# Radiance® NattoZyme

## What is Nattokinase?

Nattokinase is a potent fibrinolytic enzyme, which means that it causes the breaking up or dissolution of fibrin. Fibrin is the protein matrix that is responsible for holding a blood clot together.

## Where does Nattokinase come from?

Nattokinase is extracted and then highly purified from a traditional Japanese food called Natto. Natto has been used in Japan for over a thousand years and is a fermented food that is produced by adding the beneficial bacteria *Bacillus natto*, to boiled soybeans. The enzyme nattokinase is produced when *Bacillus natto* acts on the soybeans.

## The History of Nattokinase

Nattokinase was discovered in 1980 by Dr. Hiroyuki Sumi who had long been researching agents that assist in breaking up blood clots. After testing 173 natural foods, Dr. Sumi found what he was looking for, when fibrin exposed to natto in a Petri dish dissolved completely in 18hrs. Dr. Sumi named this enzyme "nattokinase", which means "enzyme in natto". Dr. Sumi commented that nattokinase showed "a potency matched by no other enzyme".

## How does Nattokinase work?

Nattokinase may help with:

- dissolving fibrin
- preventing unhealthy blood clot formation
- dissolving existing blood clots
- helping to regulate blood pressure
- enhancing the body's own clot buster plasmin and other clot-dissolving agents such as urokinase.

## Indications for usage

The following conditions can all be caused by excessive blood clotting

- Stroke
- Heart attack
- Senile Dementia
- Angina Pectoris
- Cerebral Haemorrhage
- Deep Vein Thrombosis (DVT)

A hypercoagulation factor has been implicated in the following conditions:

- Chronic Fatigue
- Multiple Sclerosis
- Fibromyalgia
- Some cases of infertility
- Other chronic illnesses

The following conditions can be assisted by the actions of Nattozyme:

- Diabetes
- Haemorrhoids
- Hypertension
- Dysmenorrhoea

## Dosage

Take two 50mg capsules twice daily

May be taken with or without food, however it may be recommended to be taken at bedtime or with the evening meal, since most heart attacks and strokes occur within a few hours of rising in the morning.

## Bottle size

120 hard shell vegetarian capsules

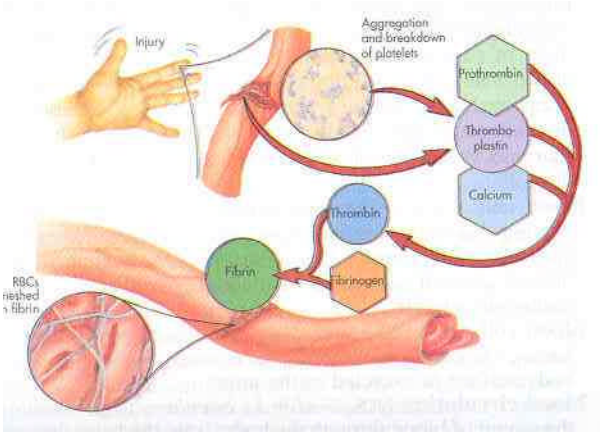
## Caution

Not recommended in conjunction with any anticoagulant medications or during pregnancy and lactation. Contraindicated in any condition associated with bleeding, including haemophilia, surgery or severe trauma

## Understanding Blood Clots

To fully understand the benefits of natto and nattokinase, you need to have a basic understanding of how and why clots, or fibrin deposits, are formed. Your body produces numerous compounds whose sole purpose is to make blood clots. But it produces only one enzyme to dissolve and break down fibrin in blood clots. That fibrinolytic, or "clot-busting" enzyme is called plasmin.

Your ability to form blood clots quickly can prevent you from bleeding to death if you're cut and stop excessive blood loss after trauma or injury. Although clotting normally occurs with an injury to a vessel, it can also occur within an intact blood vessel. Platelets will aggregate at the site; prothrombin will be converted into thrombin (an enzyme). Thrombin will then act as a catalyst for the conversion of fibrinogen to a mesh of insoluble fibrin in which it binds with all the formed elements (red and white blood cells, platelets, etc) to make a blood clot.




Fibrin is made up of sticky protein fibres that can accumulate and stick to blood vessel walls or continue to circulate in the blood stream.

Fibrin slows blood flow and forms a matrix for blood clots. When clots occur in vessels of the heart, the heart muscle is deprived of oxygen and quickly begins to die. The result: angina or a heart attack. A similar situation occurs when clots migrate from the heart to the brain or form in blood vessels that supply brain tissue. This can result in nerve cell death, which manifests as senility and/or stroke.

In the absence of or prior to full-clot formation, fibrin accumulations create hyper-coagulation or "clogging" in blood vessels. When blood coagulates more than normal, an outright clot and complete blockage might not occur immediately. Blood flow simply might begin to slow down. When that happens, fibrin strands start sticking to artery walls and blood flow is slowed even more. Over time, it slows to a trickle in the smallest vessels, the capillaries. The surrounding tissue begins to starve for oxygen, while increasing amounts of toxins and waste material accumulate.

**Various factors can contribute to this imbalance and trigger hyper-coagulation of blood:**

• **Genetic Defects** can inhibit the production of plasmin and other enzymes needed to prevent hypercoagulation and/or clotting. [7]

• **Aging:** As we age, our blood vessels become less elastic and blood flows more slowly through capillaries, which increases its tendency to coagulate.

• **Sedentary Lifestyles:** Exercise promotes the development of collateral blood vessels and helps maintain their elasticity.

• **Low Antioxidant Levels:** Antioxidants scavenge free radicals that, left unchecked, inflame endothelial cells lining blood vessels and cause the release of clot-promoting enzymes.

• **Improper Fats:** Unsaturated fatty acids are essential components for the formation of nervous tissue and an integral component of every cell wall and membrane in the body. They form one of the first lines of defence against various pathogens and toxins trying to invade cells. When essential fatty acids are deficient, your body has to use inferior fats for building and repair. Fragile or weak arterial cell walls are more susceptible to damage, which triggers the release of blood clotting enzymes.

• **Toxins** (pesticides; herbicides; industrial chemicals; household cleaners; sprays; toxic metals; vaccinations; air, water, and food contamination, etc.) are fat-soluble, fat-loving molecules that selectively bind to fatty barriers in the membrane of endothelial cells. They quickly dissolve in fatty tissue, which enables them to set up residence in the nerves, brain, liver, and kidneys. These "neurotoxins" and hyper-coagulation have been linked.

• **More-Virulent Pathogen Exposure:** Due to the overuse of antibiotics and the resulting resistant strains that have emerged, we are exposed to more and more dangerous forms of bacteria. Mutations are occurring at an alarming rate among numerous strains of viruses, moulds, and fungi, making them far more virulent. Most, if not all, of these pathogens directly assault the endothelial cells, eventually causing the formation of more fibrin, which in turn contributes to hyper-coagulation. Most of the bacterial pathogens are also anaerobic. In other words, to survive and replicate they require a low-oxygen environment. Under normal circumstances, plasmin and other fibrolytic ("fibrin cutting") enzymes rush to the scene, clear up the

mess and open up circulation. By triggering inflammation and other processes that impede circulation and increase fibrin production, they ensure their survival. Hyper-coagulation and fibrin deposits make ideal breeding grounds for these disease-causing pathogens.

## The Threat from Fibrin

For an increasing number of people however, the natural breakdown of fibrin does not happen. Instead, large amounts of fibrin are produced and is deposited on top of infected cells and bacteria. This seals bacteria off from the immune system and shuts off or greatly decreases the blood supply to the area. The pathogens no longer have to worry about oxygen levels getting too high or white blood cells from the immune system reaching them.

Other people cannot break down and remove fibrin deposits, due to a lack of enzymes. These bacteria-laden deposits can wreak all kinds of local havoc, depending on their location, and they constantly tax the immune system with toxins and "leaking" bacteria. If the deposits form in muscles, they become constantly sore and inflamed (fibromyalgia). If in the uterus, pregnancy might be impossible; and it's not uncommon to experience constant pain and other problems in that area. The deposit could be in the liver, brain, or practically anywhere in the body. That's why the correction of hyper-coagulation can be beneficial in so many different and difficult cases.

Hyper-coagulation helps explain why one person develops a chronic illness, while someone else exposed to the same pathogen quickly recovers. The breakthrough in the way we look at chronic illnesses actually came about through simple observation when researchers noted that many individuals suffering from chronic illness benefited almost immediately after being given various forms of anticoagulant drugs such as heparin and warfarin. Further investigation revealed that they had genetic defects that kept them from properly regulating the coagulation of their blood.[8] Reports began to surface showing that the majority of individuals with chronic fatigue syndrome and fibromyalgia could also be helped with anticoagulant therapy. [9]

Using anticoagulant drugs or even natural "blood thinners"-treats only the surface of the problem. Thinning blood and making blood cells less "sticky" temporarily allows more blood to flow through an area with blockages. The real solution is to actually remove the fibrin deposit or clot. That brings us full circle-back to drugs like urokinase, streptokinase, and activase. While these drugs have attained a degree of success, they all come with their own set of problems.

For one, they are extremely expensive - so expensive, in fact, that not all clinics and hospitals stock the drugs. If they do, they use them only when someone arrives at a hospital within minutes after a stroke or heart attack, because they have to be injected quickly following one of these incidents. This is because the drugs' fibrinolytic activity (ability to dissolve clots and fibrous tissue) lasts for about four to twenty minutes, while nattokinase maintains its activity for eight to twelve hours.

## Actions of Nattokinase

There are at least three separate mechanisms by which nattokinase exerts its pro-fibrinolytic effect. As mentioned earlier it has a direct fibrinolytic action working on fibrin to dissolve it. The other two mechanisms are the cleaving of plasminogen activator-inhibitor type 1 (PAI-1) and the up regulation of conversion of prourokinase to urokinase. This essentially means it helps shift the balance of key regulators of clot-dissolving factors. Nattokinase allows the body to naturally increase its fibrinolytic activity, while still maintaining overall regulation of its fibrinolytic balance.

## How can Nattokinase be measured?

Nattokinase produces a prolonged action which has been measured to last from eight to twelve hours. This effect can be determined by measuring levels of EFA (euglobulin fibrinolytic activity) and FDP (fibrin degradation products), which both become elevated as fibrin is being dissolved. The ELT (euglobulin lysis time) is another measure that can be used. This detects how long it takes for a blood clot to dissolve. This figure will drop while using nattokinase

## Clinical Studies

To date Nattokinase has been the subject of 17 studies, including some human studies. Abstracts of some of these studies follows.

### Fibrinolytic Activity

In order to confirm the effect of fibrinolytic activity by the oral administration of nattokinase, 8 healthy participants between the ages of 20 and 60 took 500mg orally in enteric coated capsules daily for seven days. The ELT was measured and was found to be shorter from day 4, and was shortened in all participants on day 7. The same results were recorded when the dosage was changed to 250mg. [1]

In order to confirm the effect of fluidity of whole blood by the oral administration of nattokinase, a 39yr old healthy male took 1g of nattokinase orally in enteric coated capsules after every meal for 14 days. They then recorded the amount of time it took for 100ul of heparinized whole blood to travel through a capillary, on day 7 it was 46.7 seconds. The average time *before* the administration of nattokinase was 54.8 seconds. The results imply that oral administration of nattokinase improves fibrinolytic activity and also control thrombus formation. [1]

Dr. Sumi and his colleagues induced blood clots in male dogs, then orally administered either four capsules of nattokinase (250mg per capsule) or four placebo capsules to each dog. Angiograms (X-rays of blood vessels) revealed that the dogs who received nattokinase regained normal blood circulation (free of the clot) within five hours of treatment. Blood clots in the dogs who received only placebo showed no sign of dissolving in the 18 hours following treatment.[1,3]

Researchers from Biotechnology Research Laboratories and JCR Pharmaceuticals Co. of Kobe, Japan, tested nattokinase's ability to dissolve a thrombus in the carotid arteries of rats. Animals treated with nattokinase regained 62 percent of blood flow, whereas those treated with plasmin regained just 15.8 percent of blood flow.[1]

Researchers from JCR Pharmaceuticals, Oklahoma State University, and Miyazaki Medical College tested nattokinase on 12 healthy Japanese volunteers (6 men and 6 women, between the ages of 21 and 55). They gave the volunteers 200 grams of natto (the food) before breakfast, then tracked fibrinolytic activity through a series of blood plasma tests. The tests indicated that the natto generated a heightened ability to dissolve blood clots: On average, the volunteers' ELT dropped by 48 percent within two hours of treatment, and volunteers retained an enhanced ability to dissolve blood clots for 2 to 8 hours. As a control, researchers later fed the same amount of boiled soybeans to the same volunteers and tracked their fibrinolytic activity. The tests showed no significant change.[1,3,6]

### Study on DVT

Nattokinase (combined with Pycnogenol) or placebo was given to individuals prior to long distance (7-8 hours) flights. Of the 92 individuals in the placebo group 7 developed a clot (out of the seven subjects, five were woman and had all been taking low dose oral contraceptives for over eight months previous), all without symptoms, discovered by ultrasound; of the 94 individuals in the Nattokinase group none developed a clot. [4]

### Benefits of Nattokinase on Blood Pressure

Traditionally in Japan, Natto has been consumed not only for cardiovascular support, but also to lower blood pressure. In recent years this has been confirmed by several clinical trials. While these studies were being carried out (see below) researchers from Miyazaki Medical College and Kurashiki University of Science and Arts in Japan discovered the presence of angiotensin converting enzyme inhibitors (ACE Inhibitors) which are commonly used to reduce blood pressure.

After a single intraperitoneal administration of 400-450 grams of the test extract (equivalent to 25 mg of natto food) into male Wister rats, systolic blood pressure (SBP) significantly decreased from 166 + mmHg to 145 + 24 mmHg in just two hours ($p<0.05$), and decreased further to 144 + 27 mmHg in 3 hours ($p<0.05$). On average, this data represents a 12.7 percent drop in SBP within two hours.[1,2]

#### Human Study

The same natto extract was then tested on human volunteers with high blood pressure. Blood pressure levels were measured after 30 grams of lyophilized extract (equivalent to 200 grams of natto food) was administered orally for 4 consecutive days. In 4 out of 5 volunteers, the systolic blood pressure (SBP) decreased on average from 173.8 + 20.5 mmHg to 154.8 + 12.6 mmHg. Diastolic blood pressure (DBP) decreased on average from 101.0 + 11.4 mmHg to 91.2 + 6.6 mmHg. On average, this data represents a 10.9 percent drop in SBP and a 9.7 percent drop in DBP.[1,2,6]

## Intimal Thickening

The effect of dietary supplementation with the natto extract nattokinase was used on intimal (pertaining to the inner lining of an artery, vein or lymphatic vessel) thickening of arteries after the vessel of the endothelium had been denudated (stripped away). This had been induced in the femoral arteries by intravenous infusion of rose bengal followed by focal irradiation with a transluminal green light. Dietary natto extract supplementation was started 3 weeks before endothelial injury and continued for another 3 weeks after. In ex vivo studies, ELT was measured 3 weeks after the initial supplementation. New intima formation and thickening were also initiated successfully. Nattokinase supplementation suppressed intimal thickening compared with the control group and shortened ELT, suggesting that their thrombolytic activities were enhanced. These findings suggest that natto extracts, because of their thrombolytic activity, suppress intimal thickening after vascular injury**.** [5]

## Comparing other Bloodthinning agents

**Aspirin:** Inhibits platelet aggregation by way of nonselective prostaglandin inhibition

**Warfarin:** Inhibits the synthesis of vitamin K dependent coagulation factors which results in depression of clotting factors VII, IX, X and II. This action is dose dependent.

**Heparin:** This enhances the rate at which Antithrombin III neutralises thrombin (causes fibrinogen to change to fibrin) and activated factor X (clotting factor). Antithrombin III also neutralises other clotting factors, e.g. factors IX, XI, XII and plasmin.

## Radiance® NattoZyme

The Radiance® NattoZyme product is the most advanced nattokinase supplement available on the market and boasts a remarkable 20 000 fibrinolytic activity units per gram (FU/g). Just two capsules, containing 50mg of pure nattokinase each, can deliver a full 2000 FU (FU indicates fibrinolytic activity or the ability to dissolve bloodclots) of activity. Just as important, with this new technique the fermentation medium used to produce the nattokinase in NattoZyme contains no soy, so that the new 20 000 FU/g Nattokinase supplements are completely soy-free and do not contain Vitamin K.

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