

Hi to everyone in the Millhouse Community

I returned from vacation and found our community buzzing with the Rugby World Cup. I'm delighted the AB's won, but I'm also glad the hype of the tournament has ended. Prior to my departure I visited my home town of Christchurch and observed the devastation of that beautiful garden city, as well as the resilience of friends and family who had suffered loss. Each week at Millhouse I meet people struggling with tragedy and illness and am amazed at their fortitude and how their physical bodies and emotional beings survive in the most difficult of situations.

During recent years I have become aware of a newly-discovered physiological pathway that is vital to maintaining health and wellbeing. In this newsletter I will discuss the **NITRIC OXIDE CELL SIGNALLING SYSTEM** and how this new information, like the traditional Mediterranean diet, improves health and accelerates healing.

NITRIC OXIDE

At medical school I learnt that **trinitroglycerine** (glyceryl trinitrate - Nitrolingual Spray & Anginine tablets) increased blood and oxygen supply to the heart to relieve acute chest pain.

Nitroglycerine was the first liquid explosive; Alfred Nobel mixed it with gun powder to make an effective but dangerous 'blasting oil'. Later Nobel combined nitroglycerine with diatomaceous (porous silica) earth to make an explosive paste which he named **dynamite**. I had always wondered if using nitroglycerine to treat angina was discovered when a miner with heart disease licked his fingers after handling explosive, and his chest pain was relieved. It wasn't quite that simple, but it was known that men using nitroglycerine experienced intense vascular pounding headaches. This prompted Dr William Murrell in 1878 to experiment with using it in treating acute angina pain. Within a year it became mainline therapy for acute chest pain and in treating raised blood pressure, yet the reason why nitroglycerine relaxed blood vessels remained a mystery till recently.

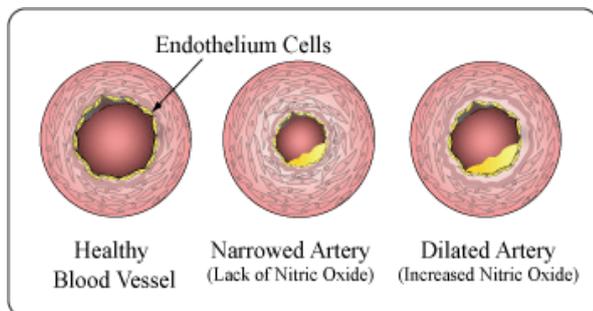


Another serendipitous event in the mid 1990's was the discovery of Viagra. Medical researchers were experimenting with sildenafil, a drug known to relax blood vessels in heart disease and high blood pressure patients. They observed it also caused sustained male erections, by boosting blood flow in the penis, and instead of sildenafil becoming a heart drug, it went on to become Viagra, a billion-dollar blockbuster success for Pfizer.

Three years ago Dr's Louis Ignarro, Robert Furchgott and Ferial Murad were awarded the Nobel Prize in medicine in recognition of their discovery that **Nitric Oxide (NO)** gas when created will within seconds penetrate cell membranes sending messages primarily to the **arteries to relax**, but also to the **immune system to kill bacteria and cancer cells** and encourage **brain cells to communicate** with each other.

'There may be no disease process where this miracle molecule (nitric oxide) does not have a protective role.'
Prof Louis Ignarro

The biggest body organ is the single cell inner **endothelial lining of the blood vessels**. A healthy artery is smooth and relaxed, but a diseased blood vessel is narrowed, and increasingly becomes clogged with plaque. Healthy arteries are known to have a high **NO** levels, while diseased vessels are low.



NO is manufactured in the endothelial cells by the enzyme **endothelial nitric oxide synthetase (eNOS)** from two pathways either by using L-arginine sourced from protein (meat, fish, dairy, bean & nuts) or from food nitrate and nitrite. I will say more about this later.

Nitroglycerine/glyceryl tri-nitrate is used by the endothelium to immediately produce **NO** which stimulates the relaxation of the artery increasing blood flow and oxygen to the heart muscle and relieving chest pain.

Viagra, (also Cialis and Levitra) on the other hand, blocks the enzyme that destroys c-GMP, the molecule activated by nitric oxide that enhances blood flow in the penis.

The **Mediterranean Diet** consists primarily of vegetables, especially leafy greens, fruits, fish (rather than meat/animal fats/dairy), beans, whole grains red wine and monounsaturated olive oil, and is known to lower cholesterol, triglyceride and inflammatory markers, increase the good HDL cholesterol, improve diabetes and decrease blood pressure. A five-year Spanish study on 14,000 people showed how the Mediterranean Diet lowered the risk of developing cardiovascular disease and strokes by 59%. In another nine-year study on 23,000 Greeks, researchers found that the most important dietary health influences were **RED WINE**, a **low intake of MEAT** and frequent consumption of **VEGETABLES**.

Leafy green vegetables* contain the highest amounts of nitrate and nitrite that produce NO in the body. Animal and human research has shown that **higher NO levels** improve a number of diseases which are listed on the next page. *vegetables also contain many other beneficial nutrients.

THE NITRATE/NITRITE CONNECTION

Earlier I mentioned that the amino acid L-arginine from food protein increased **NO** levels but researchers when they gave it as a supplement in patients with heart disease found it had no beneficial effect. However we know that consuming leafy green vegetables a rich source of food nitrate and nitrite does prevent heart disease.

Food nitrate is changed to **nitrite** by gastric acid. **Food nitrite** is absorbed in the mouth. Nitrite is then taken into the blood stream and delivered to cells, to be converted by the enzyme **nitric oxide synthetase** into **nitric oxide**. **Waste nitric oxide** is changed (oxidized) to nitrite and other nitrogen oxides which are **recycled** in the saliva and body tissue to be reused for **more NO production**.

IMPROVING NITRIC OXIDE AVAILABILITY

1. **Consume lots (2-3 cupfuls) of fresh leafy greens** daily. The Mediterranean diet has 20x the nitrate/nitrite level compared to a typical Western Diet. Below is a **Nitric Oxide Index** table showing the nitrate/nitrite rating of foods by weight. Eat lots of spinach, cabbage, lettuce and other high index foods.
2. **Add lemon juice and vinegar** to your vegetables to accelerate the conversion of nitrate to nitrite which will increase **NO** production.
3. **Ensure adequate water hydration** which increases **NO**.
4. **Enrich your diet with polyphenol** antioxidants foods from the plant kingdom (flavonoids- all colours, anthocyanins -red, proanthocyanin - clear colors). They include **resveratrol** from red wine, **epigallocatechin** from green and black tea, **enzogenol** from pine tree bark, anthocyanins in **blueberries** and **blackcurrants**, **apples** and especially **pomegranate** juice that promote **NO** release. **Cocoa** rich in dark chocolate increases **NO** and improves endothelial artery function and lowers blood pressure. **Beetroot** and **hawthorn** are rich sources of nitrate which lower blood pressure and improve heart function. Hawthorn is a traditional herbal heart remedy.
5. **Eat oily fish & fish oils** which stimulate **NO** release.

NITRIC OXIDE in -

Heart disease enlarges arteries, lowers bad LDL raised good HDL, reduces inflammation
Asthma & Obstructive Airways Disease NO relaxes the airways.
Arthritis higher NO levels boost anti-inflammatory drugs effects.
Anti-aging higher NO promotes longer life.
Altitude Sickness high levels NO are preventative and boost recovery.
Bladder NO relaxes bladder muscles
Cancer NO sensitizes cells to radiation, limits damage & boosts cancer killing cells.
Dementia & Brain Function poor NO production appears to adversely affect memory and learning.
Depression, insomnia, stress NO boosting compounds improve these conditions.
Diabetes NO helps regulate insulin and assists glucose uptake into cells.
Erectile dysfunction increased NO (with Viagra) improves penile blood flow.
Eye NO improves glaucoma and blood flow.
Infections higher NO levels help kill bacteria.
Osteoporosis weight bearing exercises increase NO which improves bone production.

FOOD - NITRIC OXIDE INDEX

HIGH		MEDIUM		LOW	
Kale	6825	Coleslaw	84	String beans	9
Swiss Chard	2055	Asparagus	82	Sausage	8
Arugula	1452	Celery	80	Figs	7
Spinach	1123	Watercress	73	Prunes	6
Chicory	938	Artichoke	63	Sweet potatoes	5
Wild Radish	814	Eggplant	39	Raspberries	5
Bok Choy	775	Strawberry	34	Raisins	4
Beet	632	Potatoes	26	Banana	4
Chinese Cabbage	499	Garlic	19	Cherries	3
Beetroot juice	482	Tomatoes	14	Onion	3
Lettuce	388	Vegetable Juice	11	Red wine	3
Cabbage	312	Vegetable soup	10	Bean sprouts	2
Mustard Greens	226	Cereal	10	Hot Dogs	1
Cauliflower raw	167	Melon	10	Bacon	1
Parsley	150			Chickpeas	1
Kohlrabi	136			Ham	0
Carrot	127			Ketchup	0
Broccoli raw	122				

6. **Eat an occasional water melon** which is high in citrulline a compound which improves natural L-arginine breakdown and **NO** production, but also high in sugar.
7. **Exercise** increases **NO** release and improves blood flow.
8. **Deep breathing, meditation, relaxation techniques** and saunas improve **NO** levels.
9. **Breast Feed**. Breast milk is high in nitrate/nitrite compared with formula milk, and activates the gut immune system.
10. A number of **Traditional Chinese Medicine herbs** have been shown to increase levels of **NO**.

In the final newsletter for 2011 I will discuss in more dept the importance of dietary intervention in cardiovascular disease.

Reference source: *The Nitric Oxide Solution* by Nathan Bryant & Janet Zand (2010)

MILLHOUSE NEWS:

OSTEOPATH Ghassan Alaraji is now working fulltime.

DOCTORS ON VACATION OR SICK LEAVE in November include Dr Else who is having a shoulder operation, and Dr Therese who deserves a well-earned break.

PRACTICE NURSE Rhiannon is commencing nurse diabetic clinics with patients.

Yours in good health
 Dr Richard J Coleman.