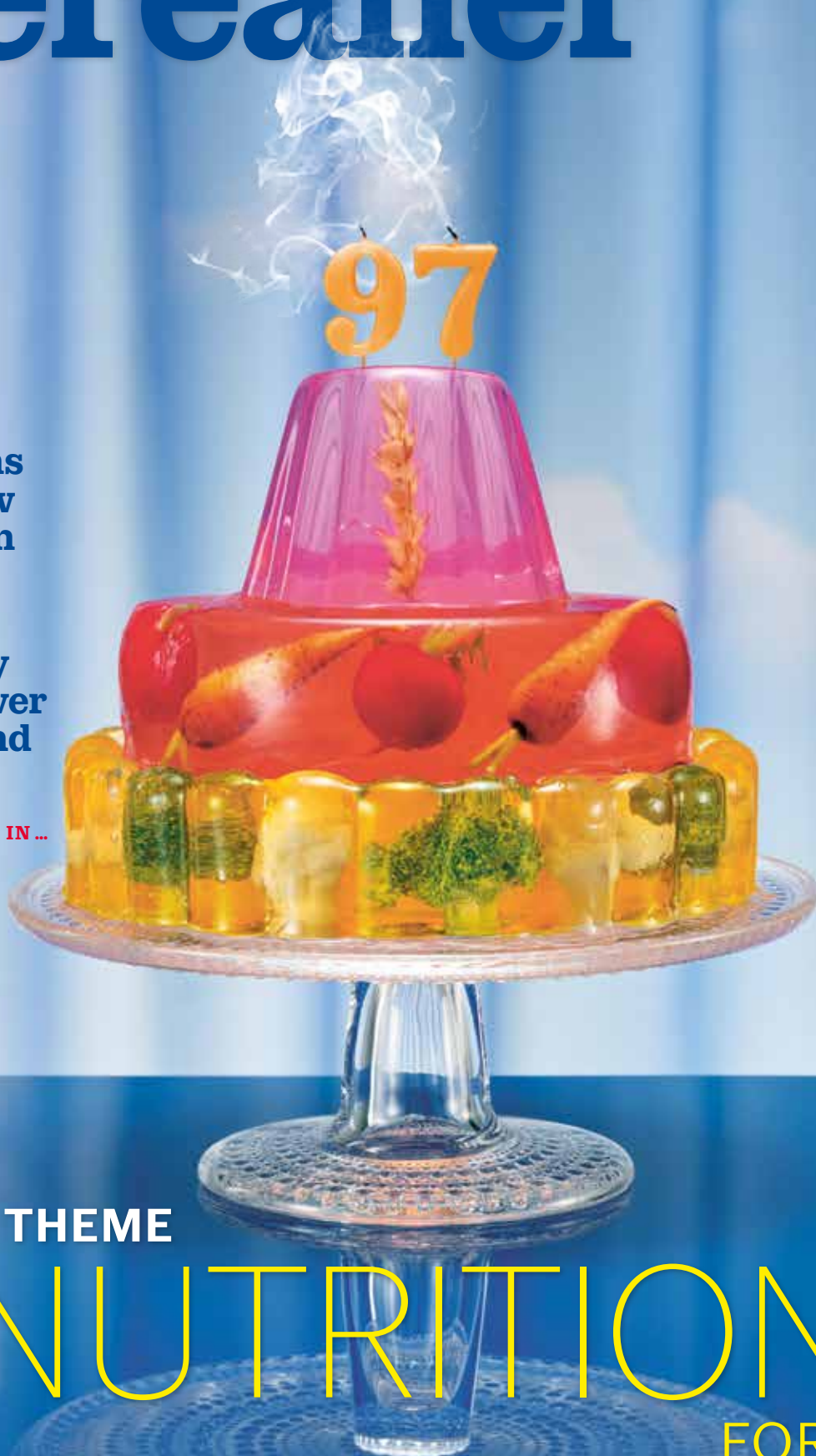
**Faba beans
create new
textures in
food**

RESEARCH

**New study
on fatty liver
disease and
diet**

WHAT HAPPENS IN ...

**Wheat
milling**



THEME

NUTRITION

FOR LIFE



Helena Fredriksson
That summer feeling!

We all know that there is a significant link between what we eat and how we feel. For this issue, on the theme of “Nutrition for life”, we have interviewed researchers who will be presenting their latest findings at the 13th Nordic Nutrition Congress in Bergen, Norway, this June. Several of them emphasise wholegrains and the Nordic diet as two important building blocks for lifelong good health.

One welcome piece of news is that a Swedish wholegrain partnership, “Fullkornsfrämjandet”, will launch soon. It is modelled on a Danish organisation, “Fullkornspartnerskapet”, which has been very successful and helped adult Danes significantly increase their wholegrain intake.

You can also read about a study where a Mediterranean diet with a low-glycaemic index had positive effects on heart health and blood sugar levels.

One conclusion drawn by the researchers is that the olive oil may not be the only element beneficial to health in the Mediterranean diet, but that the wholegrains and dietary fibres may also contribute.

In “What happens in...” we visit a wheat mill and take a look at how it operates. A skilled miller can do many exciting things with wheat. Milling is an art form.

To round off, there's a recipe for a summery pasta salad with the delicious flavours of beet-root, goat cheese and honey vinaigrette.

Happy reading!

Helena Fredriksson

Lantmännen Research Foundation



PHOTO: ISTOCK

**“Milling is
an art form.”**

Nutrition for life

*In this issue, we focus on
healthy and preventive dietary
habits throughout life.*

Pages 7–15

Cerealier

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PHOTO: PETER WESTRUP



PHOTO: ISTOCK

Cerealier Regulars

- 4 News
- 21 Recipe
- 23 News from Lantmännen Research Foundation

Theme Nutrition for life

- 8 Major health benefits from the right diet
- 10 Variety is important in children's diets
- 12 Nordic diet linked to a rich gut flora
- 14 Diet is key to the fight against dementia

In this issue

- 16 Flour composition is determined in the mill
- 18 Foods with a low GI stabilise blood sugar
- 20 Wholegrains – a path to healthy ageing
- 22 Nordic diet reduces the risk of fatty liver disease

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LANTMÄNNEN
RESEARCH FOUNDATION

Finnish study on wholegrains



A Finnish research team has studied how consuming wholegrain

wheat and rye products produces chemical compounds known as metabolites in blood and urine, and how they are linked to health.

The study involved 70 healthy people who ate differing amounts of wholegrains in two four-week intervals.

The results show that increased wholegrain intake boosts metabolites that have health-promoting properties. ●

Read more: Koistinen et al., *Nature*, 2024

Preventing malnutrition in older people



The Skåne Food Innovation Network and Research Institutes of Sweden are developing a model for calculating the savings generated by preventing malnutrition in the elderly. The aim is for policymakers to invest more in preventing this hidden public health problem. The total cost of malnutrition in healthcare and social care is

believed to be almost double the cost of overweight and obesity. A test version of the calculation model will be ready by summer 2024. ●

Read more: www.nollundernaring.se



PHOTO: LANTMÄNNEN

↑ In the future, we may be able to buy oat drink with okara in shops.

Research project about okara

A new research project at Sweden's KTH Royal Institute of Technology will create innovative food ingredients from okara, a fibre-rich by-product from oat drinks.

The project, called Over

& Oat, will investigate how okara can be better utilised.

RESEARCH WILL FOCUS on innovations in food design and ingredients, but also explore the okara's potential for use in bio-based materials. Over & Oat has received funding from the Swedish

Energy Agency. Its research is expected to contribute to a more sustainable food industry through more efficient use of resources.

The project runs until spring 2026. ●

Read more: www.kth.se/kthfood/

Eating sustainably can reduce emissions

Diet-related greenhouse gas emissions can be reduced by up to 53% with more plant-based foods.

Researchers at Karolinska Institutet conducted an optimisation analysis of data from the latest Swedish food survey, Riksmaten 2010, and succeeded in producing a diet that is below the WWF's recommendation for

greenhouse gas emissions of 1.6 kg per day from food. "We can continue to eat the same foods, but need to increase the proportion of plant-based foods," says researcher Liselotte Schäfer Elinder. ●

Read more: www.sustainableconsumption.se





Faba beans in desserts and sausages

In a recent doctoral thesis from the Swedish University of Agricultural Sciences, Mathias Johansson shows how components from the protein-rich faba bean can create new textures in food. This may eventually help increase the consumption of plant-based foods.

What we choose to put on our plates impacts the climate. The food sector now accounts for around a quarter of global emissions. Increasing the share of plant-based products and eating fewer animal products is one way to reduce food's climate impact.

In his research, Johansson has focused on the structure and properties of legumes and investigated the properties of mixed gels, jelly or tofu-like materials that can be either soft and weak or hard and chewy depending on how they have been produced. The gels were based on protein, starch and fibre from Swedish legumes, mainly faba beans.

"IF WE UNDERSTAND what controls changes in the gel's structure, we can control a food's characteristics. For example, utilising more of the faba bean will promote increased consumption of plant-based foods," says Johansson.

Gels with different structures and

properties are created when pH value changes. At a neutral pH (pH 7), stronger gels with a finer and more homogeneous structure are formed; these also hold water better than gels at an acidic pH.

GELLING PROPERTIES ARE important in the production of plant-based desserts or quark-like products, as well as sausages.

"I hope that my results can contribute to the development of new plant-based foods made from Swedish legumes," says Johansson.

Ylva Carlsson

Thesis: Johansson 2024, *Texture and micro-structure of legume-based mixed gels*, SLU.

Tastier green food with extrusion



Food technology researchers at Lund University have conducted

taste studies on vegan steaks, known as meat analogues. Ingredients such as rapeseed, hemp, yellow pea, chickpea, faba bean, oats and wheat gluten have been extruded, creating structure with fibres like those in meat.

A tasting panel then tested five different steaks, and the favourite was a combination of hemp and gluten. The results have been published in a scientific article and more studies are underway. ●

Read more: www.lu.se
(in Swedish)

Consumer study of plant-based gurt



PHOTO: LANTMÄNNEN

A new study from RISE Research Institutes of Sweden has shown that taste, appearance, texture and price are important factors when consumers buy plant-based gurt. Over 700 people aged 18 to 75 participated in the study.

A low sugar content was more important than a high protein content. Other factors that influenced their choice were the use of local ingredients, animal welfare and the environment. The study's overall aim was to understand purchase drivers for future product development. ●

Read more: www.ri.se
(in Swedish)



ILLUSTRATION: LENE DUE JENSEN

Oats as an alternative protein source

A research team at the VTT Technical Research Centre of Finland has published a review article on oats as an alternative protein source.

The article highlights techniques for separating oat protein and producing protein isolates and concentrates, as well as describing the quality and functional properties of oat protein.

The article also discusses how oat protein can be used in traditional and new foods, such as bread, pasta, spreads and chocolate. ●

Referens: Holopainen et al., *Journal of Cereal Science*, 2024

Regional initiative to promote wholegrains



PHOTO: LANTMÄNNEN

Sweden's Region Västra Götaland is investing SEK 8 million in the GoCo Health Innovation City in Mölndal, which supports sustainable and healthy food

innovations. This is enabling the start of the Swedish Fullkornsfrämjandet, a Swedish wholegrain partnership that will be run by a resource at Chalmers University

of Technology and located at GoCo Health Innovation City.

"This regional initiative will both open up GoCo to more food actors and help strengthen research focusing on food and nutrition," says Rikard Landberg, professor of food science at Chalmers.

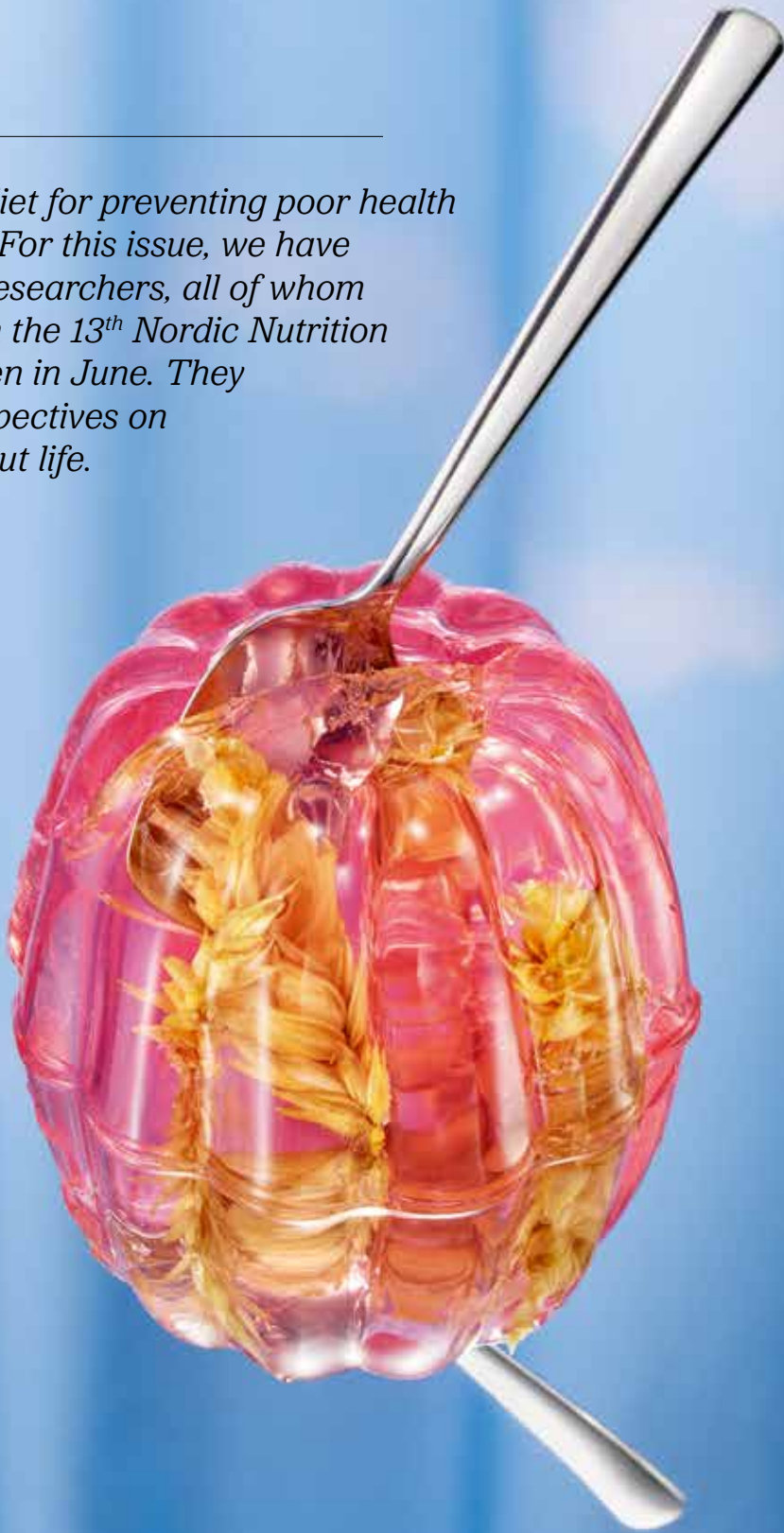
Fullkornsfrämjandet is a collaboration between the food industry, academia, public authorities and other organisations, and aims to disseminate knowledge about the health benefits of wholegrains. ●

Read more: <https://press.newsmachine.com>
(in Swedish)

THEME

What is the best diet for preventing poor health at different ages? For this issue, we have interviewed four researchers, all of whom are participants in the 13th Nordic Nutrition Congress in Bergen in June. They provide their perspectives on nutrition throughout life.

Photo Golden Retriever



NUTRITION FOR LIFE



↑ A healthy Nordic diet can prevent a range of lifestyle diseases.

Major health benefits from the right diet

A healthy Nordic diet can help prevent illness throughout life. Ursula Schwab, professor of health and clinical nutrition at the University of Eastern Finland, hopes more people will realise its potential.

“Almost everyone benefits from following the Nordic Nutrition Recommendations,” she says.

Text Karin Janson

The Mediterranean diet is probably more a familiar concept than the Nordic diet when it comes to the health benefits of food. A few years ago, Ursula Schwab compared the composition of the Mediterranean diet and the Nordic diet for a cardiology conference.

“My review showed that the difference is primarily cultural. The Mediterranean diet and its health effects have attracted great interest, and lots of research has been conducted on the diet, making it a household name. In the Nordic countries, it is natural for us to eat the foods that are available here. For example, rapeseed oil instead of olive oil and Nordic berries instead of the fruit and berries grown in other countries.”

THE NEW NORDIC Nutrition Recommendations, NNR2023, were published last year, and build upon a review of a large number of studies.

“Primarily, eating plenty of vegetables, wholegrain products and vegetable oils is important, as well as low-fat dairy

products and less red meat. Eating according to NNR2023 can prevent many of our common lifestyle diseases such as type 2 diabetes, low-grade inflammation, fatty liver and cardiovascular disease,” says Schwab.

In recent years, she has participated in studies about nutrigenomics – a field that studies how diet affects gene expression. Gene expression is how a cell responds to signals and controls different cellular processes. Abnormalities in gene expression can cause disease.

“Your diet and lifestyle affect gene expression. Several studies have shown very promising results, indicating that diet can reduce the expression of genes that are disadvantageous from the perspective of disease development.”

NUTRIGENOMICS ALSO SHOWS that we have different genetic predispositions. Some of us may be more prone to elevated

cholesterol levels or developing fatty liver.

“I would say that almost everyone benefits from following the Nordic Nutrition Recommendations but, depending on genetics, this will have a greater effect for some people,” says Schwab.

One challenge is that people generally know very little about what constitutes a healthy diet.

“I do clinical work two days a week, seeing patients. I meet people who think they eat very healthily but don’t, and vice versa. Some patients have said that they would have made dietary changes earlier if they had known about the importance of healthy food choices.

AND IT’S NEVER too late to change your lifestyle,” she emphasises. “Someone who has had a poor diet for fifty years is likely to have some health problems, but changing it can reduce the negative effects. For example, we used to think that type 2 diabetes was irreversible, but we now know that some people can avoid medication and even get rid of the disease by changing their diet and lifestyle.”

Ursula Schwab therefore hopes that the Nordic diet will become as recognised as the Mediterranean diet.

“The Nordic diet is both healthy and sustainable, so I would be surprised if it is not adopted more by both scientists and the public in the future.” ●



“...almost everyone benefits from following the Nordic Nutrition Recommendations but, depending on genetics, this will have a greater effect for some people.”

Ursula Schwab Professor, University of Eastern Finland

Reference: Schwab et al., *Mol Nutr Food Res*, 2022

Variety is important in children's diets

Many preschool children could improve their nutritional intake by increasing the proportion of fruit and vegetables in their diet, so eating a more diverse range of foods.

"Achieving an adequate intake of vitamins and minerals is possible, if some meat is replaced by legumes, whole grains and fish," says Maijaliisa Erkkola, professor of nutrition at the University of Helsinki.

Text Karin Janson

Maijaliisa Erkkola has extensive experience of studying childhood nutrition. Teaching children to eat healthily has a positive impact throughout their lives, she says.

"Dietary habits learned in childhood tend to be relatively stable and continue into adulthood, so it is important that the child's physical and social food environments support healthy choices."

AND THAT THE RESPONSIBILITY for food is with the adults surrounding the child.

"Adults are important role models for children. Introducing different tastes early in a child's life helps them develop an appreciation for bitter and sour tastes, for example, which are particularly found in fruits and vegetables."

Previous research shows that the main

nutritional challenges for children include a low intake of fruit and vegetables, especially legumes, and a high consumption of meat and dairy products.

"Lifestyle habits that contribute to obesity are also a common problem, such as a lack of physical activity, too much sedentary behaviour and insufficient sleep."

Inequality is another threat to children's wellbeing.

"Research shows that low consumption of fruit and vegetables, together with a large proportion of unhealthy food in the family's food purchases, can be linked to factors such as low parental education, low income, living in rural areas and larger families."

In a study in 2021, Erkkola and her research colleagues examined the nutritional intake of 40 Finnish preschool children, including vegans, vegetarians and meat eaters. The analyses showed that all the children on a vegan diet had vitamin A deficiency and a borderline insufficient intake of vitamin D. The vegans also had low levels of omega-3 fatty acids in their blood.

TWO YEARS EARLIER, Erkkola and her colleagues had conducted a large study that analysed the nutritional intake of 557 Finnish preschool children. They found that their intake of saturated fatty acids exceeded the Nordic recommendations for schoolchildren by more than 10% of the total energy (calories) in their diet. Meat and spreads

↑ A more varied diet could provide many children with a better nutritional balance.





PHOTO: ADOBE STOCK

were identified as important sources of saturated fatty acids.

“Finnish children who eat a mixed diet get about 70% of their protein from animal sources, especially dairy products and meat, which are also the most significant sources of saturated fatty acids.”

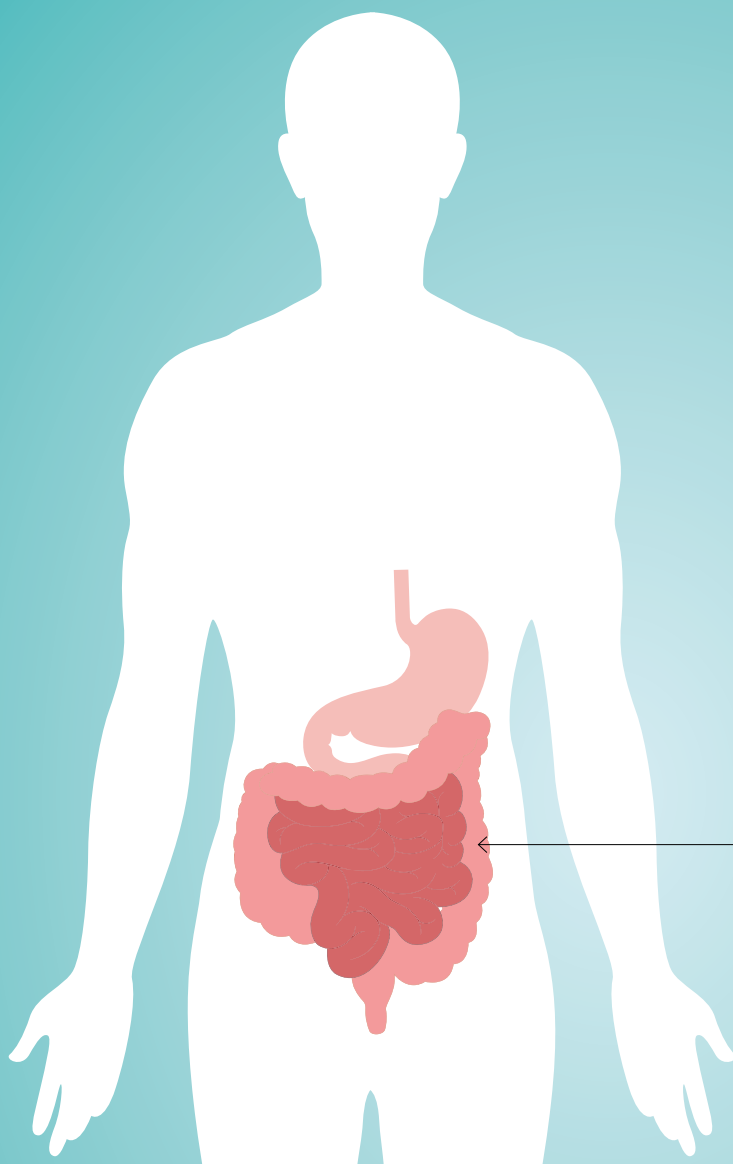
TO IMPROVE NUTRITIONAL balance, it would be good to replace some of the meat in children's diets with fish, whole grains and legumes. This would reduce their intake of saturated fatty acids.



↑ Majjaliisa Erkkola
Professor, University of Helsinki.

“It is possible to shift these relative proportions towards a greater share of plant-based foods without compromising the intake of vitamins and minerals, as long as the diet remains varied. In fact, we have recently done calculations that show how a diet that conforms with NNR2023 meets the recommended nutrient intakes for children,” concludes Erkkola. ●

References: Erkkola et al., *EMBO Mol Med*, 2021.
Erkkola et al., *Nutrients*, 2019



What is a rich gut flora?

The term “rich gut microbiota” means that the large intestine’s microbiota has a good variety of organisms, with a thousand or so different species of bacteria.

Their composition should be balanced. Some bacteria have been identified as “good”, but the line between good and bad is not absolute and can be influenced by individual health factors.

However, little diversity and/or imbalances in the gut microbiota are linked to several diseases.

What does the Nordic diet include?

According to the Nordic Nutrition Recommendations, NNR 2023, a healthy Nordic diet consists of plenty of vegetables, fruit, berries, legumes, potatoes and wholegrain products, lots of fish and nuts, a moderate intake of low-fat dairy products, limited intake of red and white meat, and a minimal intake of processed meat, alcohol, and processed foods with high amounts of added fat, salt and sugar.



SOURCE: LIVSMEDELSVERKET

Nordic diet linked to a rich gut flora

A well-balanced Nordic diet provides a rich microbiota and contributes to a healthier life. This is the result of a study of the gut bacteria of around 10,000 individuals. The more closely you follow the Nordic Nutrition Recommendations, the richer your gut flora will be.

Text Linda Swartz

Professor Marju Orho-Melander and her research team at Lund University, Sweden, used data from the large population-based cohort study SCAPIS (see explanation). In total, data from approximately 10,000 individuals from Malmö and Uppsala were used.

One thing the researchers investigated was the link between dietary habits and the richness of the gut bacteria, the microbiota. They chose dietary guidelines that are based on the Nordic Nutrition Recommendations, both what to eat more of and what to limit or replace with better alternatives. People in the study were asked how much, and how often, they eat different foods. Orho-Melander's colleague, Ulrika Ericson then processed the data.

"We looked at twelve dietary components, such as wholegrain, vegetables, fruit and nuts. The responses were then converted, at individual level, into an index that shows how well the recommendations were followed," says Orho-Melander.

The next step was to investigate how the gut microbiota was linked to eating habits. They found a clear pattern: the more closely the recommendations were followed, the richer the gut flora. In this



"They can also provide clues about causality, meaning whether and how your gut microbiota actually affects the risk of developing a disease in the future."

Marju Orho-Melander
Professor, Lund University

as yet unpublished study, 4,000 different bacteria were examined, as well as how they are affected by diet.

Studies on dietary intake have a well-known problem – that people tend to misjudge what they eat. In this case, the researchers feel confident about the results, as they also examined objective biomarkers.

"We have measured metabolites, biomarkers circulating in the blood, which reflect the dietary components. For example, beta-cryptoxanthin indicates the intake of fruit and berries," says Orho-Melander.

WHEN ULRIKA ERICSON combined the dietary index that was based on self-reported intake with an index based on dietary biomarkers, she saw an even stronger link to the microbiota's richness. Orho-Melander points out that studies of gut bacteria on this scale are very expensive but important, because small studies only included a limited part of the microbiota.

From a research perspective, the best

thing about SCAPIS is that it includes a follow-up about nine years after the first study was conducted. Orho-Melander says she is looking forward to seeing what happens in the body – and the gut flora – over such a long period.

"For example, once the follow-up is complete, we can look at the difference in gut flora in someone who didn't have diabetes in the first round but developed it since. And because we are getting dietary data again, we can see who changed their eating habits for the better or worse, or maintained them, and how that has affected gut flora and disease development."

"Many diseases have been linked to the gut microbiota, usually one that is less species-rich," explains Orho-Melander.

EXAMPLES INCLUDE OBESITY, type 2 diabetes, cardiovascular disease, Parkinson's and Alzheimer's.

"This large-scale study with repeated measurements makes it easier to perform analyses that can provide more than just correlations. They can also provide clues about causality, meaning whether and how your gut microbiota affects the risk of developing a disease in the future." ●

SCAPIS

SCAPIS (Swedish CArdioPulmonary bioImage Study) is a unique study being run at six Swedish universities and university hospitals. It started in 2012 and includes 30,000 randomly selected participants aged between 50 and 64 from all over Sweden, who have undergone extensive examinations. Half the participants from the study's first phase have been invited to a follow-up (SCAPIS2) that started in spring 2024. Read more: www.hjart-lungfonden.se/forskning/scapis/scapis-org/

Diet is key to the fight against dementia

With dementia on the rise worldwide, researchers are looking for ways to prevent the disease, such as rethinking the food we put on our plates.

Text Ebba Arnborg

"Although there is no absolute protection from dementia, research shows that diet has preventive potential, despite some disagreements and conflicting results," says Miguel G. Borda, a specialist in geriatrics and researcher at Stavanger University Hospital in Norway.

He says that studies have shown that eating a lot of wholegrains, fruit, fish, legumes and vegetables, typical of the Mediterranean diet, is associated with a reduced risk of dementia. The polyunsaturated fatty acid omega-3, which is found in oily fish, is also important for brain health.

FOODS THAT ARE RICH in antioxidants, such as berries, leafy greens and brightly coloured fruits and vegetables, can also help counteract the development of dementia. Anthocyanins are antioxidants that give many berries and fruits their blue, purple and red colouring, and have been shown to have positive effects on brain health.

"In Stavanger, we conducted a randomised controlled trial in which we gave anthocyanins for 24 months to individuals at risk of developing dementia. We saw that their cognitive decline stopped," says Borda and continues, "We also found that people with high levels of inflammation, which can often be due to poor dietary habits, tobacco use or chronic disease, showed a more



Miguel G. Borda Geriatrics Specialist
Researcher, Stavanger University Hospital

"Maintaining a healthy weight and eating balanced meals with appropriately sized portions is important..."

pronounced benefit from consuming anthocyanins. They experienced significantly less cognitive impairment when compared to people in both the placebo and low inflammation groups."

VITAMINS B, D AND E can also potentially reduce the risk of developing the disease. The best way to get these vitamins and other nutrients is through food.

"The World Health Organisation (WHO) recommends the Mediterranean diet to reduce the risk of cognitive decline and dementia, but they conclude

A DIET TO HELP PREVENT DEMENTIA

- Choose a balanced diet and eat appropriate portions.
- Include sources of healthy fats, such as oily fish, nuts and seeds.
- Choose wholegrain products, high protein foods and a variety of colourful fruits and vegetables.

that supplementary vitamins and polyunsaturated fatty acids should not yet be recommended, as there is insufficient scientific evidence," says Borda.

Controlling your weight is also important for reducing the risk of dementia. There are always potential benefits to improving your diet, whatever your age.

"Maintaining a healthy weight and eating balanced meals with the right portion size is important from an early age, but it's never too late to start," says Borda.

STILL, HE EMPHASISES that damage to the brain's blood vessels can begin in early adulthood, and how individuals with a higher cognitive reserve are better equipped to deal with the brain pathology associated with dementia. Cognitive reserve means the brain's ability to function normally despite challenges, and can be influenced by factors such as genetics, education and life factors.

"It is logical to think that people who have had better nutrition since they were in the womb may have better cognitive reserves. However, there is a need for studies on risk factors such as poor health during pregnancy in malnourished mothers, difficult births and early life malnutrition," says Borda.

He also stresses the need for more specific research and longer follow-up periods, and calls for more targeted and individualised dietary advice. In addition, more research is needed on how to combine diet with other lifestyle factors in the fight against dementia. ●

Reference: Borda et al., *Journal of Alzheimer's Disease*, 2021



↑ A diet rich in anti-oxidants may reduce the risk of dementia.

Flour composition is determined in the mill

There are many different types of flour to choose from on the shelves. Flour's properties are naturally determined by the choice of grain, but also by how the grain is processed in the mill.

Text **Karin Janson**

“The mill's primary task is to produce flour with the most consistent quality possible,” says Lasse Jensen, production manager at Lantmännen's mill in Vejle, Denmark.

Every year, the mill in Vejle receives around 200,000 tons of grain, mainly wheat, but also rye and oats. After the grain has been cleaned, analyses are carried out to check its quality. Grain

from different deliveries can then be mixed to obtain the optimal composition for the flour to be produced.

“All grain entering the mill is analysed to assess its quality. The finished flour is also analysed before being test-baked,” says Jensen.

THE GRAIN IS TEMPERED and conditioned, which means that moisture is added, after being cleaned. This makes the

outermost part of the kernel, the bran, elastic, so it holds together better when it is processed. Several types of mill can be used to produce flour.

FOR GRAHAM, WHOLEGRAIN and all-purpose flour, a roller mill is used to crush the grains. The kernel is not gristed into flour in one go, instead this is done in stages using several rollers. Different fractions are sifted out between each stage. For example, wheat bran is a fraction that is sifted out early, while graham flour is gristed about twenty times. Sifted wheat flour is gristed twice as many times.

“As we grist and sift, we obtain a finer and finer flour. Then we blend the fractions into different types of flour depending on what they will be used for,” explains Jensen. ●

WHEAT PRODUCTS FROM THE MILL

Sifted wheat flour (all-purpose flour) consists of the inner part of the wheat kernel, the endosperm. Wheat flour comes in several varieties, such as “Special”, which has better gluten quality, “Pizza” with a high protein content, and “Ideal” with larger particles that dissolve more easily in dressings and sauces.

Graham flour is a slightly coarser wholegrain wheat flour made from all parts of the grain. In both graham flour and finely ground wholemeal flour, the different fractions are remixed to the original ratio of bran, germ and endosperm.

Crushed wheat is whole kernels of wheat that have been cut in the mill.

Semolina is made from the inner part of the wheat kernel, which is removed from the mill when the kernel is the right size.

Wheat bran consists of the outer part of the wheat kernel, bran. “Kruskakli” is coarser wheat bran with a higher fibre content.

Source: Lantmännen



PHOTO: AXA / LANTMÄNNEN

Step by step Milling wheat



PHOTO: ISTOCK

Preparation

1 Wheat kernels are transported to the mill and undergo preparatory stages such as cleaning, weighing, drying, sorting and fine cleaning.

Tempering and conditioning

2 Prior to milling, the wheat kernels are tempered and conditioned by adding moisture. This makes the bran more elastic than the endosperm, so it is easier to remove the bran from the inner parts, the endosperm and the germ, during milling.

Gristing in a roller mill

3 The wheat grain is crushed – gristed – in stages. Initially grooved rollers are used, then smooth ones. Between each gristing, the contents of the different fractions are separated using sifters. The more times the material passes through the rollers, the finer the flour.



PHOTO: LANTMÄNNEN

Sifting

4 Sifting means that flour fractions are separated by particle size and density after being gristed. To create flour for different areas of use, fractions from several sifters are blended.



PHOTO: LANTMÄNNEN

Analysis and test baking

5 To ensure the quality of the finished flour, parameters such as falling number, water, protein and ash content are analysed. All flour is then test-baked before leaving the mill. ●

Source: Lantmännen

Foods with a low GI stabilise blood sugar

How is your health affected by the carbohydrates you eat? Researchers at Chalmers University of Technology, in collaboration with Purdue University in the US and Federico II University in Italy, have taken a closer look.

Text Ebba Arnborg

Researchers asked 160 people at risk of developing type 2 diabetes to undergo a 12-week dietary intervention, in which they ate a Mediterranean-inspired diet, with a high intake of fruit, vegetables and olive oil, and a moderate intake of animal products, but with varied sources of carbohydrates. Half the participants were given low glycaemic index (GI) foods such as pasta, brown rice and wholemeal rusks, while the other half were given high GI foods like jasmine rice, mashed potatoes and couscous.

"We wanted to see whether the differences between high and low GI products matter in an otherwise healthy diet. The theory is that a low-GI diet reduces blood sugar, but we still didn't know about its long-term effects," says Thérèse Hjorth, doctoral student in food science at Chalmers and one of the study's researchers.

THEY FOUND THAT participants on the low-GI diet had significantly lower daily blood glucose levels. They also had less variation in their blood glucose levels across the day, indicating more stable blood glucose.

"As we hypothesised, blood glucose was lower

after the low GI meals compared to the high GI meals – and the difference between the groups increased over time," says Hjorth.

The difference was mainly because, over time, the group on a high-GI diet had higher blood sugar after meals, while the low-GI group had the same blood sugar response as at the start of the study.

"The study shows that a food's GI affects blood sugar levels among non-diabetics, even though they eat a healthy Mediterranean diet. Healthy dietary patterns therefore do not compensate for a high-GI diet, so you should therefore pay attention to the carbohydrate quality of your food and choose low-GI foods," she says.

A RECENTLY PUBLISHED follow-up study also showed that people with a high risk of cardiovascular disease had lower levels of triglycerides in their blood after low-GI meals compared to a similar diet that had a high GI.

Triglycerides are a type of blood fat that can increase the risk of cardiovascular disease. Lower triglyceride levels also appear to be linked to an improvement in how the body deals with blood sugar and insulin, which may also reduce the risk of cardiovascular disease.

↑ Thérèse Hjorth, doctoral student in food science at Chalmers University of Technology.



PHOTO: ANNA-LENA LUNDQVIST / CHALMERS

This supports the idea that a low-GI diet, like the Mediterranean diet, may help reduce the risk of heart problems. The right type of cereal products in the diet is therefore important, Hjorth points out.

“Our conclusion is that wholegrain products and dietary fibre are what contribute to the health benefits of the Mediterranean diet. The recommended Nordic diet has many similarities with the Mediterranean diet,” she says.

THE RESEARCHERS ALSO found great variation between the people in each group, so Hjorth says more research is needed to provide more targeted dietary advice.

“The next step is personalised nutrition,

“We wanted to see whether the difference between high and low GI products matters in an otherwise healthy diet.”

perhaps not giving the same dietary advice to everyone, because we respond to food differently,” she says. ●

Reference: Hjorth et al., *European Journal of Clinical Nutrition*, 2024

GLYCAEMIC INDEX

The glycaemic index (GI) is a scale that measures how quickly different foods raise blood glucose levels. Foods that are broken down quickly during digestion and lead to rapid fluctuations in blood sugar have high GI values, while foods that are broken down more slowly and result in more stable blood sugar levels have low GI values.



ILLUSTRATION: LENE DUE JENSEN

Wholegrains – a path to healthy ageing

According to a new Danish study, a high intake of whole grains can increase healthy life expectancy in middle-aged men and women. The greatest effect was observed for wholegrain bread.

Text Karin Janson

The results of the study come from data collected in a large population-level cohort study in Denmark, which followed 22,600

men and 25,400 women aged 50 to 64. The study started back in 1993, with the aim of discovering the link between diet and cancer. Participants had to report how much they ate of different foods.

RESEARCHER ANNE KIRSTINE Eriksen at the Danish Cancer Institute has used the study's data to create a mathematical model that examines the link between wholegrain intake and healthy ageing. Healthy ageing is defined as the length of time a person lives without

"... whole-grains are a significant factor in increasing healthy years of life."

Anne Kirstine Eriksen
Researcher,
Danish Cancer
Institute

symptoms of diseases such as cancer, stroke, type 2 diabetes, asthma, cardiovascular disease, COPD or dementia.

The results show that wholegrains may be associated with healthy ageing, and the effect is particularly clear for men. On average, the men who reported the highest wholegrain intake, over 60 grams per day, had a healthy life expectancy one year longer than that for the men who reported the lowest intake, less than 28 grams per day. Among women, those with the highest intake, over 51 grams, lived an average of 0.3 healthy years longer than those with the lowest intake, less than 24 grams per day. The reasons for the gender difference are not clear from the study.

INCREASED LONGEVITY WAS also linked to specific foods, such as rye bread for men and wholegrain bread for women.

"This shows that wholegrains are a significant factor in increasing healthy years of life. Increasing the consumption of wholegrains at a population level is realistic, because this is a sustainable and economic food source," says Eriksen. ●

Reference: Eriksen et al., *European Journal of Nutrition*, 2024

RECIPE

Fibre-rich summer salad

Beetroot, goat cheese and honey are a classic choice, precisely because it's a winning combination of flavours. The salad is also rich in greens and fibre, which the NNR2023 say help us feel good.

Pasta salad with beetroot, goat cheese & honey vinaigrette

Serves: 4

Time: 35 minutes

Salad

340 g wholegrain fusilli pasta
300 g fresh beetroot
200 g pointed cabbage
1 fennel bulb
100 ml parboiled broad beans or edamame beans
200 g goat cheese
1 cone of fresh thyme

Honey vinaigrette

1 tbsp mustard
3 tbsp honey
5 tbsp rapeseed oil
4 tbsp balsamic vinegar
Salt & black pepper

INSTRUCTIONS:

1. Cook the pasta according to the instructions on the packet. Rinse until cold.
2. Boil the beetroot in lightly salted water until soft, 20–30 minutes depending on their size. Peel and cut into large pieces.
3. Combine the beetroot with the pasta to give it a beautiful pink colour.
4. *Vinaigrette:* Combine the mustard, honey and half the vinegar in a bowl. Then add the oil drop by drop, stirring to make a lovely thick vinaigrette that sticks well to the pasta. Stir in the rest of the vinegar and season with salt and black pepper.
5. Combine the pasta with half the dressing.
6. Rinse the cabbage and slice/chop it very thinly, preferably with a mandolin. Combine the cabbage and the beans with the pasta. Crumble the cheese and place it on top of the salad. Pour over some more dressing, season with salt and pepper. ●

↑ The recipe is from Kungsörnen.

PHOTO: LANTMÄNNEN



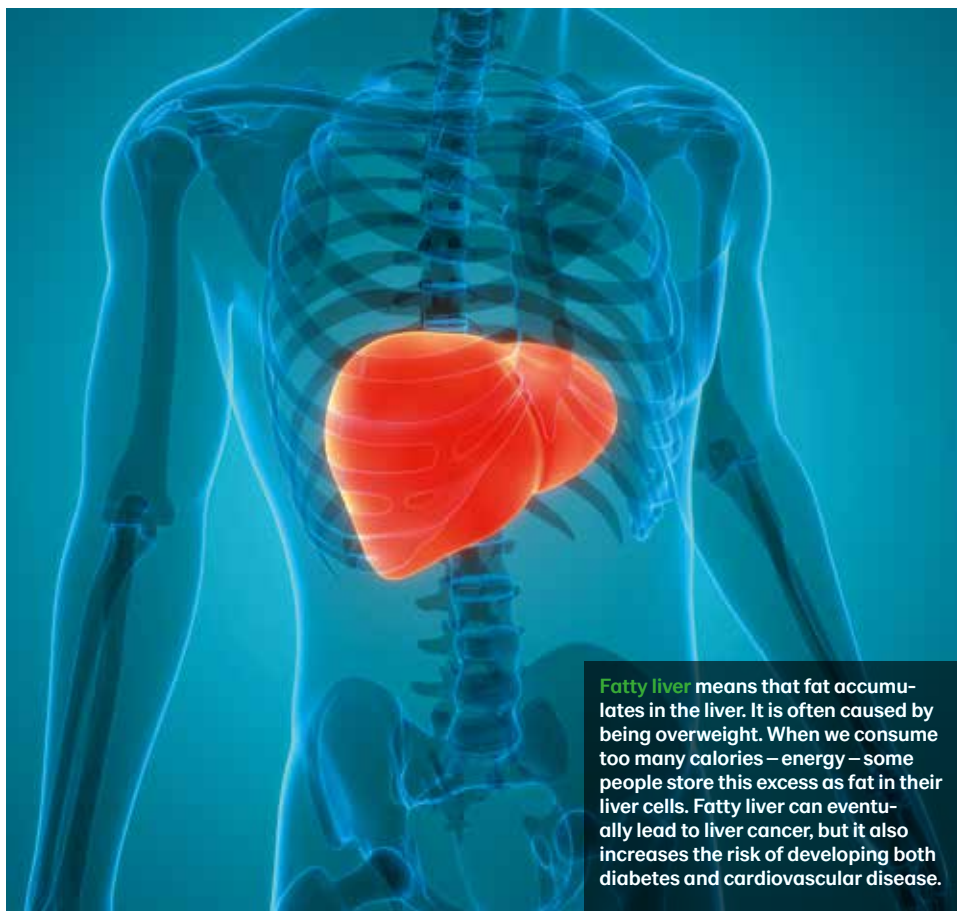


PHOTO: ISTOCK

Fatty liver means that fat accumulates in the liver. It is often caused by being overweight. When we consume too many calories – energy – some people store this excess as fat in their liver cells. Fatty liver can eventually lead to liver cancer, but it also increases the risk of developing both diabetes and cardiovascular disease.

The Nordic diet reduces the risk of fatty liver disease

A healthy Nordic diet, rich in whole grains and legumes, helps reduce fat accumulating in the livers of people with diabetes. This was shown by the first major study of people with prediabetes and type 2 diabetes.

Text Karin Janson

Over the course of a year, 150 people – 81 with type 2 diabetes and 69 with prediabetes – were given treatment and dietary advice.

They were divided into three groups: one ate a healthy Nordic diet that was rich in dietary fibre, including wholegrains, legumes, berries and vegetables, rapeseed oil and oily fish; the second was

assigned a low-carbohydrate diet, where some carbohydrates were replaced by plant-based polyunsaturated fats; and the third group was a control that could eat according to the dietary advice normally given to diabetics. Compliance was high, with 142 out of 150 people participating in the entire study period.

ULF RISÉRUS, PROFESSOR of clinical nutrition and metabolism at Uppsala University, led the study. He says its aim was to discover which diet would best help reduce patients' fatty liver.

"Many patients with diabetes have elevated levels of liver fat. If this build-up of fat can be prevented, it reduces the risk of developing more serious liver



PHOTO: CATARINA OLSSON

"If this build-up of fat can be prevented, it reduces the risk of developing more serious liver diseases..."

Ulf Risérus Professor, Uppsala University

diseases and has a positive impact on other risk factors," he says.

The results showed that the Nordic diet had the best effect on almost all the measured risk factors – blood sugar, blood lipids and inflammatory markers. Those who ate the healthy Nordic diet also lost the most weight and managed to maintain their new weight. Risérus points out that the low-carb diet also showed good results, but he was a little surprised that the Nordic diet was even more effective.

"Interestingly, both blood sugar levels and weight decreased more after the Nordic diet, which contained more fibre-rich carbohydrates and less fat."

IN ADDITION TO dietary advice, study participants were given supplies of the types of food they should eat. For the Nordic diet group, these included oatmeal, rye bread, oat rice, almonds and low-fat margarine.

Risérus and his research team will soon start a similar study with cardiovascular patients. ●

The results of the study will be presented at the 41st International Symposium on Diabetes and Nutrition in Uppsala, 27–29 June.

ABOUT THE PROJECT

The project, NAFLDiet, studied how different diets for people with prediabetes and type 2 diabetes can influence the risk factors for serious disease. It was funded by the Formas research council, the Swedish Diabetes Foundation and the Swedish Heart Lung Foundation.



PHOTO: LANTMÄNNEN

↑ A three-year project is currently underway at the Finnish Meteorological Institute, studying carbon sequestration in arable land.

Research on carbon and nitrogen balance in Nordic growing conditions

The Lantmännen Research Foundation has identified agriculture's climate impact and climate adaptation as strategic research issues.

Text Pär-Johan Lööf, Lantmännen R&D

Ground sequestration of carbon is one of the main ways to reduce the amount of carbon dioxide in the atmosphere, and slow global warming. However, there is very little data available on the extent to which cereal fields absorb carbon dioxide from the atmosphere.

A THREE-YEAR PROJECT is currently underway at the Finnish Meteorological Institute. It is studying carbon sequestration in arable soils and includes identifying

the most effective farming practices for sequestering carbon in the soil.

IN THE SUMMER of 2023, the first measurements were taken at Lantmännen's Hauho farm in Finland, and now additional farms around Finland will be linked to the project. The measurements are reported continuously and are openly available. The study, co-financed by Lantmännen Research Foundation, is the first of its kind in the Nordics, and will contribute valuable knowledge.

However, carbon sequestration alone is not enough, it is also important to reduce agriculture's greenhouse gas emissions. These can be reduced now, such as by using fossil-free fuels and mineral fertilisers produced without fossil gas. Unfortunately, nitrous oxide emissions from arable land are more

difficult to manage, so our research foundation and Yara, a mineral fertiliser manufacturer, are investing in nitrous oxide research at the Swedish University of Agricultural Sciences in Skara and the University of Gothenburg. The project will examine how using different fertilisers and cultivation strategies can reduce nitrous oxide emissions from arable land. Field trials started in 2023 and measurements will continue until the spring of 2025.

SIGNIFICANT RESEARCH EFFORTS are needed to enable climate-neutral food production and achieve the goals of the Paris Agreement by 2050. These projects can provide us with important new knowledge that can be practically implemented in agriculture and make a real difference.. ●



PHOTO: MÅRTEN SVENSSON / LANTMÄNNEN

↑ Research shows potential for rearing slaughter pigs in large groups.

Recently completed projects



Pigs in large groups

The development and modernisation of slaughter

pig farming is important for sustainable Swedish meat production. Researchers at the Swedish University of Agricultural Sciences have studied rearing systems in larger groups, giving the pigs more free space to move around than in box systems. The results showed that there is potential to rear slaughter pigs in large groups. ●



Wheat bran in a new way

Wheat bran is generated as a side stream

when wheat is fractioned. Researchers at Sweden's KTH Royal Institute of Technology have shown that a dietary fibre called arabinoxylan, extracted from wheat bran, can be combined with plant proteins to create hydrogels and films with interesting rheological and mechanical properties. Hydrogels have potential in both materials and food. ●



Marker for more reliable data

In dietary studies, it is difficult

to know whether subjects have eaten what they claim. A more reliable method is analysing blood samples for biomarkers of a specific dietary component. Researchers at Nofima, Norway, have developed a biomarker analysis method for beta-glucan. However, more studies are needed to ensure the method's feasibility. ●

About the research foundation

Lantmännen Research Foundation supports research in the entire chain, from field to fork. It grants SEK 25 million to research annually, focusing on three areas:

- Agriculture and machinery
- Bioenergy and green materials
- Food and health

The goals of this research funding include increased agricultural production with minimised

environmental impact, and establishing how agriculture can contribute to the development of a biobased society. In the area of food, we want to increase knowledge of grains and legumes as a natural element of sustainable future food.

The foundation has an open call for proposals every year. Applications are assessed on their newsworthiness, scientific quality and business potential. ●

See: www.lantmannen.com/researchfoundation

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