

FOOD INTOLERANCE NETWORK FACTSHEET

Nitrates, nitrites and nitrosamines

Nitrates and nitrites

249 Potassium nitrite

250 Sodium nitrite

251 Sodium nitrate (Chile saltpetre)

252 Potassium nitrate (saltpetre)

Used in bacon, ham, corned beef, saveloys and hot dogs, devon, salami-type sausages and some luncheon rolls.

Not permitted in organic foods.

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Introduction

Processed meats generally contain nitrates and nitrites that are used as preservatives and colour fixatives.

These additives have been associated with a range of intolerance symptoms such as headaches, irritable bowel symptoms, itchy rashes, asthma, children's behaviour problems, difficulty falling asleep and frequent night waking, and the Food Intolerance Network recommends avoiding them. You can see reader reports about intolerance reactions to nitrates (including behaviour, growing pains, stuttering, headaches and asthma) below.

In August 2009, the WCRF (World Cancer Research Fund) issued a warning to parents, suggesting they limit their children's intake to 70 grams of processed meat per week.

Furthermore, according to the latest Expert Report from the WCRF ("Stopping cancer before it starts"), there is strong evidence that red and processed meats are causes of bowel cancer, and there is no amount of processed meat that can be confidently shown not to increase risk. The recommendation is to avoid processed meats completely.

Levels of nitrates are increasing in our food supply due to overuse of artificial fertilisers. Is it true that the amount of nitrate in a lettuce is more than that in ham? Does that mean you need to avoid vegetables too? See more information below.

Nitrates and nitrites – are they natural?

Nitrates (251, 252) are naturally occurring minerals. Chile saltpetre (251) occurs especially in the Atacama desert in Chile. Potassium nitrate (250) can occur naturally and also be made in laboratory; nitrites are synthetic. Chemically it makes no difference whether these additives are natural or synthetic.

Nitrates occur naturally in the body and are essential for digestion – in small amounts. It is the size of the amount that matters.

Nitrosamines

Nitrates and nitrites are not carcinogenic but nitrates can be converted to nitrites in the gut and saliva. Nitrites are considered to be more toxic because they can combine readily with natural amines in some foods to form highly carcinogenic chemicals called nitrosamines.

Here's the catch: processed meats that contain nitrate and nitrite additives are naturally very high in amines, chemicals that are formed by protein breakdown in protein-rich foods such as meat, fish and cheese and increase with age and processing.

Despite their cancer-causing potential, nitrates and nitrites are regarded as a necessary evil by health authorities because preservatives inhibit the development of toxic micro-organisms. Without these additives there would be many more deaths from food poisoning.

The more processed meat consumers eat, the more they are at risk, and cancer may not be the only problem. A study published earlier this year by researchers at Rhode Island Hospital in the US reported a link between increased levels of nitrates and increased deaths from certain diseases including Alzheimer's, diabetes mellitus and Parkinson's, possibly through the damaging effect of nitrosamines on DNA.

"We have become a 'nitrosamine generation", said lead researcher Professor Suzanne de la Monte. "In essence, we have moved to a diet that is rich in amines and nitrates, which lead to increased nitrosamine production."

Nitrates and nitrites in meats

In meats, these additives are used as preservatives and colour fixers. They are regarded as essential because preservatives inhibit the development of toxic micro-organisms. Food authorities say that without these additives there would be many more deaths from food poisoning, especially botulism. Critics say that there are other methods to preserve meat: refrigeration, freezing and the concurrent use of lactic acid which reduces the amount of nitrites needed.

Table 1: MPL (Maximum Permitted Level) Nitrates and Nitrites in Meats (mg/kg)

Food	Country	Sodium Nitrate	Sodium Nitrite	Source*
Processed meats	Australia	500		FSANZ
Processed meats	Australia		125	FSANZ
(Proposed) Sterilised meat products	Europe		100	EFSA
(Proposed) Non-heat treated meat products	Europe	150		EFSA**

* Source - see references at foot of page

** There are some exceptions for traditional UK meat products such as Wiltshire cured ham

Nitrates and nitrites in vegetables

Nitrites are rarely found in vegetables and only in small amounts. Nitrates occur naturally in most vegetables in variable amounts depending on the type of plant and growing conditions.

Nitrate levels have roughly doubled in the last several decades due to the use of synthetic fertilisers. Leafy greens especially lettuces have been found with some of the highest levels, followed by some tubers. Of commonly eaten vegetables, lettuce, spinach, beetroot, celery and radishes have the most nitrates. Brussels sprouts, peas and beans are some of the lowest (see Table 3 below). There can be large variations in vegetables grown for supermarkets. It is possible to grow an organic lettuce with 150 mg/kg of nitrates but the maximum permitted level for nitrates in lettuce in Europe is 4,500 mg/kg, see Table 2 below.

Table 2: Nitrates in Lettuce (mg/kg)

Food	Country	Nitrate			Year	Source*
		Low	Average	High		
Lettuce glasshouse	UK			5700	2004	FSA
Lettuce rucola	Europe		4800		2008	EFSA
Lettuce curly	UK		3263		2005	FSA
Lettuce iceberg u/cover	UK		2500		2004	FSA
Lettuce organic	UK		1115		2005	FSA
Lettuce iceberg	Europe	210	875	1537	2008	EFSA
Lettuce	Australia		596		1982	SA
Lettuce organic	Denmark		150		2009	Kulmanen

Unless otherwise stated, figures are the average of a number of samples.

The EFSA maximum permitted level for nitrates in lettuce is 4,500 mg/kg

* see more details in References

While it is true that lettuces can contain more nitrates than ham, some researchers think that nitrates in vegetables may be inhibited from forming toxic nitrosamines due to protective effects of nutrients such as Vitamin C in vegetables. This is the opposite effect from meat where nitrates are actually added to a very high amine source.

Nitrates and nitrites in water

Nitrates/nitrites can occur naturally or leach into water through overfertilisation. EPA guidelines permit 10 ppm (parts per million) of nitrates in drinking water and 1 ppm of nitrites. Formula fed infants under 3 months are most vulnerable to the toxic effects of nitrites and can suffer from a condition called methaemoglobinaemia due to formula made with contaminated well water. In this potentially fatal condition, the oxygen-carrying capacity of the blood is reduced. Symptoms include nausea and vomiting, dizziness, headaches, confusion, cyanosis (the patient turns blue), and low blood pressure. Methaemoglobinaemia can also result from excessive exposure to nitrite preservative in meat due to accidental overdosage by butchers (see "Deadly Meatballs" in references below).

Can I reduce nitrate levels in my vegetables?

The EFSA (European Food Safety Authority) recommends minimising nitrate intake.

The following hints will reduce nitrates in vegetables. The problem is that some of them will reduce essential nutrients such as Vitamin C as well.

- washing and cooking in water (nitrates are soluble in water)
- peeling e.g. in potatoes because the nitrates are concentrated in the skin and just below (again, this is part of failsafe eating)
- discarding: in leafy vegetables such as lettuce, discarding the stem and mid-rib can decrease up to 40 per cent of the nitrates
- a study of French fries showed that peeling reduced levels by 30 per cent; preheating and cutting reduced the nitrate content by a further 20 per cent and blanching by 30 per cent. After final frying only about five per cent of the original nitrate content remained. (Reheating cold cooked vegetables has been shown not to increase nitrate levels as previously thought.)
- for homegrown vegetables, choose low nitrate varieties (iceberg lettuce is one of the lowest and is failsafe); use slower releasing nitrogen sources such as manure and compost; avoid fertilising just before harvest; grow vegetables outside if possible (lower light due to plastic or glass covering contributes to higher nitrates); harvest in full sun
- A number of studies have suggested a protective effect of Vitamin C and other nutrients against either nitrates or particular cancers. Some experts think that the naturally occurring nutrients in vegetables are enough to protect against effects of nitrates. The WCRF warns: don't use high-dose supplements to protect against cancer. Research shows that high-dose nutrient supplements can affect our risk of cancer, so it's best to opt for a balanced diet without supplements

Conclusion

To reduce the risks of nitrosamine exposure, you can reduce your nitrate and amine intake. Curiously, failsafe eating does both of these by avoiding both processed meats and sticking to low amine foods, see our [Amines Factsheet](#) (You can request our Amine Mistakes Information Sheet from suedengate@ozemail.com.au).

Reader reports: intolerance reactions to nitrates/nitrites

[701] A nitrate reaction to supposedly nitrate-free organic ham (November 2008)

My children have severe intolerances to preservatives and colours but not amines. I have been going very well, until the last couple of days when my children started yelling, hitting, slamming doors and just generally being violent with horrible mood swings.

I had purchased ham from my usual shop a few days before. I had asked if they had any of the nitrate-free ham, as I couldn't see the one I normally buy from the deli. The assistant identified a particular one as nitrate-free, explaining that they had changed suppliers and the price had gone up. I pointed out that the deli label stuck into the leg of ham said organic (I know organic doesn't always mean nitrate-free) and asked if she was sure it was nitrate-free. She said it definitely was. So I bought it. The kids had a bit that night, and a bit each day since. By yesterday they were both shocking, particularly my 3 year-old daughter, who had had more.

Today I went back to the shop to check. Someone else was on the deli counter. I asked if they had any nitrate-free ham. Before he could answer, I said is that it there, pointing to the one I had purchased. He said no, that the nitrate-free ham is not being stocked anymore. I

told him what had happened and he apologized. I told him how severe the reaction has been and how that my children will be like this for a week now. I was told I could get a refund for the ham I purchased. - Michelle, Sydney [Note that ham is not failsafe due to amines. However, it is suitable for people who have passed their amine challenge. See [Product Updates](#) on the website for sources of preservative free ham. Remember you can use CTRL F to search for <nitrate-free ham>]

[396] Nitrates (249-252) used in preserved meats such as ham, bacon and hotdogs affect stuttering (March 2006)

Our two and a half year old son had difficulty with stuttering for a few months. After my sister-in-law, a nurse, told us about the potential dangers of nitrates for children, especially contributions to developmental delays, we removed all nitrates from our son's diet and within about a week the stuttering was gone. Yesterday, our son went on an outing to the zoo with my mother. Strangely, his stuttering returned full-force today. I called my mother to ask what he had ingested for lunch and dinner yesterday. The glaring answer: a HOTDOG. – by email, NSW

[857] Nitrates and 'growing pains' (1999)

My 4 yo son used to wake up complaining of pains in his legs, sometimes they were so bad he would be sobbing with the pain. The doctor said it was just growing pains but after reading your website we tried an additive free diet. We found that he only gets these pains if he has been eating ham and devon (with nitrate/nitrite preservatives). – by email, NT

[856] Hotdog headaches from school (2002)

I was wondering if you could shed some light on how to rid my 9yr old daughters headaches that she has had nearly every Thursday all year, sometimes so bad she has to stay home from school. The doctor said does she hate school but she doesn't. (Answer: It is very common for people to have recurring headaches on a particular day of the week. What do they eat the day before? In this case the school canteen sold hotdogs only on Wednesdays. When the hotdogs stopped, the headaches stopped.) – by email, SA

[855] Ham sandwiches cause behaviour, eczema, concentration problems (October 2009)

A few months ago we went over to Europe. When we came back my 6 yo son went back to school and started getting very clingy, crying and not being able to read or write properly and was not able to concentrate. I have had trouble with these symptoms on and off over the previous year and a half. I mentioned this to my friend, she gave me the book and I started your additive-free diet (we did not eliminate fruit/veg or cheese).

After about 1 week everything had improved dramatically. I waited about 4 weeks before I introduced nitrates (ham). He went pretty nutty after eating it, not violent, just manic. The next day he had bad eczema and was unable to read or write properly when I asked. The teacher also mentioned that he was having trouble concentrating again. He was also crying and clinging to me when it was time to drop him at school. The effects lasted about 5 days. I realized of course that when we had come home from overseas he was having ham sandwiches (not something he would normally eat). I then went back to the additive-free diet again. Michelle, by email

[361] Asthma and diet (March 2005)

I got asthma for the first time four years ago. At that time, I didn't know what was happening and it took me about two hours to breathe properly again. After my second asthma attack I went to the doctor and my peakflow reading was only 160 - anything under 200, you should be in hospital. I spent about \$3000 trying to find out what was wrong. I went to ear, nose and throat specialists, respiratory specialists etc. Finally I got the diagnosis of asthma, chronic allergic rhinosinusitis and I found out later by a blood test that I had alpha-1 antitrypsin deficiency (A1AD) – a genetic enzyme deficiency that can cause lung disease.

I have your books Fed Up, Fed Up with Asthma and the Failsafe Cookbook - all brilliant!!!! And I have not been sick since I started the elimination diet. The only doctors' visits I have needed have been to get approval to reduce the medication. When I first developed asthma, I was put on a preventer which I took 4 times a day. Later they put me on a stronger preventer (Symbicort 200/6 turbohaler). After the diet, when I cut down my preventer medication to half (2 puffs a day) my peakflow readings never went below 400. When I had a peakflow reading of 500, I decided to reduce it again with the approval of my doctor. I felt so good the next day I decided not to take the preventer medication at night, I now only take the 1 puff of preventer in the morning.

Through the diet, I have found that I react to all the food you say sensitive people might react to: MSG, nitrates, salicylates, amines, colours, preservatives and dairy foods, although MSG is the worst. I do gluten free, egg free baking because I found out my 5 year old is dairy/gluten intolerant and my 6 year old reacts to eggs - they are affected by everything else like me and my 7 year old is also affected by antioxidants. I am also intolerant to chemicals and had very bad side effects from the contraceptive pill.

I hope that other people will achieve the results I have as it has made a huge change in my life, and as a bonus, I have lost 15 kg! – Tracy, NZ

Scientific References

Cancer risk of red and processed meat

1. Cross AJ, Leitzmann MF, Gail MH et al, *A Prospective Study of Red and Processed Meat Intake in Relation to Cancer Risk. PLoS Med.* 2007;4(12):e325.

Part of the National Institutes of Health-AARP (formerly the American Association for Retired Persons) Diet and Health Study, this cohort consists of approximately 500,000 people aged 50–71 years at baseline (1995–1996) and followed for 8 years. Meat intake was estimated from a food frequency questionnaire administered at baseline. Both red and processed meat intakes were positively associated with cancers of the colorectum and lung, and red meat intake was associated with an elevated risk for cancers of the esophagus and liver. Unfortunately, bacon and ham were included in both red meat and processed meat categories. People with the highest intake of red meat compared to the lowest had significant elevated risks (ranging from 20% to 60%) for esophageal, colorectal, liver, and lung cancer, and people with the highest intake of processed meat had a 20% elevated risk for colorectal and a 16% elevated risk for lung cancer. This was the first big study to show a connection between meat eating and lung cancer.

2. Larsson SC, Bergkvist L, Wolk A. *Processed meat consumption, dietary nitrosamines and stomach cancer risk in a cohort of Swedish women. Int J Cancer.* 2006;119(4):915-9

A Swedish team prospectively investigated the associations between intakes of processed meat, other meats and N-nitrosodimethylamine (the most frequently occurring nitrosamine in foods) with risk of stomach cancer among 61,433 women who were enrolled in the population-based Swedish Mammography Cohort during 18 years of follow up. High consumption of processed meat, but not of other meats (red meat, fish and poultry), was associated with a statistically significant increased risk of stomach cancer. Women with the highest intake of N-nitrosodimethylamine intake had double the risk of stomach cancer compared with those in the lowest quintile.

3. Norat T, Bingham S, Ferrari P et al. *Meat, fish, and colorectal cancer risk: the European Prospective Investigation into cancer and nutrition. J Natl Cancer Inst.* 2005;97(12):906-16. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1913932/?tool=pubmed>

A European team prospectively followed 478 040 men and women from 10 European countries who were free of cancer at enrolment between 1992 and 1998. Information on diet and lifestyle was collected at baseline and subjects were followed for an average of about 5

years. The relationship between intakes of red and processed meat, poultry, and fish and colorectal cancer risk was examined using a proportional hazards model adjusted for age, sex, energy (nonfat and fat sources), height, weight, work-related physical activity, smoking status, dietary fiber and folate, and alcohol consumption. Colorectal cancer risk was positively associated with intake of red and processed meat and inversely associated with intake of fish but was not related to poultry intake. These European researchers were puzzled about the role of processed meats because “not all processed meats contain added nitrites — for example, most sausages and air-dried hams do not” – as opposed to Australia where most European style sausages (that is, salamis) and hams do contain nitrites.

De Stefani E, Boffetta P, Deneo-Pellegrini H et al. Meat intake, meat mutagens and risk of lung cancer in Uruguayan men. Cancer Causes Control. 2009;20(9):1635-43

The most recent in a series of studies about red meat and lung cancer risk, this eight year Uruguayan study with 846 cases and 846 matched controls also found that the highest vs. the lowest quartile of intake of total meat, red meat, and processed meat was associated with increased risk of lung cancer, while intake of total white meat, poultry and fish was not.

Nitrites and risk of lung disease (COPD)

Varraso R, Jiang R, Barr RG et al, Prospective study of cured meats consumption and risk of chronic obstructive pulmonary disease in men. Am J Epidemiol. 2007;166(12):1438-45.

This study from Columbia University Medical Centre in New York assessed the relationship between frequent consumption of cured meats and the risk of newly diagnosed chronic obstructive pulmonary disease (COPD). Between 1986 and 1998, the authors identified 111 self-reported cases of newly diagnosed COPD among 42,915 men from the Health Professionals Follow-up Study. The cumulative average intake of cured meats consumption (processed meats, bacon, hot dogs) was calculated from food frequency questionnaires. Following adjustment for age, sex, ethnic group and smoking habits, the data show that subjects who consume cured meat at least once in two days on average (at least 14 times a month) have significantly more lung obstruction than those who never eat it at all. Researchers found that people who regularly eat cured meats are 71 per cent more likely to have symptoms of lung disease than people who never eat this type of meat and concluded that cured meat may worsen the adverse effects of smoking on risk of COPD.

Nitrosamines and type 2 diabetes, fatty liver disease and Alzheimers

Tong M, Neusner A, Longato L et al, Nitrosamine Exposure Causes Insulin Resistance Diseases: Relevance to Type 2 Diabetes Mellitus, Non-Alcoholic Steatohepatitis, and Alzheimer's Disease. Alzheimers Dis. 2009;17(4):827-844.

In this study, researchers at Rhode Island Hospital in the USA found a substantial link between increased levels of nitrates in our environment and food with increased deaths from diseases, including Alzheimer's, diabetes mellitus and Parkinson's. Rat pups were treated with a nitrosamine and evaluated 2-4 weeks later for cognitive-motor dysfunction, insulin resistance, and neurodegeneration using behavioral, biochemical, and molecular approaches.

Researchers found that the nitrosamine treatment caused type 2 diabetes, non-alcoholic fatty liver disease, deficits in motor function and spatial learning, and neurodegeneration characterized by insulin resistance and deficiency and other symptoms which together promote insulin resistance. They concluded that environmental and food contaminant exposures to nitrosamines play critical roles in the pathogenesis of major insulin resistance diseases including type 2 diabetes and Alzheimers Disease and that “improved detection and prevention of human exposures to nitrosamines will lead to earlier treatments and eventual quelling of these costly and devastating epidemics”.

Methaemoglobinemia

1. Khan A et al. *Deadly meatballs--a near fatal case of methaemoglobinaemia.* *N Z Med J.* 2006;119(1239):U2107.

A 47-year-old Māori male was found unresponsive and 'blue' by family members when they returned home at night. Earlier in the evening the patient had eaten microwave-heated meatballs. About an hour later he vomited then lost consciousness. Analysis of the meatballs revealed the sodium nitrite level at 4.3% w/w (43000mg/kg), which exceeded the recommended nitrite level as meat preservative by 344-fold. Full text: <http://nzmj.org/journal/119-1239/2107/>

2. Savino F and others, *Methemoglobinemia caused by the ingestion of courgette soup given in order to resolve constipation in two formula-fed infants* *Ann Nutr Metab.* 2006;50(4):368-71. Italian researchers report 2 cases of methemoglobinemia in infants less than 3 months of age. Babies of this age are more susceptible than adults because of lower amounts of a key enzyme which converts methemoglobin back to hemoglobin. Both babies developed severe cyanosis with methemoglobinemia after being fed formula with a high concentration of courgette (zucchini) soup to resolve constipation. The authors warn that methemoglobinemia is not a rare condition, and can arise from the exposure to nitrates-nitrites present in well water or vegetables: "it is important not to feed infants with vegetables having a high nitrate content (e.g., courgette, spinach, beets and green beans) in the first months of life".

3. Greer FR, Shannon M, *Infant methemoglobinemia: the role of dietary nitrate in food and water.* *Pediatrics.* 2005 Sep;116(3):784-6.

Two experts from the American Academy of Pediatrics Committee on Nutrition warn that infants for whom formula may be prepared with well water remain a high-risk group for nitrate poisoning and recommend the testing of well water for nitrate content. Although there seems to be little or no risk of nitrate poisoning from commercially prepared infant foods in the United States, reports of nitrate poisoning from home-prepared vegetable foods for infants do occur. Breastfeeding infants are not at risk of methemoglobinemia even when mothers ingest water with very high concentrations of nitrate nitrogen (100 ppm).

World Cancer Research Fund

WCRF/AICR. *Food, Nutrition, Physical Activity and the Prevention of Cancer: a Global Perspective (2007) and Policy and Action for Cancer Prevention (2009).* Online. www.dietandcancerreport.org

According to the WCRF ('Stopping cancer before it starts'), there is strong evidence that red and processed meats are causes of bowel cancer, and that there is no amount of processed meat that can be confidently shown not to increase risk. Their recommendations: 'Aim to limit intake of red meat to less than 500g cooked weight (about 700-750g raw weight) a week. Try to avoid processed meats such as bacon, ham, salami, corned beef and some sausages'.

Incidence rate of colorectal cancer

Parkin DM, Bray F, Ferlay J, Pisani P, *Global Cancer Statistics, 2002.* *CA Cancer J Clin* 2005; 55:74-108. Full text <http://caonline.amcancersoc.org/cgi/content/full/55/2/74#FIG13>

There is at least a 25-fold variation in occurrence of colorectal cancer worldwide. Japanese men have the highest incidence rate followed by Australians; incidence tends to be low in Africa and Asia. The large geographic differences for colon and rectal cancers are probably explained by different environmental exposures.

FSANZ: Food Standards Code MPLs <http://www.foodstandards.gov.au/thecode/>

Nitrates, colorectal cancer and the protective effect of nutrients

A number of studies have suggested a protective effect of Vitamin C and other nutrients against either nitrates or particular cancers. The WCRF warns: 'don't use supplements to protect against cancer. Research shows that high-dose nutrient supplements can affect our risk of cancer, so it's best to opt for a balanced diet without supplements'.

http://www.wcrf.org/research/expert_report/recommendations.php

Surveys - nitrates in meat and vegetables

ACT Survey: An ACT government survey analysed 67 samples of salami, cabanossi, and other manufactured meat products collected from supermarkets and stores around Canberra. Of those, 12 per cent contained over the legal limit (125 ppm) for nitrites. Other levels were not provided. Ref: Microbial Quality and Preservatives in Manufactured Meat Products 1996

<http://www.health.act.gov.au/c/health?a=da&did=10017393&pid=1053660020>

EFSA Survey: European Food Safety Agency, Nitrate in Vegetables - Scientific Opinion of the Panel on Contaminants in the Food chain, the EFSA Journal (2008) 689, 1-79. In response to a call for data on nitrate levels in vegetables, EFSA received 41,969 analytical results from 20 Member States and Norway covering the period from 2000 to 2007.

http://www.efsa.europa.eu/cs/BlobServer/Scientific_Opinion/contam_ej_689_nitrate_en.pdf

FSA Survey 2004: Food Standards Agency UK, Nitrate in Lettuce and Spinach Survey, 2004. Nitrate concentrations are higher in winter than summer, higher in glasshouses than outdoors. Glasshouse maximum quoted is for lettuces not including iceberg. Iceberg grown under cover were 2500. <http://www.food.gov.uk/multimedia/pdfs/fsis7405.pdf>

FSA Retail Salad Survey 2005: <http://www.food.gov.uk/multimedia/pdfs/retailsaladsurvey.pdf>

SA: South Australian Health Commission Epidemiology Branch, Nitrates in Vegetables in the lower south east of South Australia, 1982

<http://www.publications.health.sa.gov.au/cgi/viewcontent.cgi?article=1066&context=envh>

Kulmanen organically grown lettuce:: Organic farmer Ari Kulmanen from Ikaalinen in western Finland analysed lettuce samples and found nitrate levels for organic lettuce were 150 mg/kg compared to conventional lettuce levels of over 3,500 mg/kg. Research director Jouni Kujala from Helsinki University's Ruralia Institute commented that in Finland conventionally grown produce is often presented as 'near organic'. 'It seems as if Finnish authorities have not wanted to make conventional and organic segments compete for consumer choice,' says Kujala.

http://www.yle.fi/uutiset/news/2009/05/organic_lettuce_packs_25_times_less_nitrate_than_conventional_lettuce_761344.html

Table 3: Nitrates and Nitrites in Vegetables (mg/kg)

Food	Country	Nitrate			Year	Source*
		Low	Average	High		
Beans	Europe	6	392	810	2008	EFSA
Beetroot	Europe	110	1370	3670	2008	EFSA
Brussels sprouts	Europe	1	24	100	2008	EFSA
Cabbage	Europe	47	311	833	2008	EFSA
Carrots	Australia		158		1982	SA
Carrots	Europe	21	296	1574	2008	EFSA
Cauliflower	Australia		204		1982	SA
Cauliflower	Europe	7	148	148	2008	EFSA
Celery	Europe	18	1103	3319	2008	EFSA
Garlic	Europe	8	69	161	2008	EFSA
Green Beans	Europe	9	323	735	2008	EFSA
Leek	Europe	5	345	975	2008	EFSA
Lettuce	Australia		596		1982	SA
Lettuce iceberg	Europe	210	875	1537	2008	EFSA
Parsnip	Europe	2	16	83	2008	EFSA
Peas	Europe	1	30	100	2008	EFSA
Potatoes	Australia		90		1982	SA
Potatoes	Europe	10	168	340	2008	EFSA
Pumpkin	Europe	8	894	4617	2008	EFSA
Rhubarb	Europe	28	2943	6550	2008	EFSA
Spinach	Europe	64	1066	3048	2008	EFSA
Spinach organic	UK		2138		2005	FSA

Unless otherwise stated, figures are the mean of a number of samples.

*See sources in References above

See the full European list at

http://www.efsa.europa.eu/cs/BlobServer/Scientific_Opinion/contam_ej_689_nitrate_en.pdf

www.fedup.com.au

The information given is not intended as medical advice. Always consult with your doctor for underlying illness. Before beginning dietary investigation, consult a dietician with an interest in food intolerance. You can find a supportive dietitian through the Dietitians Association of Australia www.daa.asn.au or write for our list of supportive dietitians (confednet@ozemail.com.au)

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