Nanobacterium sanguineum

In Pathological Calcifications

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M.B.,B.S; PhD (Alternative Medicine)
Nanobacterium sanguineum

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This book is intended to be solely educational and informational to know about Nanobacteria. It is not intended to substitute for any treatment currently prescribed by a physician.
1. What is *Nanobacterium sanguineum*?

*Nanobacterium sanguineum* is a Gram negative, small, motile, slowly growing bacterium that divides by binary fission within a calcium-coated slimy shell (this yeast-like shell replicate by budding). They are in the 20-200 nm range (one nm is $1 \times 10^{-9}$ m); the size much smaller than typical bacterium and the generally accepted lower limit size for life. It has a unique structure containing 16S ribosomal RNA.\(^1\)^\(^2\)^\(^3\)

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**EM picture of NB**

a. *particles of a renal stone*

b. *inside structure of renal stone revealed NB*

c. *NB in multiplication*

d. *NB under special stain*

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There are some arguments for the existence of nanobacteria. They mentioned that the theoretical minimum size for free-living organism (capable of holding the mineral molecular component of 250-450 proteins, genes and ribosomes would be 250-300 nm in diameter, a figure which matches well that described for the ultrabacteria.
Indeed, even a single ribosome, if surrounded by membrane and wall, would occupy a sphere of 57 nm in diameter. Therefore, they still believed that the particles identified as the living organism *Nanobacterium sanguineum* are in fact non-living but self-generating inorganic particles of hydroxyapatite which has been complex with nucleic acids, proteins and other ionic biomolecules.\textsuperscript{15}

2. History of *Nanobacterium sanguineum*

In 1981, Torella and Morita described very small cells called ultra-microbacteria; defined as being smaller than 300 nm.\textsuperscript{3}

By 1982 MacDonell and Hood found that some could pass through a 200 nm membrane (renal dialysis membrane, RO water treatment).\textsuperscript{3}

Early 1989, geologist Robert L. Folk found what he later identified nannobacteria (written with double “n”), that is, nanoparticles isolated from geological specimens in travertine from hot springs of Viterbo, Italy.
Initially searching for a bacterial cause for travertine deposition, scanning electron microscope examination of the mineral where no bacteria were detectable revealed extremely small objects which appeared to be biological. His first oral presentation elicited what he called “mostly a stony silence”, at the 1992, Geological Society of America’s annual convention. He proposed that nanobacteria are the principle agents of precipitation of all minerals and crystals on earth formed in liquid water, that they also cause all oxidation of metals, and that they are abundant in many biological specimens.³

*Nanobacterium sanguineum* 

was proposed in 1998 as an explanation of certain kinds of pathologic calcification (apatite in kidney stones) by Finnish researcher Olavikajander and Turkish researcher Neva Ciftcioglu, working at the University of Kuopio in Finland. According to the researchers the particles self-replicated in microbiological culture, and the researchers further reported having identified DNA in these structures by staining.⁴

Dr. Neva Ciftcioglu, PhD, born in Turkey is codiscoverer and a principal researcher of Calcifying nanoparticles (CNP) formerly known as Nanobacteria with Dr. E Olavi Kajander. She has been director of science at Nanobac Pharmaceuticals since 2004.
A paper published in 2000 by a team led by an NIH scientist John Cisar further tested these ideas. It stated that what had previously been described as “self-replication” was a form of crystalline growth. The only DNA detected in his specimens was identified as coming from the bacteria *Phyllobacterium myxiniacearum*, which is a common contaminant in PCR reactions.⁵

Kajander and Ciftcioglu set up a company in Finland in 2000, Nanobac Oy, to market medical diagnostic kits for identifying nanobacteria to medical researchers, and develop prescription medical treatment for calcification-associated diseases. The company was absorbed in 2003 by Nanobac Pharmaceuticals Inc., a publicly traded company in Tampa, Florida founded by nanobiotic developer Gary Mezo.³

In 2004 a Mayo Clinic team led by Franklin Cocklin Cockrill, John Lieske, and Virginia M. Miller, reports to have isolated nanobacteria in diseased human arteries and kidney stones. Their results were published in 2004 and 2006 respectively.⁶⁷

Similar findings were obtained in 2005 by Laszlo Pukas at the DNA Lab, University of Szeged, Hungary. Dr. Pukas identified these particles in cultures obtained from human atherosclerotic aortic walls and blood samples of atherosclerotic patients but the group was unable to detect DNA in the samples.⁸

In 2005, Ciftcioglu and her research team at NASA used a rotating cell culture flask, which stimulates some aspects of low-gravity conditions, to
culture nanobacteria suspected of rapidly forming kidney stones in astronauts. In this environment, they were found to multiply five times faster than in normal earth gravity. The study concluded that nanobacteria might have a potential role in forming kidney stones and may need to be screened for in crew pre-flight.⁹

The February 2008 PLOS Pathogens article focused on the comprehensive characterization of nanobacteria. The authors say that their results rule out the existence of nanobacteria as living entities, instead revealing that they are a unique self-propagating entity similar to prions and that they are self-propagating mineral-fetuin complexes.¹⁰

In April 2008 PNAS article also reported blood nanobacteria are not living organisms and stated that CaCO₃ precipitates prepared in vitro are remarkably similar to purported nanobacteria in terms of their uniformly sized, membrane-delineated vesicular shapes, with cellular division-like formations and aggregations in the form of colonies.¹¹

The growth of such “biomorphic” inorganic precipitates was studied in a 2009 Science paper, which showed that unusually crystal growth mechanisms can produce precipitate from barium chloride and silica solutions that closely resemble primitive organisms. The authors commented on the close resemblance of these crystals to putative nanobacteria, stating that their results showed that evidence for life cannot rest on morphology alone.¹²

3. Where is Nanobacterium sanguineum found?

Nanobacteria (NB) can be cultured from human blood, dental pulp, kidney stones, and calcified heart valves and
vascular wall plaque. It is not only present in the human body but also associated with human ailments without a specific aetiological role. Anti-NB antibody has been detected in subject with calcified lesions and inflammation in diverse ailments including choriodicidal inflammation in pregnancy, ovarian cancers, arthritis and even Alzheimer’s disease.\textsuperscript{1,2}

4. Culture and Growth of

\textit{Nanobacterium sanguineum}

It has been stated that NB are unique in that they can develop a calcium apatite cell wall, forming an enclosure around organism. Considering the size of the hydroxyapatite “wall” it is even more difficult to see how a living organism can be within a small structure. Nanobacteria divide very, very slowly, splitting into daughter cells once every three days, 1/10,000\textsuperscript{b} growth rate of conventional bacteria. Nanobacteria do not grow in standard bacteriologic culture conditions.\textsuperscript{1,15}

An isolated Nanobacterium in cell culture demonstrates a round to D-shaped configuration, termed coccolid by microbiologists. Initially 20 nm in size, it is seen to “grow” in mammalian culture media, related to the elaboration of a goey biofilm. Over time,
the biofilm hardens to cover the Nanobacterium like an “igloo”. Isolated Nanobacteria tend to coalesce, merging their biofilms to form a common shelter, which protects the Nanobacteria from predators such as heat, radiation, the immune system, and most antibiotics.¹

Crystal growth is enhanced in low gravitational environments and this may help to explain why astronauts returning to earth are prone to calcific atherosclerosis.¹⁵

5. Identification of *Nanobacterium sanguineum*

Their small size, slow growth rate, and unusual culture requirements explain why *Nanobacterium sanguineum* has until now eluded detection, as they can only be seen under an electron microscope.¹

The cross section through a mature, isolated NB shows the spicules surrounding the cell body which are composed of carbonate appetite, the principle form in which abnormal, extra-skeletal calcium is found in humans. NB elaborates biofilm which gradually become thicken and calcified and finally forming a NB colony, surrounded by raspberry shaped calcific shelter that houses and protects the NB inside.¹
6. Incidence of *Nanobacterium sanguineum* in human

NB can be cultured from the blood of medical students (5%), blood donors (15%), dialysis patients (80%) and untreated cardiovascular patients. In one study, urine cultures for NB were positive in 30% of healthy men. It can be cultured from dental pulp stones and calcified pineal glands (the brain centre that controls our sleep-wake cycle).¹

7. Clinical importance of *Nanobacterium sanguineum*

7.1. Nanobacteria and pathological calcification

It is becoming clear that pathological calcifications (*calcification in dental pulp, arteries, heart valves, kidney stones*) in our body are related to *Nanobacterium sanguineum*.¹

We are born with calcium in our teeth and bones. Osteoblasts and odontoblasts fix calcium and phosphorous, and then precipitate the product onto an organic matrix; this is the process of physiologic biomineralization involving apatite minerals. However, as a result of “ageing and disease states”, calcium deposition in our blood vessels and internal organs are known as pathological calcification.
Pathological calcifications

- Dental pulp stones and dental plaque
- Kidney stones and PKD
- Gallstones
- Atherosclerotic arteries & veins
- Calcified heart valves
- Cardiac skeleton
- Cataracts
- Pineal gland calcification (brain sand)
- Salivary stones
- Soft tissue calcification

These pathological calcifications don’t have anything to do with high or low dietary calcium intake. *Nanobacterium sanguineum* fixes calcium and phosphorous and converts it into carbonate apatite, the form in which these minerals are found in pathologically calcified tissues. NB can be cultured from kidney stones, calcified arteries, and PKD, and its antigen has been detected in dental pulp stones and calcified pineal tissue. So far, it appears that wherever the scientists find pathological calcification, they will also find NB.¹⁶
7.2. Nanobacteria and immune system

Many sea creatures are small and defenceless, but within their shell they enjoy protection from their natural predators. The only natural predator of NB is the immune system of their host. Given the small size and slow growth rate of this organism, NB vs immune system wouldn’t seem to be a fair fight—it isn’t, the NB always win!

![Image of NB](image)

The immune system can engulf or surround NB, if the immune response is aggressive enough. Even then our defence is moot, as the NB neither kills the cell that engulfs them, or they calcify inside the immune cell only to kill it later. Host generated antibodies to the NB biofilm should bind to the individual NB, rendering them a tasty morsel for circulating phagocytes. Rapidly dividing bacteria should hog all the available nutrients, crowding NB out. But this does not happen, because:

- NB shelter itself from the immune system (calcific semi-dormant defence). The biofilm elaborated by NB render them “sticky”. They bind to mammalian cells, trick the cell into endocytosing them, and then cause the now invaded cell to commit apoptosis (as occurs with tubular cells in polycystic kidney disease)—but not in all cases. This speculated, thickened, partially calcified biofilm material provides the individual NB with some protection against immune scavengers.

- NB can live where other bacteria cannot (extreme morphilie defence)
The end result is a “stand alone” NB colony, consisting of stuck together NB cell bodies, surrounded by a thick, layered wall of carbonate apatite. This structure in and of itself is not noticed by our bodies as “foreign”, but rather as normal “calcium” that causes no alarm. White cells, antibodies, and other bacteria cannot penetrate this shell. In clusters they can reach the size of the largest kidney stones.\(^{16}\)

The enclosed NB may now grow at their own, leisurely pace, free from molestation by their natural predators. Only when the NB secretes their biofilm does our immune system notice that something is wrong. Even then, the immune troops arrive to the scene of the biofilm ready to do battle…only no one is home (they’re hiding inside the calcium apatite shell). The immune troops wait and nothing arrives. If the NB were there, they would enter the immune defence cells and kill them approximately within three days.\(^{16}\)

7.3. Nanobacteria and periodontal disease

Dental research studies tell us that animals drinking from a common water supply are more likely to develop caries than are animals that drink from a non-common source. Treatment with some, but not all, antibiotics provide protection. Dental pulp stones and calcified dental plaques are caused by *Nanobacterium sanguineum*. Pulp stones patients and their family members are more likely than not to harbour pathological calcium elsewhere.\(^{13}\)

Dr. Mezo’s registry study includes heart disease patients, treated for vascular calcification with the nanobiotic *Nnanobac TX*, who noted concomitant improvement in gingivitis, dental plaque, and periodontal disease. Today,
there are more evidenced that Nanobacteria are principle causative factors for dental pulp stones and dental plaque.\textsuperscript{13}

7.3.1. Dental pulp stones
It is now clear that dental pulp stones are made by NB. Dental pulp stones are tiny concretions that can be found in the dental pulp chamber, the vascularized, central portion of the tooth—the region that your dentist drilled out when he did root canal treatment. Dental pulp stones are not found in the young, healthy mouth; rather their presence is associated with age and poor dental and/or periodontal health. Dental pulp stones contain a matrix of organic material, upon which calcium, in the form of carbonate apatite, were deposited, the same stuff that we will find in the kidney stones and calcified vascular wall plaque. Dental pulp stones are an example of pathological calcification.\textsuperscript{13}

The mechanisms of dental pulp stone formation are still largely unknown. Only few experimental reports have elucidated the potential of some selected bacteria to produce apatite under in vitro condition using special calcification media.

Ciftciglu and her research team studied to find out what cause them. They interviewed 18 patients with advanced periodontal disease, from whom pulp stones had been extracted. They found the presence of NB antigens in the
demineralized stones. They also found that these patients, all of whom demonstrated pathological calcification in their mouth, also harboured pathological calcifications elsewhere in their bodies, at a frequency far greater than that of the general population. What’s more, it seemed to be a family affair; their parents had more than their fair share of stones and soft tissue calcium. Why should this be?  

<table>
<thead>
<tr>
<th>Stones Types</th>
<th>Patients</th>
<th>Mothers</th>
<th>Fathers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kidney stones</td>
<td>28%</td>
<td>17%</td>
<td>33%</td>
</tr>
<tr>
<td>Urinary sand</td>
<td>33%</td>
<td>6%</td>
<td>0%</td>
</tr>
<tr>
<td>Gallstones</td>
<td>11%</td>
<td>39%</td>
<td>17%</td>
</tr>
<tr>
<td>Soft tissue stones</td>
<td>6%</td>
<td>28%</td>
<td>6%</td>
</tr>
</tbody>
</table>

This raises the implication that NB may enter the body also via oral route, in addition to the parenteral and transplacental route (NB can crosses the placenta). It is also present in saliva and therefore kissing the children by the parents can transmit *N. sanguineum*. Their next step was to react the stone material with fluorescent monoclonal antibodies raised against the cell wall of *N. sanguineum*.

As tissue *N. sanguineum* will always encase itself in a calcific shelter, the stones were first decalcified with HCL, as we would not expect an antibody, endogenous or experimental, to be able to get at the cell wall of a bacteria through a carbonate shell. All of the decalcified stones lit up with the anti-nanobacterial antibodies — thus *N. sanguineum* is present in dental pulp stones.  

Then they examined teeth, both healthy and pulp stones containing, with light and electron microscopy. The
normal teeth looked good, while the pulp stone teeth contained round, calcific masses, with a size and shape similar to that of the shelters surrounding NB colonies grown in tissue culture. Finally, a healthy tooth was incubated with lab stock *N. sanguineum*. One month later the previously healthy tooth didn’t look so good. The new unhealthy appearing tissue contained numerous hollowed out calcosphere like structures, identical in appearance to nanobacterial shelters grown in tissue culture or recovered from kidney stones.\textsuperscript{13}

Dental pulp stones thus contain *N. sanguineum*, and lab-stock NB seems to thrive when inoculated into teeth, and why not; NB is calcium dependent organism. Ciftcioglu has observed that NB growth is enhanced when calcium is provided to their growth medium.\textsuperscript{13}

7.3.2. Calcified dental plaque

When the dentist cleans your teeth, it will probably feel like scraping off small rocks. The dentist will come in and saw something like”the plaque on your teeth has calcified”. When Ciftcioglu’s team carried out EDAX (Energy Dispersive X-ray) analysis of dental plaque and NB grown in tissue culture, the appearances are quite similar.\textsuperscript{13}
7.4. Nanobacteria and kidney stones

Kajander and Ciftcioglu, the Finnish researchers and Nobel Prize nominees who first described *Nanobacteria sanguineum*, obtained kidney stones from 30 consecutive patients, ground them up, and then examined the stones under the electron microscope. What they found looks a lot like Nanobacteria within their calcific shelters. Hydrochloric acid was then applied to demineralize the kidney stone samples, and from this pulverized, acid treated kidney stone powder they could culture Nanobacterium.¹

If Nanobacterium was injected into an animal, it will concentrate in the kidney cells, from there migrate into the renal tubules and then appear in the urine. Kidney stones don’t form spontaneously in the urine, but as precipitate of calcium and other minerals upon dysfunctional, calcified kidney tubular cells, much like stalactites hanging from the roof of a cave. Nanobacteria initiate this calcification.¹

Eventually this mass of calcified Nanobacteria shelters and precipitated minerals will break off from its attachment to the kidney and migrate into the ureter where it can lodge, producing the pain of renal colic. About 5% of women and 10% of men will experience a kidney stone
Polycystic kidney disease (PKD) is strongly associated with NB infection because of presence of monoclonal antibodies to NB are found in cyst fluids and endotoxin produced by NB are the cause of disease.

7.5. Nanobacteria and polycystic kidney disease (PKD)

Background microbes have been suspected as provocateurs of polycystic kidney disease (PKD), but attempts to isolate viable organism have failed. Bacterial endotoxin is the most often reported microbial product found in PKD fluids. Although interstitial renal inflammation occurs in PKD, it is not known whether this inflammation is due exclusively to PKD cell biology or microbial factors impacting kidney and other affected tissues, especially the gastrointestinal and cardiovascular system.14

Bacterial endotoxin known as lipopolysaccharides (LPS), a potent nephrotoxic inflammatory agent, has been found in PKD cyst fluid and urine.14

A group of scientists from the University of Illinois, USA; University of Edinburgh Medical School, Scotland; and University of Kuopio, Finland have studied the polycystic kidneys from 13 patients with ADPKD (Autosomal Dominant Polycystic Kidney Disease) within 2 hours of nephrectomy at the Department of Surgery, St Francis Medical Centre, USA. They found that;
Nanobacterium sanguineum

- Endotoxin or its remnants in cyst fluids and urine were found in all kidneys examined (positively 8 folds).
- Monoclonal antibodies to NB were present in the cyst fluids.
- NB were cultured from the sample of urine and cyst fluid of 11 out of 13 PKD patients, and were visualized in all PKD patients.
- NB was also detected in urine and liver of patient with PKD.
- Tetracycline and citrate inhibited NB growth *in vitro*.

They concluded that NB or its antigens were present in PKD and the endotoxin produced by NB is probably the cause of the PKD.14

7.6. Nanobacteria and arterial calcification

Our arteries are calcium-free at birth. Calcium deposition within the vascular wall is not unusual with aging. We do not want calcium within our blood vessel walls. The ultrafast CT scanner can localize and quantitate calcium within our coronary arteries. As a general rule, the more calcium present in our arteries, the more likely we are to have obstructive coronary artery disease, placing us at risk for heart attack or stroke.1

In relation to age, gender, and risk factor status, your CT “calcium score” can be used to predict the likelihood that
you have a blocked coronary artery. Of interest, in coronary patients, the calcium score progresses at a rate of 45% per year, roughly the same rate at which kidney stone calcification progress.¹

Mechanisms mediating vascular calcification remain incompletely understood. Nanometer scale objects hypothesized to be a type of bacteria NB are associated with calcified kidney stones. A group of scientists from Mayo Clinic, USA studied in 2004 to evaluate human vascular tissue for the presence of similar nanometer scale objects. Calcified human aneurysms (n = 8), carotid plaque (n = 2), femoral arterial plaque (n = 2), and cardiac valves (n = 2) were collected as surgical waste from the Heart Hospital of Austin. They found that nanosized particles were cultured from calcified tissues but not from non-calcified specimens.¹⁸

Laslo Puskas, a Hungarian researcher, applied calcium specific stains and fluorescent, Nanobacteria-specific monoclonal antibodies (which attach only to Nanobacteria), to microscopic sections of carotid and aortic atherosclerotic plaque, 66% of the specimens “lit up” for Nanobacteria, 100% of the specimens stained for calcium, in a “calcospherule” pattern. The diameter of calcospherule was similar to that of the calcific Nanobacteria shelters that can be grown in cell culture. Puskas was then able to culture Nanobacterium sanguineum colonies from 63% of the specimens. Thus live Nanobacterium sanguineum colonies are present in human artherosclerotic plaque, and correspond to areas of vascular calcification.¹
7.7. Nanobacteria and calcified heart valves
Pathological calcification is also present in cardiac valves with rheumatic heart disease. The scientists from Central South University, Hunan, China studied to detect, isolate, culture and characterize nanobacteria-like material from human calcified cardiac valves with rheumatic heart disease during 2009.\(^\text{16}\)

They used normal and calcified valve groups, as well as positive (nanobacteria strain Se90) and negative (serum radiated with 30 kGy of \(\gamma\)-ray) control groups, were included in this study. Part of each valve was immunostained with nanobacterial antibody 8D10, and the remaining parts were homogenized, filtered, and maintained in culture. The cultures were checked with microscope weekly. Culture medium at different time points was analysed with a spectrophotometer. The cultures maintained for 3 weeks were further examined with immunofluorescence double staining and transmission electron microscopy.\(^\text{16}\)

As a result, while 26 of 29 calcified valves stained positive for 8D10 antibody, all normal valves stained negative. Mobile tiny particles were observed under a microscope in the calcified valve group and the Se90 group. Optical densities were significantly different among groups (\(p<0.001\)).

\textit{NB is possible responsible agent for pathological calcification in rheumatic valvular heart disease leading to mitral valve and aortic valve stenosis.}
Immunofluorescence double staining displayed tiny green fluorescence particles in the calcified valve group, in the Se90 group, and in two samples of the normal valve group. Transmission electron microscopy analysis indicated that cultured particles from calcified valves ranging in size from 88 to 341 nm had an obvious cell membrane structure similar to that of Se90.16

It was concluded that the nanobacteria-like material has been isolated and cultured from calcified cardiac valves with rheumatic heart disease, and its characteristics are similar to those of Se90.16

7.8. Nanobacteria and HIV
More recent report on the detection and vertical transmission of NB antigen and anti-NB antibody in HIV-infected mothers supports that NB might be an important opportunistic infective agent contributing to HIV pathology. The scientists noted the presence of viable and transmitting NB was not studied and suggest further study to establish vertical transmission of NB in HIV-infected persons.2
8. Treatment for Nanobacteria and pathological calcification

8.1. Calcium Chelating Therapy (EDTA)
EDTA (Ethylene-Diamine-Tetra-Acetic acid) is a synthetic amino acid related to vinegar. EDTA was developed by the Germans in 1931 to reverse heavy metal poisoning from the ingestion of lead, mercury, cadmium, and more. It removes calcium from arteriosclerotic plaque. It dissolves kidney stones, reduces heart valve calcification, improve heart function.\(^{19}\)

It is not a new treatment; it is one of the best guarded secrets that is known for heart improvement. EDTA is known to be calcium-blocking agent and a potent coronary vasodilator. In other words, EDTA can bind or chelate calcium, as well as other mineral in the body. It removes the calcium particles deposited in the arterial wall plaques and atheromas as well as the calcium in the outer wall of NB, exposing to antibiotics to kill the bacteria. In addition EDTA blocks the slow calcium currents in the arterial wall, resulting in arterial vasodilation.\(^{19}\)

Today oral EDTA preparations are available in powder form. The body absorb 50% of oral EDTA. It should be taken away from the meals so that its action does not remove the beneficial nutrients in the food. EDTA 1500 mg
Dr. Khin Maung Lwin (FAME)

taken in a rectal suppository base every evening can be given to avoid interaction with foods. The patient should take vitamin B complex and minerals as supplement while taking EDTA. While the IV method does get 100% of the EDTA into the blood stream, it is much more costly, time consuming, and requires a medical technician.¹⁹

8.2. Tetracycline

Up to now, the only antibiotic sensitive to NB is tetracycline. It should be used in combination with EDTA that destroy outer calcium sheet of the NB. The scientists suggest that tetracycline in suppository formulation acted in combination with EDTA, more as a chelating agent than an antibiotic. Oral Tetracycline HCL 500 mg or Doxycycline 200 mg can be given in the every evening. However, Oxytetracycline, a non-chelating form of tetracycline does not inhibit or kill NB.³

8.3. Mouth Hygiene

Mouth hygiene is the most important part of the management of pathological calcification in the body because it is only the known point of entry to NB. Regular tooth brushing twice daily; morning and before bed and use of mouth washing after eating meals three times daily; after breakfast, lunch and dinner. Natural mouth wash containing neem or clove are preferable. Neem has been
used for thousands of years in India to cure mouth infections. Recent studies suggest that neem is also effective for NB.

8.4. Diet
Dietary factor is also important role in controlling NB. The diet rich in vitamin C like citrus fruits act as calcium chelating agent that prevent pathological calcification in the body. Among the fruits, apple and pineapple are the most popular. The diet containing vitamin B complex, folic acid, niacin and selenium are also useful.

9. Future of Nanobacteria

Nanotechnology and nanomedicine are increasing popular in medical science. Development of high resolution electron microscope and digital imaging system identified the new strain of microorganisms including Nanobacterium sanguineum. Some researchers suggest Nanobacteria are a new class of living organisms capable of incorporating radiolabeled uridine, while other investigators attribute to them a simpler, abiotic nature.

The term “calcifying nanoparticles (CNPs)” has also been used a conservative name regarding their possible status as a life form. The most recent research tends to agree
that these structures exist, and probably replicate in some way, but their status as living entities is still hotly debated.  

On the basis of foregoing the scientists suggest that NB possibly exacerbates human ailments and raise the question; Is NB a new life form in search of human ailments or a commensal organism?

Recognizing the presence of NB in the human body, the scientists discuss clinical trials, reported in the literature relevant to the eradication, with a rectal suppository containing very high amount of disodium EDTA and tetracycline. Evaluation of anti-NB effect of orally administrable and potentially safer as well as therapeutically more acceptable chelating agent-ascorbic acid, acting alone or in combination with antibiotics is also suggested.
10. REFERENCES


Nanobacterium sanguineum

The development of high resolution electron microscope and digital imaging system identified a new strain of bacteria known as *Nanobacterium sanguineum*, which is very small, about 20 nm in diameter, motile, Gram negative, slowing growing bacterium that divides by binary fission within a calcium-coated slimy shell.

NB can be cultured not only human blood and urine, but isolated from dental pulp stones, dental plaque, kidney stones, fluid of polycystic kidney disease (PKD), calcified heart valves and calcified vascular wall plaque.

NB can be treated by calcium chelating agent like EDTA, and vitamin C, antibiotic (the only sensitive for NB is tetracycline), and proper mouth hygiene by using tooth brushing twice daily and use of neem or clove mouth wash after eating foods.