

Cerealier

No. 01/2026

A magazine from
Lantmännen
Research Foundation



#01

Cook a fibre-rich pasta dish



STUDY

**Nordic diet
good for the gut**

FIBRE SCHOOL

**Valuable facts
about fibre**

GUT RESEARCH

**New technology
simulates the gut**

THEME

GUT HEALTH

THE FINAL ISSUE
A newsletter
takes over from
Cerealier



Helena Fredriksson Goodbye – and see you again soon!

Recently, Lantmännen Research Foundation took the difficult decision to discontinue Cerealier, so this will be our final issue. Naturally, the editorial board thanks all our loyal readers for your great interest and commitment. In the future, you will be able to follow the foundation's work in a newsletter, which will have a broader focus on our research into cereals, health and the farming of the future. We hope that many of you will do so. Read more about this on page 22.

THIS ISSUE OF CEREALIER is on the theme of gut health, which has a huge impact on our wellbeing. We have talked to Swedish and international researchers who study gut health from slightly different perspectives.

On page 23, we look ahead and present the foundation's major research initiative on yellow peas and faba beans as ingredients.

Our interview with Ulf Risérus describes exciting research that focuses on the Nordic diet, for which the foundation is providing cereals, lentils and wholegrain pasta, so rounding off with a recipe that uses wholegrain pasta feels fitting and a natural part of our final issue of Cerealier.

Thanks for now – and see you again soon!

Helena Fredriksson

Lantmännen Research Foundation

“...so this will
be our final
issue.”



PHOTO: MATTIAS SÖDERMARK / LANTMÄNNEN

Gut health

*We feel better with a
balanced gut. **Pages 7–15***

Cerealier

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(see also image on page 7).



PHOTO: MIRANDA SOLVANG



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**LANTMÄNNEN
RESEARCH FOUNDATION**

He made the best wholegrain sandwich



A wholegrain wrap packed with healthy ingredients, such as hummus, baby spinach, chicken and yoghurt, won this year's competition for the best wholegrain sandwich.

The winner, Thomas Broström from Boden, was announced on Wholegrain Day, 14 January. The competition was organised by Brödinstitutet (the Bread Institute) and FullkornsFrämjandet, a wholegrain private-public partnership. ●

Recipe: www.brodinstitutet.se/kunskapsbanken/prisbelontafullkornsmackor/ (link in Swedish)

PHOTO: BRÖDINSTITUTET



PHOTO: ISTOCK

New guidelines emphasise good school lunches



Dining halls in Swedish schools can be stressful and feel unsafe for

students, which is the main reason that up to a third of secondary school students skip school lunches, opting for snacks and sweets instead.

The Swedish Food Agency's updated guidelines for school meals state that this can lead to poorer performance and health. One action the agency will take is to expand support for improving the physical and social meal environment.

In addition, the recommendation is that students have fixed and regular times for school meals and that each student has the opportunity to eat in peace and quiet for at least 25 minutes. ●

Read more: www.livsmedelsverket.se

BILD: LIVSMEDELSVERKET

Nordic lifestyle survey

The Nordic Council of Ministers has published a major study, Normo 2025,

which shows how lifestyles in the Nordic countries changed between 2014 and 2024.

Over 5,000 people were

asked about their dietary, exercise and alcohol habits. The results show that lifestyles have become less healthy overall.

THE NORDIC POPULATION does not exercise enough and eats less in line with the Nordic Nutrition Recommendations,

while the proportion of people who are overweight or obese has increased. Alcohol consumption is at the same level as ten years ago, but patterns vary. ●

Read more: www.norden.org/en/publication/normo-2025-nordic-monitoring-2014-2024

More protein and energy recommended in older people's food

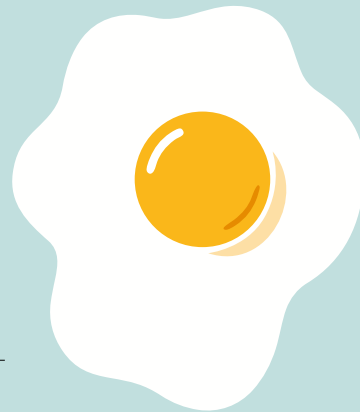
As we age, our muscles break down more quickly. According to the Swedish Food Agency, in its proposal for new guidelines for older adults, people over 65 need to supplement their diet with a little more protein to maintain muscle strength.

Our eating habits can protect us against a range of diseases, such as dementia, diabetes and cancer. Healthy older people can maintain this protection by

following the agency's dietary recommendations.

For frail older people with reduced appetite, the advice is to eat frequently and have small but energy-dense meals. Important sources of protein include poultry, fish, legumes, eggs, seeds and nuts. ●

Read more (link in Swedish): www.livsmedelsverket.se





New thesis on strategies for sustainable food choices and behaviours

In a country like Sweden, where meat is often seen as a central part of a meal, radically changing food habits can be difficult. In her thesis from Örebro University, Sweden, Ansung Kim investigated strategies to encourage more people to make sustainable food choices and opt for plant-based alternatives.

Kim grew up in South Korea, a country where tofu, made from soya beans, is a natural part of the diet.

“We see tofu as a dietary staple, not as an alternative to meat. Western societies lack this cultural connection to a plant-based ingredient as the central element of a dish. That’s why you choose meat, you are used to eating it,” says Kim.

Kim has an academic background in both nutrition and psychology. As part

of her research, a test group performed sensory tests on plant-based products. She also studied how attitudes towards meat alternatives differ in restaurants and homes.

“People’s attitudes towards these alternatives differ and depend on many factors, such as history, demographics, eating habits, emotional experiences and taste preferences. In my research, I saw that most people, despite varying backgrounds, still preferred the plant-based products that most closely resemble and taste like meat.”

IT PROVED DIFFICULT to make dietary changes at home, but when plant-based alternatives were introduced in a restaurant setting, the result was somewhat different. All the dishes with plant-based alternatives were highly rated by guests. When one dish was described as the chef’s choice, it was particularly appreciated.

“We found that many Swedes recognise and enjoy pan-fried beef, and many restaurant guests chose a vegetarian ‘pan-fried beef’ if it was on the menu. A less familiar vegetarian dish, meanwhile, could be popular if it was presented as the chef’s choice.”

KIM BELIEVES THAT restaurants can have a particular influence on getting people to try more plant-based alternatives.

“It certainly works for some people, but we also need to work with a range of strategies for different consumer groups when we launch new products.”

Ingar Nilsson

Thesis: Ansung Kim. Seeds of change for plant-based food consumption: Products, restaurants and everyday life. Örebro University, School of Hospitality, Culinary Arts and Meal Science. 2025.

Climate-smart school meals with equal nutritional value



Climate-smart food consumption is possible, and fairly broad public support

for change already exists. This is the view of *Mistra Sustainable Consumption*, a research programme that aims to encourage a transition to sustainable consumption, in a recently published report.

Results from municipalities that serve more climate-smart school meals with less meat show that this does not make them more expensive, and that the food is just as nutritious as a menu with more meat dishes. Furthermore, students are generally happy with the change. ●

Read more: www.sustainableconsumption.se (link in Swedish)

Initiative will get 10,000 students to eat more wholegrains

An EU project called *Switch*, run by Chalmers University of Technology and *RISE*, will receive further funding from *Formas*. Over the next four years, efforts will focus on initiatives that can generate clear and measurable societal benefits. One of these is the wholegrain campaign *Fullkornslyftet*, in the *Västra Götaland* region, which aims to increase schoolchildren's consumption of wholegrains. *FullkornsFrämjandet* will also produce a symbol and criteria for its use on wholegrain products. ●

Read more: www.chalmers.se/aktuellt/nyheter/life-eu-projekt-tar-nasta-steg-mot-framtidens-hallbara-matvanor/



ILLUSTRATION: LENE DUE-JENSEN

How spaghetti stays in shape

A research group at Lund University have shown that gluten and the right amount of salt in the cooking water determine the quality of the finished pasta dish.

THE STUDY COMPARED two types of commercial spaghetti: regular pasta made from wheat

flour and gluten-free pasta made from corn and rice flour. Using advanced technology, they studied the structure of spaghetti at a microscopic level.

THE GLUTEN IN spaghetti helps to maintain the starch's structure and shape, even when it is cooked for longer than stated on the packet. The

gluten-free spaghetti breaks apart easily when the cooking instructions are not followed.

THE AMOUNT OF SALT in the water is also an important factor. Spaghetti that contains gluten retains its texture even when the cooking water is too salty. ●

Read more: www.sciencedirect.com

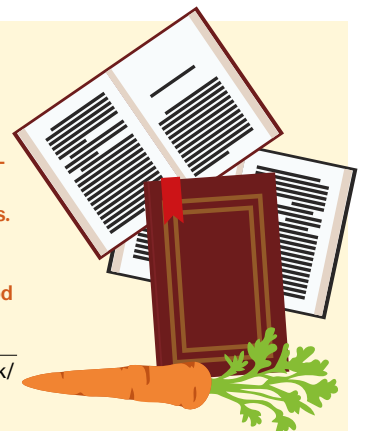
Danish libraries become food community centres

Danish families would like to eat more vegetables, but think it is difficult to cook using greens or legumes as a base, according to the latest food habits survey from the *Madkulturen* institution, part of the Ministry of Food, Agriculture and Fisheries.

So, in a special initiative, the libraries in *Slagelse*, *Kolding* and *Svendborg* municipalities will be transformed into centres of food inspiration.

In a pilot project funded by the *Novo Nordisk Foundation*, libraries will develop activities based on the *Danish Dietary Guidelines*. The activities will encourage small changes to eating habits and increase curiosity about food among children and adults. ●

Read more: www.madkulturen.dk/projekt-indsats/groen-inspiration-til-boernefamilier/ (link in Danish)



THEME

GUT HEALTH

A healthy and functioning gut is vital to health.

Most of what we eat is broken down in the gastrointestinal tract, distributing important nutrients to the body. Researchers want to uncover the diets and lifestyles that help maintain a healthy gut. They have made some progress, and food made with traditional Nordic ingredients and following dietary guidelines seems like a good start. ►

Photo Golden Retriever



Technology is an important aid for research on the gut and health

The balance in the gut probably affects our immune system, multiple organs and the risk of developing various diseases. Research into diet and gut health and what characterises healthy gut flora is advancing, in part thanks to technological advances. Although we all have a different genetic makeup, researchers know that diet is important for improving gut health and overall health.

Text Ingar Nilsson

SHIME, the Simulator of the Human Intestinal Microbial Ecosystem, is in the basement of Kemicentrum in Lund. The simulator's ten glass containers can mimic the gut environment, allowing researchers to study what happens to food in different parts of the gut: which substances form at different stages of digestion; changes to the composition of gut flora; and any disease or damage.

"By adding an individual's stool sample to SHIME, we can map how their gut flora reacts to different foods," explains Frida Hällenius, associate professor at the Department of Food and Pharmaceuticals at Lund University's Faculty of Engineering.

THE INTRODUCTION OF SHIME will reduce the need for animal testing, because it will be possible to see how the human gut reacts straight away. For

example, DNA can be extracted from stool samples and gut bacteria sequenced to understand their functions.

Hällenius's specialist area is how different foods and probiotics can affect our gut flora and, ultimately, our health. She is currently involved in a research project that is investigating the link between diet, gut flora and the risk of developing dementia.

Previously, she has studied how berries, such as lingonberries, blueberries, strawberries, raspberries and sea buckthorn, affect gut flora.

"Berries contain both dietary fibre and polyphenols that are good for the gut flora," explains Frida Hällenius. "Especially blueberries and lingonberries."

HER RESEARCH HAS also focused on cereals and wholegrains, where oats, barley and rye have been processed in various ways to investigate whether it is possible to steer towards the development of healthier products.

"Probiotics, which we often take as dietary supplements to improve gut health, are effective at an individual level, such as for diarrhoea. However, we will soon also be seeing more products with probiotics that can protect against colds and infections."

Psychobiotics are also being discussed within the research community. By modelling the gut flora, researchers are attempting to understand which bacteria are needed to reduce stress and



"Diet trumps genes if we want to ... improve our gut flora"

Frida Hällenius
Associate Professor,
Faculty of Engineering, Lund University.



PHOTO: HILDE SKAR OLSEN

improve sleep, but no one yet knows the optimal mix of bacteria.

“We need to conduct more functional testing of the intestine and more long-term studies that can link the results to diseases that develop later in life,” says Hållenius.

OUR GUT IS ESSENTIALLY sterile when we are born, and our genetic predisposition influences the bacterial composition of our gut flora. But diet trumps genes if we want to change and improve our gut flora, according to Hållenius.

↑ **Frida Hållenius and her colleague Åsa Håkansson in front of SHIME, which can simulate the environment in the gut.**

She has seen this experimentally, where different gene sets in mice resulted in different gut flora composition. However, by changing their diet, their gut flora could be made similar. In another study, conducted by fellow researcher Anne Nilsson, the subjects were asked to replace white bread with wholegrain rye bread.

“The gut flora changed after just one day. By then, several good gut bacteria had been fed and had begun to multiply. So it happens quickly, but you must continue feeding the bacteria with a good diet, otherwise they will decrease again,” concludes Hållenius. ●



Although Estonians no longer ferment white cabbage as much as they once did, consumption of fermented ingredients is higher in eastern Europe than in other parts of the Continent.

Mapping fermented foods in Europe

Research has shown that fermented foods can positively influence our gut health. But how often and how much should you eat to obtain the desired health benefits? A large European study will attempt to provide answers and, in the first step, has mapped consumption habits regarding fermented foods in four European regions.

Text Ingar Nilsson

As part of the PIMENTO 3FQ study, European researchers collected information from more than 12,600 participants, divided into four geographical groups.

“Using a specially designed questionnaire, we were able to get an idea of how much fermented food Europeans consume in 15 different categories,” says Michail Syrpas, a researcher at the Kaunas University of Technology in Lithuania and one of the study’s leaders.

Fermented dairy products and sourdough bread are the foods that appear most frequently in the responses, especially in countries in central and eastern Europe.

THE RESEARCHERS HAVE identified regional differences, such as participants from western Europe being the group most likely to choose plant-based dairy analogues. Fermented vegetables and legumes are a minor part of the diet across Europe, with a minimum of 2 grams per person per day in southern European countries to a maximum of just over 8 grams in central and eastern Europe.

“Although fermented foods are common throughout Europe, daily



“One gram of sauerkraut contains a million beneficial bacteria”

Kaarel Adamberg Researcher,
Tallinn University of Technology

consumption is generally quite low,” explains Emmanuella Magriplis, a senior lecturer at the Agricultural University of Athens and the other leader of the study.

KAAREL ADAMBERG IS a researcher at the Department of Chemistry and Biotechnology at Tallinn University of Technology. He and his research team have collected data from their geographical area. He has previously studied the microbiota of Estonians who eat a traditional diet.

“Sauerkraut was once a common Estonian food, but that tradition has practically disappeared as people have moved from the countryside to the cities. Many people ferment unripe green tomatoes in the autumn, and young people have

started making kimchi, which is also a fermented product.

Although the average daily consumption of sauerkraut in Estonia is now only 10 grams per person, it is important from a health perspective,” Adamberg points out.

“One gram of sauerkraut contains a million beneficial bacteria – I think it should be mandatory for everyone to eat food that contains live bacteria. However, their effect is temporary, so if you stop eating fermented foods, the beneficial bacteria may disappear.”

WORK IS CONTINUING with an analysis and in-depth study of the responses to identify regional differences and then to determine the health effects of various fermented foods. This may vary between countries, so it requires separate research in each one. The study may be a valuable tool for epidemiological research, clarifying the link between specific fermented foods and health in different European diets.

“In the end, we will hopefully know which fermented foods can be beneficial to health, in what quantities and for whom. We will have created a baseline for an optimal intake,” concludes Syrpas. ●



“We will have created a baseline for an optimal intake”

Michail Syrpas Researcher,
Kaunas University of Technology

PIMENTO

The PIMENTO (promoting innovation of fermented foods) study is one of the EU’s COST actions. These are multidisciplinary networks of researchers, companies and inventors who work together on multi-year projects, focusing on a topic where they have identified an essential need for more knowledge.

Read more: www.cost.eu/

How much fibre should we eat?

According to Swedish dietary guidelines, an adult's intake of dietary fibre should be between 25 and 35 grams per day.

FACTS ABOUT

Different types of fibre

BETA-GLUCANS



Beta-glucans are mainly found in oats and barley. They form a gel when they absorb

water, which is obvious in foods such as oatmeal porridge. In addition to the classic properties of fibre, beta-glucans also lower cholesterol and blood glucose. ●

FRUCTANS

Easily fermented fibres found in, for example, cereals, onions, leeks, artichokes and bananas. Inulin is a fructan in the FODMAP group, which is fermented in the large intestine. ●

CELLULOSE



Cellulose is an insoluble fibre found in cereals. It passes through the digestive system largely unchanged. ●

ARABINOXYLANS



Arabinosylans are mainly found in rye, but also in wheat and barley. In addition to their beneficial fibre properties in their natural form, their degradation products, oligosaccharides – AXOS – have been shown to promote certain “good” bacterial strains in the large intestine. ●

PECTIN

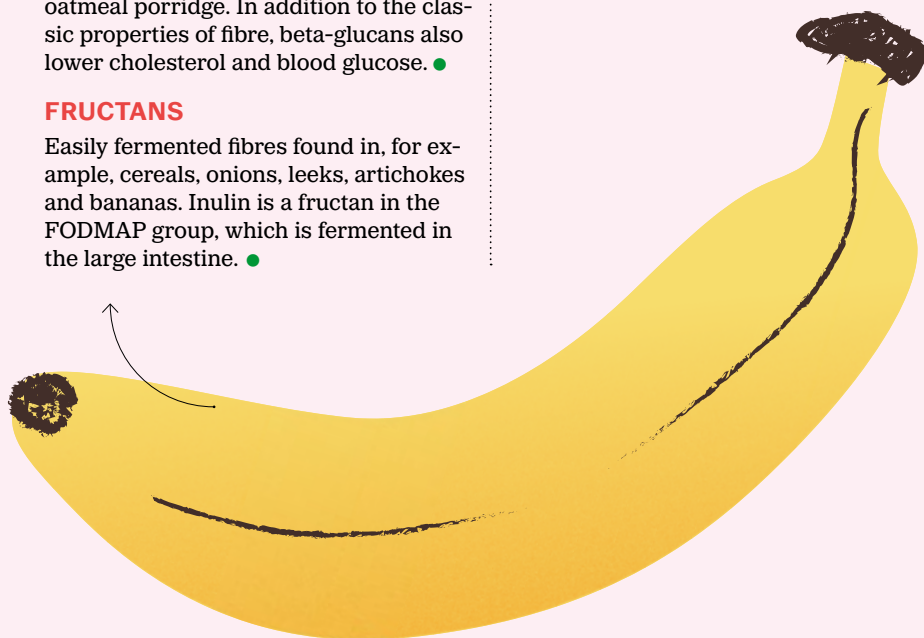


This naturally occurs in fruit and in the cell walls of many plants. It has similar properties to beta-glucan and swells and forms a gel when it absorbs water. ●

RESISTANT STARCH



Resistant starch is found in wholegrains, lentils, beans, chickpeas, cold boiled potatoes and green bananas. It is not absorbed as energy in the small intestine; instead, it is fermented into short-chain fatty acids, such as butyric acid, in the large intestine. Butyric acid is believed to strengthen the gut barrier function. ●

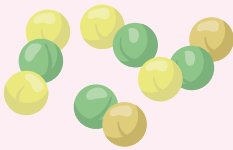


FIBRE

Fibre with different functions

FERMENTABLE DIETARY FIBRE

When dietary fibre is broken down by bacteria in the large intestine, the fibre is described as being fermented. This type of fibre is found in, for example, whole grains and legumes. Fermentation forms short-chain fatty acids that can have positive, prebiotic health effects. ●



INSOLUBLE DIETARY FIBRE

Fibre with a low degree of fermentability, such as lignin, cellulose and hemicellulose, binds water and increases the volume of intestinal contents. The insoluble fibre combats constipation and contributes to greater satiation. It reduces the risk of colorectal cancer. ●



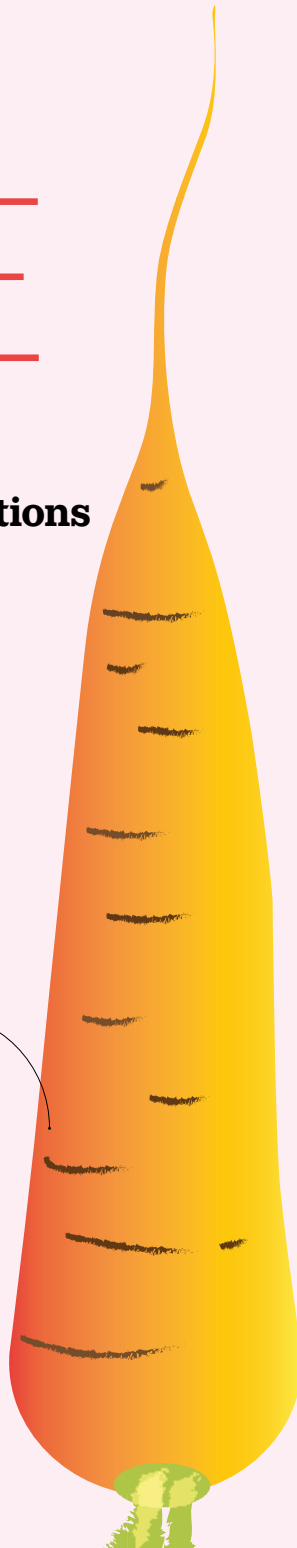
SOLUBLE DIETARY FIBRE

Can form a gel-like structure in water, slowing down gastric emptying, which can result in a more even blood sugar curve.

Examples of soluble fibres are pectin in vegetables and fruit, beta-glucans in oats and barley, and the arabinoxylans found in rye, wheat and barley. Gel-forming fibres can lower cholesterol. ●



SOURCE: LANTMÄNNEN





A healthy Nordic diet, rich in whole grains and legumes, can benefit your gut flora. Diet may become part of the treatment for people with type 2 diabetes and fatty liver disease, as shown in a major new Swedish study. **Text Ylva Carlsson**

Nordic diet good for gut flora

The study was conducted by researchers at Uppsala University and was led by Ulf Risérus, professor of clinical nutrition and metabolism. He explains that the Nordic diet has already been successfully tested on overweight individuals.

“The new study shows that the Nordic diet can also help cure fatty liver disease and alleviate type 2 diabetes, so it appears to be at least as beneficial as the better-known Mediterranean diet.”

In this study, to which Lantmännen's Research Foundation contributed products, 150 people were treated for diabetes or prediabetes. They were divided into three groups: one eating a Nordic diet; another eating a plant-based, low-carbohydrate diet; and a third serving as a control group based on the Swedish Food Agency's dietary guidelines.

PARTICIPANTS WHO FOLLOWED the healthy Nordic diet lost the most weight and maintained their new weight over time.

The specific results for gut flora and abdominal fat are also interesting, but are still preliminary and unpublished. Risérus emphasises that gut flora appears to be positively affected by both types of diet – and that dangerous abdominal fat decreased most after consuming the Nordic diet.

“The Nordic diet appears to be at least as beneficial as the better-known Mediterranean diet.”

Ulf Risérus Professor, Uppsala University

“These positive results need to be confirmed, but are entirely consistent with the results we have published so far,” he says.

More research projects on gut flora and the Nordic diet are in the pipeline, including a new study funded by the Swedish Research Council. Its participants will follow a healthy Nordic diet that is more rye-based, and there are plans to also measure wholegrain markers.

RESEARCHERS BELIEVE THAT eating plenty of wholegrain products can help reduce inflammation in the blood vessels and slow down arteriosclerosis with the help of dietary antioxidants and fibre's effect on gut flora.

Participants are now being recruited, and initial results are expected in 2027/28.

“Wholegrain foods increase satiety and reduce LDL cholesterol. I expect that we will see this in the upcoming

study, where we will focus on both rye and oats.”

Risérus is also responsible for a multi-centre study on fatty liver disease, which will be conducted simultaneously in Sweden, Finland, Norway and Denmark in 2027.

THIS MEANS THAT within a few years, results will be available from three long-term studies in which the Nordic diet has been tested on cardiovascular disease, type 2 diabetes, obesity and fatty liver disease across various spectrums.

“This will give us a comprehensive scientific basis for investigating how we can move forward with the Nordic diet for broader treatments, not just as a preventive dietary pattern,” says Risérus.

In addition to proving unexpectedly effective in combating disease, the Nordic diet has also been easy to follow, with only a few participants dropping out of the year-long study. ●

HEALTHY NORDIC FOODS

Carbohydrates Choose wholegrain pasta and bread. Preferably choose Nordic fruits and vegetables.

Fats Primarily rapeseed oil, as well as polyunsaturated and monounsaturated fatty acids from nuts and seeds.

Protein Fatty fish, yoghurt and legumes.

Students develop sourdough bread with rye

Bake an emergency bread and a healthy, delicious sourdough rye bread for children. That was the assignment given to students on the Food Service and Nutrition programme at Uppsala University, resulting in two moist rye breads.

Text Ylva Carlsson
Photo Miranda Solvang



Rye is a nutritious grain with plenty of dietary fibre, which is good for intestinal health and provides a long-lasting feeling of satiety. However, wholegrain rye bread is not always a favourite among children. Its taste, texture and appearance rarely appeal to the youngest members of the family.

UPPSALA UNIVERSITY'S Food Service and Nutrition programme includes a 15-credit course in sensory analysis and product development. Ingela Marklinder, professor of food science, explains that students learn about how appearance, aroma and taste affect a product's acceptance.

"We know that habits form early. My research shows that many adults continue to eat the same type of bread they

ate as children. If we want more people to eat healthily, children need to be introduced to healthy bread when they are young," says her colleague Pernilla Sandvik, associate professor of sensory science.

TWO OF THE STUDENTS in the autumn course, Nadia Nabil and Åsa Sandling, decided to develop a rye bread that would appeal to children aged two to ten and that would also qualify for Keyhole labelling.

Eight types of bread were developed from two sourdough cultures with rye. The students used sifted rye flour and wholemeal flour.

All the breads had equal amounts of yeast, water and salt. Syrup was also added at a maximum of 5 grams of sugar per 100 grams of bread to meet the requirements for Keyhole labelling. All

the sourdoughs were fermented at 30°C for just over 18 hours.

Two of the eight prototypes were selected for consumer testing.

The rye bread that received the highest rating contained 35 per cent finely ground wholemeal flour, and the rest was sifted rye flour, as well as sourdough fermented with *Lactiplantibacillus plantarum* – a lactic acid bacterium that helps give the bread a mild, aromatic sourness and improves its baking properties.

THE BREAD'S HIGH proportion of whole grains strengthens its potential as a sustainable alternative from a public health perspective, according to Sandvik and Marklinder.

"The test shows that it is possible to develop bread for children that combines high nutritional quality with low climate impact. The challenge is



↑ Two future graduates with a keen eye for bread. Maja Emilsson, a master's student, and Emma Svensson, a bachelor's student.



↑ Ingela Marklinder, professor of food science, has a vision of scaling up the students' project and a bakery baking the bread on a large scale.



← Packed with wholegrains – emergency bread on the left and children's bread on the right.



↑ "The challenge is in getting children to like a type of bread they are not used to eating," says Pernilla Sandvik, associate professor in food science.

in getting children to like a type of bread they are not used to eating," says Sandvik.

Two other students, Linus Lind and Sam Parker, were tasked with developing an emergency bread, one that is easy to bake and that can be stored for at least two weeks. The bread contains almost 100% coarsely ground rye flour and wheat bran and is leavened with spontaneously started sourdough.

"The request that the bread should keep for two weeks comes from our contact person, a contingency officer at the Swedish Food Agency," explains Marklinder. "We have a loaf that's been sitting there since mid-December and that's only just developed a few white spots. A mould expert has examined the spots and concluded that they are caused by yeast rather than mould, but storage tests for emergency bread need

to be looked at more closely in the future."

As with the children's bread, eight varieties were baked, two of which went to consumer testing. Marklinder compares the bread to an "armoured vehicle", saying that it tastes especially good with a well-aged cheese.

"I have a vision of scaling up this type of project and having a bakery bake the bread on a large scale," she says. ●

DEGREE PROGRAMMES IN THREE LOCATIONS

The Food Service and Nutrition programme is a three-year university programme that combines nutrition science with subjects such as business administration and food science. Similar programmes are available at the universities of Uppsala, Umeå and Gothenburg.

More diverse gut flora when dietary guidelines are followed

Following Sweden's dietary guidelines is good for your gut flora, and following all twelve of them has the greatest effect. Using data from SCAPIS, a large population study, a research group at Lund University has demonstrated the relationship between compliance with Swedish dietary guidelines and its effect on the composition of gut flora and the incidence of disease.

Text Ingar Nilsson

Illustration Lene Due Jensen

Studies on how our eating habits are linked to our gut flora have so far been too small to establish a definite connection. The study on the effects of following dietary guidelines utilised the results from approximately 10,000 participants in the SCAPIS cohort study, which was conducted at Swedish university hospitals between 2014 and 2018.

"We used data from Malmö and Uppsala because they have information about both diet and gut flora from study participants," explains Ulrika Ericson. She is an associate professor in nutritional epidemiology at Lund University and one of the researchers who conducted the study.

THE PARTICIPANTS COMPLETED dietary questionnaires, recording what they ate, how much and how often. From this information, the researchers could conclude that no one followed all twelve dietary

guidelines and that most were followed by less than half of the participants.

"Compliance was measured using points, and participants could earn a maximum of 48 points if they followed all the dietary recommendations," says Ericson. Most were in the middle of the scale and followed the advice for red meat and sugar, but not for nuts and legumes.

SHE SAYS THAT FOLLOWING the dietary guidelines helps maintain a rich gut flora. The participants in the study who best followed the advice had more diverse gut flora than the others. This group also had the lowest incidence of metabolic syndrome, which may mean they had a lower long-term risk of cardiovascular disease and type 2 diabetes.

"All participants in the study went about their lives as usual. The individuals with the best results generally had higher levels of education, were more physically active, smoked less frequently

and had a lower BMI than the others. The study is ongoing, and in the longer term, participants will grow older, and more will suffer from disease. It's then we may see an even clearer link between dietary habits and disease risk."

Ericson believes that the results indicate that eating plenty of vegetables, nuts and wholegrains is beneficial for avoiding metabolic syndrome. However, she emphasises that the overall picture is most important, and that following all the dietary guidelines is best.

"We still don't know exactly what constitutes good gut flora or which combination of bacteria is most beneficial. As part of this study, we have also looked at all species of bacteria in the gut flora to see how much of each species it contains and what their function is."

SHE DOES NOT BELIEVE that the study will lead to any revolutionary changes in dietary advice. However, the large amount of information being collected can be used for further studies and increase knowledge about the quality of gut flora.

"It varies between individuals, and I believe that in the future we will see personalised dietary advice," says Ericson. ●



"...I believe that in the future we will see personalised dietary advice."

Ulrika Ericson Associate Professor, Nutritional Epidemiology Lund University

Read more: Ericson et al. *A Swedish dietary guideline index, gut microbial α -diversity and prevalence of metabolic syndrome – observations in the Swedish Cardiopulmonary bioImage Study (SCAPIS)*. Food and nutrition research. 2024 Nov.

THE 12 GUIDELINES



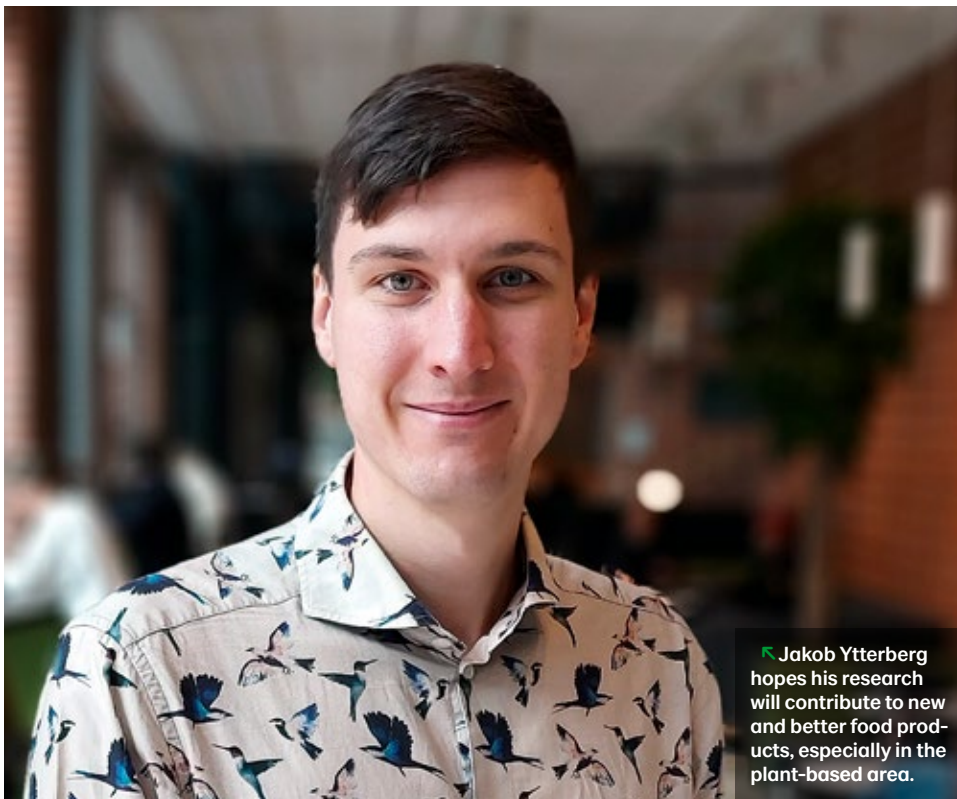


PHOTO: SANDRA NAYERI

↑ Jakob Ytterberg hopes his research will contribute to new and better food products, especially in the plant-based area.

Pea hull fibre is beneficial for gut health

Dietary fibre is important for our health. Results presented in a new doctoral thesis show that pea hull fibre can help increase the proportion of beneficial substances in the large intestine.

Text Ylva Carlsson

How well we can break down and utilise protein varies from person to person and has an impact on both gut flora and health.

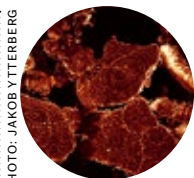
Researcher Jakob Ytterberg at Chalmers University of Technology has investigated the link between proteins' properties and their effects on human health. In his thesis, he also studied how different treatments for pea hull fibre and pea protein affect their functional properties – and how, in turn, these changes influence how

the fibre and protein are affected by the bacterial flora in the large intestine.

PEA HULL FIBRE IS a sidestream from protein extraction from peas. Substances that are good for health form when the fibres encounter bacteria in the large intestine.

“For proteins, the opposite is true: when they are fermented in the large intestine, toxic substances are formed that are made up of, for example, nitrogen and sulphur. That is why we prefer protein to be absorbed earlier in the digestive process,” says Ytterberg.

PEA FIBRES WERE GIVEN a more porous texture by treating them with heat and enzymes. This is positive, as pea fibre is generally less soluble than more easily soluble fibres, such as those found in berries, oats and rye.



↑ Microscope image of pea hull fibre.



↑ Pea hull among yellow peas.



↑ Microscope image of pea protein.

PHOTO: JAKOB YTTBERG

“Research often focuses on easily soluble fibres. My research shows that other types of fibre, when modified, can also affect the gut flora and reduce the production of toxic substances by proteins.

The pea protein was modified using heat and enzymes in the same way as the pea fibre. The study showed that the gut bacteria's reaction is affected by how decomposed the protein is before it reaches the large intestine. And, when pea fibre and pea protein were simultaneously present in the large intestine, it was noted that the fibre helped form a larger proportion of beneficial substances.

YTTBERG HOPES THAT his research will contribute to new and better foods in the future, especially in the plant-based area, as plant proteins can be more difficult to break down than animal proteins.

He envisions more foods that combine fibre, protein and fat, such as meat analogues and other plant-based products.

“I also think that increasing the fibre content of foods like bread and pasta is the right way to go,” says Ytterberg. ●

Thesis: Jakob Ytterberg: Relationships between physicochemical properties and colonic fermentation in pea fibre and protein. Chalmers University of Technology, 2025.

Read more: <https://research.chalmers.se/publication/548974>

RECIPE

Pasta dish with fibre

Wholegrains in pasta not only make it taste good, but also contribute to good gut health.

Recipe Lantmännen Cerealia Photo Mattias Södermark / Lantmännen

Pasta with a creamy tomato sauce topped with feta cheese and herbs

Serves: 4

Preparation time: 30 minutes

400 g wholegrain pasta, conchiglie
1 onion
2 garlic cloves
1 tbsp rapeseed oil
2 tbsp tomato purée
1–2 pinches chili flakes
1 can/carton chopped tomatoes (400 g)
1 tbsp concentrated vegetable stock
150–200 ml cooking cream
¾ tsp salt
2 pinches of pepper

Topping

200 g feta cheese
fresh thyme

INSTRUCTIONS

1. Cook the pasta according to the instructions on the package.
2. Peel and finely chop the onion and garlic. Fry the onion and garlic in the oil without letting them brown. Add tomato purée and chilli flakes and stir.
3. Add the chopped tomatoes and vegetable stock. Simmer for about 15 minutes.
4. Add the cooking cream and season with salt and pepper. Leave to simmer for another 5 minutes. Pour the sauce over the pasta and top with crumbled feta cheese and thyme. ●



Newsletter from Lantmännen Research Foundation to take over from Cerealier.

Follow the foundation's work going forward

The aim of Cerealier has been to increase awareness about cereals as foods, based on current research and debates on nutrition, and to explain how research results can be taken all the way to your plate.

Much has happened over the nearly 40 years that Cerealier has been published, in research funded by our own foundation and by others.

FIBRE AND WHOLEGRAINS have always been key to Cerealier. Research has also shown that wholegrains are the most important dietary factor in public health. The recommendation is to eat 90 grams of wholegrains per day. This is a challenge for many people, so there is still plenty of work to be done, for example, improving taste and texture – an area where research is ongoing.

Another important conclusion from the research is that a healthy Nordic diet, in which wholegrain products and legumes have a natural place, is comparable to the better-known Mediterranean diet.

IN RECENT YEARS, we have also highlighted legumes in Cerealier. They not only contain healthy fibre, but are an important

raw material in the protein shift. We have also written about current research in grain and legume processing, such as milling, baking and fermenting.

MANY PEOPLE BELIEVE there will be a move towards precision nutrition and individual dietary advice. You will be able to follow these developments and much more in the foundation's new newsletter.

In addition to news about food and health, the newsletter will also highlight research from our foundation's other focus areas: agriculture and machinery, and bioenergy and green materials.

So, sign up for the newsletter to stay updated on the latest developments in Lantmännen Research Foundation's areas of activity. ●

Scan the QR code or visit: www.lantmannen.com/researchfoundation to subscribe to the newsletter.



↑ Cerealier through the years.



PHOTO: MATTIAS SÖDERMARK / LANTMÄNNEN

↑ In 2025, Lantmännen Research Foundation invested in projects that contribute to the development of legume-based foods.

Research initiative on legumes as foodstuffs

Interest in Swedish-grown legumes has grown in recent years, both as animal feed and as a green protein source in foods. To increase knowledge about yellow peas and faba beans in the entire production chain, Lantmännen Research Foundation made a major investment in the area of Food and health in 2025.

Helena Fredriksson Head of Research
Lantmännen Research Foundation

To create sustainable Swedish food production, research is necessary throughout the entire chain. In total, Lantmännen Research Foundation invested 22 million kronor in research in 2025.

OF THIS, 8 MILLION went to food projects related to research on legumes. The hope underlying this initiative is that

legumes will become a greater part of everyday food.

The call for proposals sought, among other things, knowledge that could contribute to the development of new legume-based ingredients and foods.

Yellow peas are traditionally grown at our latitudes and are often used as a protein source in plant-based foods.

However, it is a crop with many challenges. By developing process knowledge in this area, the aim is that yellow peas can be used in new ways. Increased knowledge about the raw material's properties will also facilitate product development.

IN THREE NEW PROJECTS, researchers will work with yellow peas. At Chalmers University of Technology, they will investigate how to improve the taste and function of protein isolates. In another project, Estonian researchers at TFTAK

will investigate which pea protein properties create texture and structure in plant-based meat substitutes, properties that are crucial for attracting consumers. In a third project, researchers at RISE will investigate whether pea hulls can be processed and used as an ingredient in fibre-rich bread.

A LARGE PROPORTION of the faba beans grown today are used as animal feed and are not suitable for human consumption. In recent years, demand has risen for varieties that are better suited for foodstuffs. A new project at Chalmers University of Technology aims to increase knowledge about faba beans as a raw material in the production of protein-rich ingredients. By understanding how the value chain can be optimised, from cultivation to consumer products, the goal is to enable faba beans to be used in different types of foods. ●

NEWS FROM LANTMÄNNEN RESEARCH FOUNDATION



PHOTO: CAROLINE MATTSSON / LANTMÄNNEN

↑ A research group in Lund will develop cereal-based fuel additives for renewable fuels.

Recently granted projects



Renewable fuels for tractors

Renewable fuel additives that work

in today's diesel engines are needed if fossil-free agriculture is to be achieved.

Researchers at Lund University will develop a process in which cereal-based raw materials are converted into fuel additives for renewable fuels. ●



Starch in a new way

Gluten, an important baking

ingredient, is produced by fractionating wheat, a process that also results in large quantities of starch.

Researchers at RISE will now investigate the potential to modify wheat starch for use in food applications. ●



Flowering field margins

Many farmers are planting flower

strips to promote biodiversity in the agricultural landscape. Researchers at the Swedish University of Agricultural Sciences will use new technology to investigate how different seed mixtures affect pollinators and soil organisms. ●

About the research foundation

Lantmännen Research Foundation supports research in the entire chain, from field to fork. It grants up to 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 increasing 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 natural elements of healthy and 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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