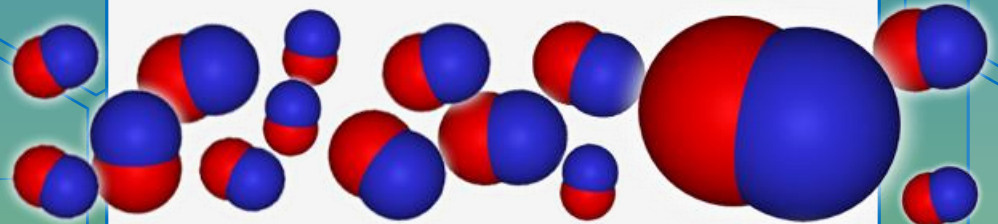


# Say **NO** to Disease



Preventing and  
reversing disease by  
generating nitric oxide  
with whole foods

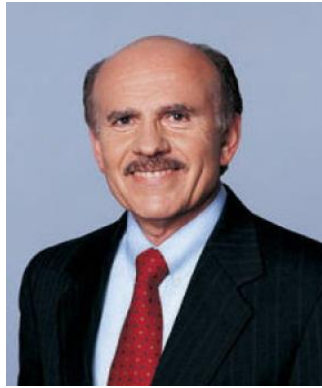
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Stephanie Polizzi, MPH, RDN, CHES, FAND  
OSU Extension Family & Community Health  
Coos and Curry Counties

It may sound too good to be true, but whole foods can give the body what it needs to fight disease.

✦ One example of this is Nitric Oxide or **NO**

✦ By saying YES to nitric oxide production, you may be saying **NO** to many of today's chronic diseases



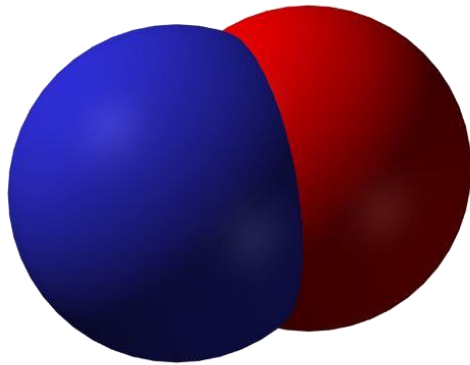
In 1998, 3 men  
were awarded  
the Nobel Prize

in Physiology or Medicine for their discovery of,  
“the most significant molecule in the body.”

They discovered that **NO** has implications  
for reversing heart disease, cancer, diabetes  
and much more.

# What is NO?

✦ NO stands for Nitric Oxide



✦ A combination of one molecule of Nitrogen and one molecule of Oxygen

✦ It is a gas that disperses rapidly into tissues

✦ It is found naturally in the body

## What NO is not



- ◆ Not nitrous oxide, “laughing gas” used in the dentist’s office  $N_2O$



- ◆ Not nitrogen dioxide, an air pollutant  $NO_2$

## What does **NO** do?

It is a chemical messenger that signals:

- ◆ arteries to relax and expand
- ◆ immune cells to kill bacteria and cancer cells
- ◆ brain cells to communicate



There's much more...



## NO can

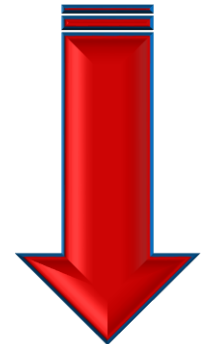
- ◆ prevent high blood pressure
- ◆ keep arteries young and flexible
- ◆ lower cholesterol
- ◆ reduce formation of blood clots
- ◆ prevent, slow or reverse arterial plaque



But wait, there's still more...

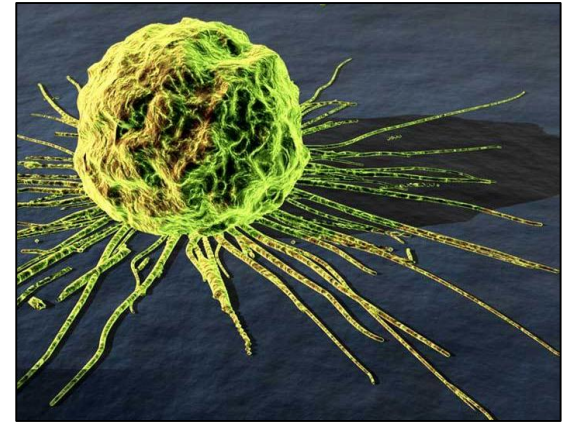
# More...

- ✦ reduce risk of diabetes and complications like kidney disease, blindness, and neuropathy (numbness which can lead to the development of gangrene or even amputations)
- ✦ limit swelling and pain of arthritis
- ✦ protect bones from osteoporosis
- ✦ help protect skin from sun damage
- ✦ reduce risk of developing dementia





# More...



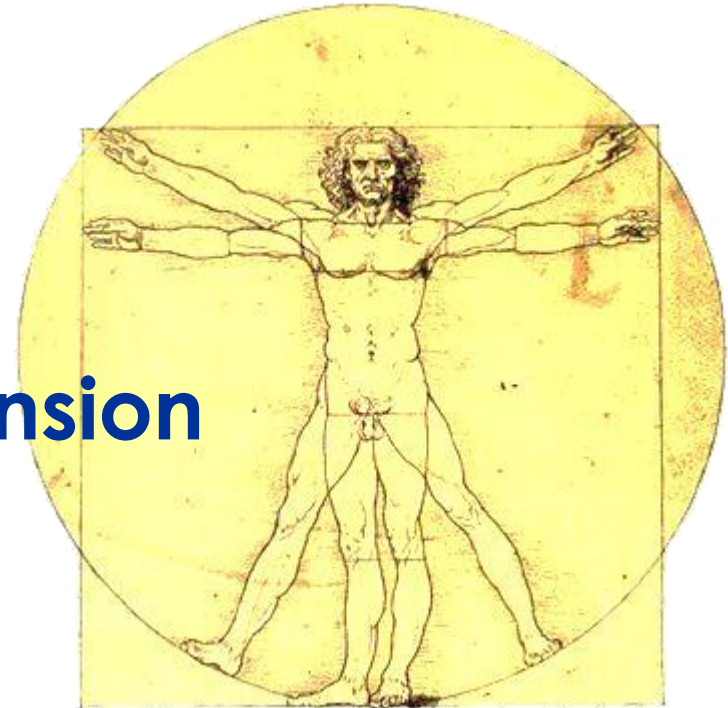
- ✦ **NO** can be used to inhibit the growth of cancerous tumors
- ✦ It can be used as a marker to reveal inflammatory disease, asthma, colitis and others
- ✦ It is important for our olfactory senses in helping us recognize different scents



It's **NO** wonder  
the Nobel Prize committee  
named nitric oxide  
“the most significant molecule  
in the body!”

## NO and Disease

Humans with  
atherosclerosis,  
diabetes or hypertension  
show impaired  
**NO** pathways.



Dessy, C.; Ferron, O. (2004).

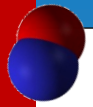
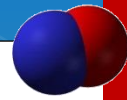
# NO and Heart Disease

When **NO** is produced by the innermost cell layer of the arteries, the endothelium, [it results in] a dilatation of the arteries.

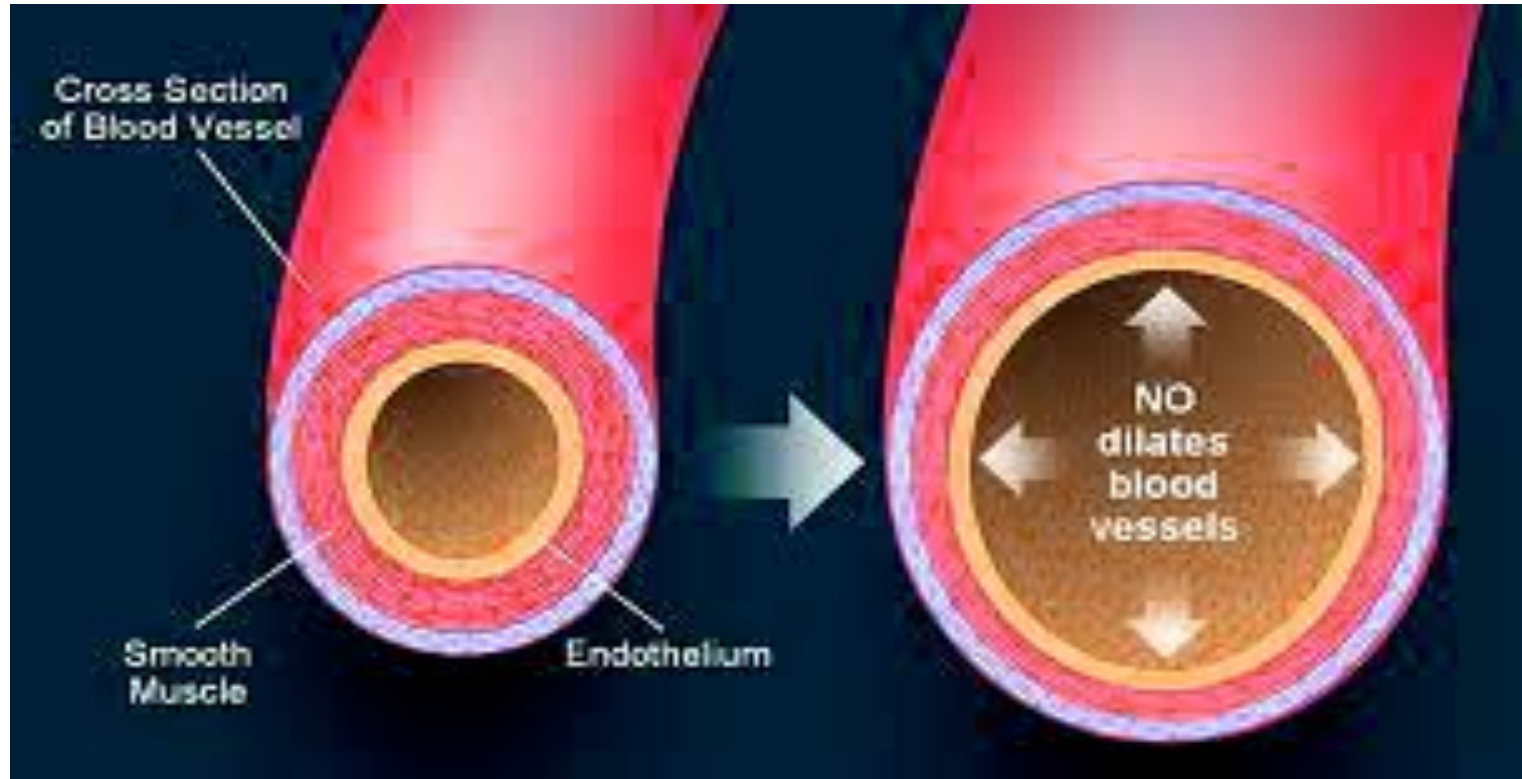
In this way, **NO** controls blood pressure and also prevents the formation of thrombi.

Naseem, KM. (2005).





## NO and Heart Disease



**NO:**

## Mechanism of Nitroglycerine pills

- ◆ Nitroglycerin pills are used to prevent or treat acute chest pain
- ◆ Nitroglycerin reacts with a sulfhydryl group to produce nitric oxide, which eases the pain by initiating vasodilation





# NO and Diabetes

Patients with diabetes are at high risk for vascular disorders such as hypertension, nephropathy and retinopathy.

The role of **NO** in vascular responsiveness may improve symptoms of the disease.

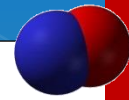
Traub,O; Van Bibber,R. (1995).

## NO and Diabetes

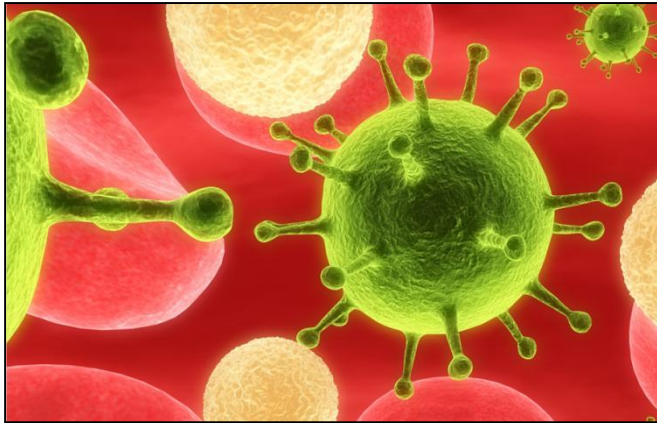
Patients with both Type 1 and Type 2 diabetes are likely to show endothelial dysfunction, reduced blood vessel flexibility, and reduced capacity to produce **NO**.

This results in inflammation, blood clots and increase of cholesterol adhesion to the interior of the arteries.

Farkas, K; et al. (2000).

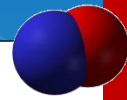


## NO and the immune response



- ✦ When **NO** is secreted as an immune response it can kill bacteria and virus

Jacobs, L; et al. (2010).



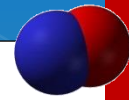
## NO and Exercise Performance

- ◆ Nitric oxide lowers oxygen demand during moderate and vigorous exercise

Larsen, FJ; et al. (2007), Bailey, DM; et al. (2009)

- ◆ Beet root juice helps produce NO which reduces oxygen cost, improves muscle efficiency and extends time to exhaustion during exercise

(Vanhatalo, A; et al. (2010), Bailey, DM; et al, 2010)



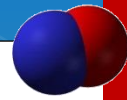
## At Risk Populations for low NO

- ◆ African-Americans
- ◆ Preemie babies
- ◆ Being over age 40

Over the age of 40, one of the 2 pathways we use to produce NO loses efficiency







## Who can Benefit from Increasing **NO**

### ◆ Those with diseases like

diabetes  
cancer  
osteoporosis  
obesity

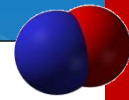
asthma  
dementia  
insomnia  
skin disease

COPD  
glaucoma  
depression  
stomach ulcers  
erectile dysfunction

### ◆ Those over age 40

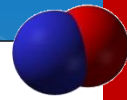






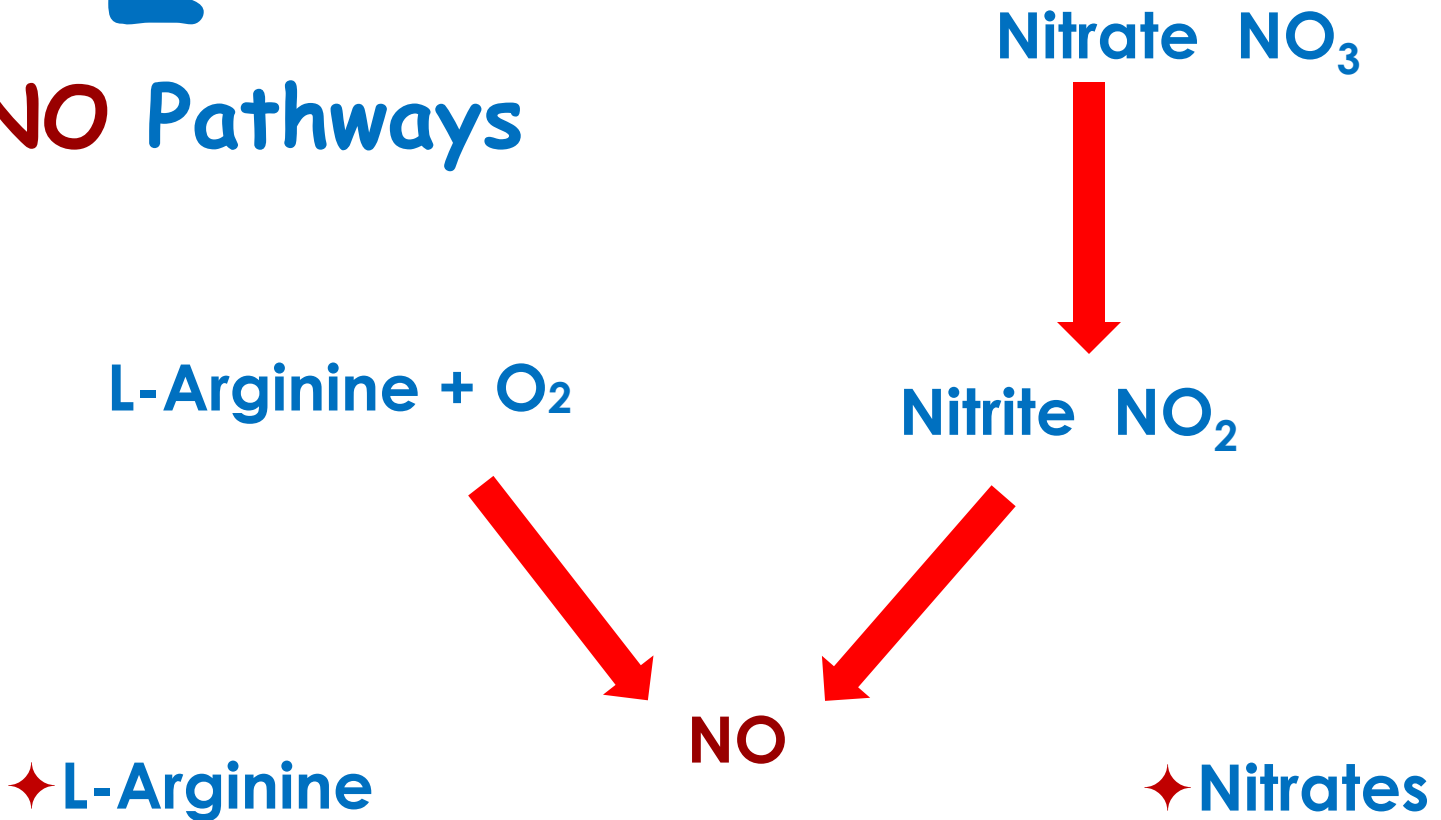
## How does NO work?





## 2

### NO Pathways





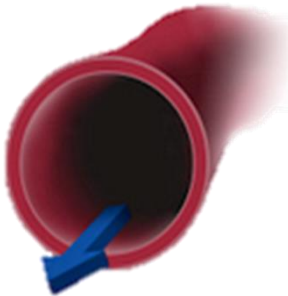
1. Nitrates are supplied by food (dark leafy greens)



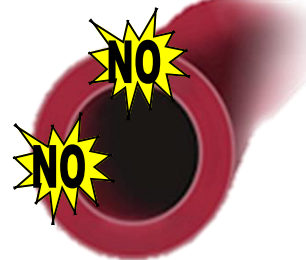
2. Oral bacteria in the saliva convert nitrates to nitrites



3. Stomach acid converts nitrites into nitric oxide and it enters the blood stream



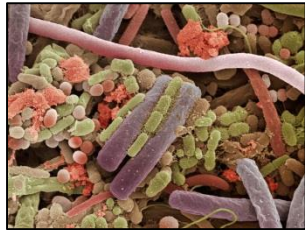
5. This allows greater blood flow and circulation which increases oxygen and nutrient transport



4. Nitric oxides immediately triggers the muscles of the arteries to relax so they widen (vasodilation)



## Tongue Bacteria



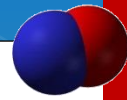
✦ Bacteria on the tongue reduce salivary nitrate to nitrite

✦ Interference with healthy bacteria can reduce **NO** production by at least 1/3

✦ Mouthwash kills healthy bacteria







Which foods make **NO**?

# Vegetables

especially

**DARK LEAFY GREENS**

& some fruits



## High **NO** producers



- ◆ Kale, Swiss chard, arugula, spinach
- ◆ Chicory, wild radish, bok choy, beet
- ◆ Lettuce, cabbage, mustard greens
- ◆ Cauliflower, parsley, kohlrabi, carrot, broccoli



## Nitrate Confusion

Some may have heard nitrates are dangerous

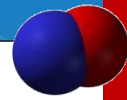


- ✦ Sodium nitrate/sodium nitrite are salts used to preserve meats like ham, bacon, lunchmeats and hot dogs
- ✦ These salts have been linked to cancer since they are converted to nitrosamines by stomach acid in the presence of saturated fat
- ✦ They can also be formed by frying at high temps

## Nitrates in Greens

- ◆ Do not form nitrosamines
- ◆ Contain no saturated fats
- ◆ Are best sources for making **NO** if they are consumed raw since nitrates are destroyed with cooking





Capacity to produce **NO** is reliant on nitrates from raw vegetables and fruits.



Cooking, boiling, steaming, broiling, baking, blanching all destroy the nitrates for **NO** production.

Eating greens daily will provide the nitrates for producing **NO**.

# Go Green!



- ◆ Those who ate the most dark green leafy vegetables had 21% lower risk of stroke
- ◆ Those who ate the most cruciferous vegetables had 32% lower risk of stroke
- ◆ Just one serving of green leafy vegetables can decrease risk of heart disease by 23%

Studies from the Harvard School of Public Health

## Warfarin & other blood thinners

- ✦ Those taking blood-thinning medications are often advised to restrict foods with vitamin K which also tend to be the foods high in nitrates needed for NO production
- ✦ To make NO, you will want to consume raw greens daily but may need your medication adjusted, but you must be consistent
- ✦ Consult with your physician before adding greens if you are taking these medications

# Boosting **NO** production

## 1. Have greens at every meal





# Boosting **NO** production

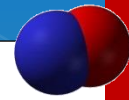
## 2. Accompany greens with a source of vitamin C



# Boosting **NO** production

3. Consume foods high in polyphenol antioxidants, like darkly colored fruit, red wine or grapes and even a small amount of dark chocolate





## More ways to boost NO

- ◆ both cardio and strengthening exercise
- ◆ deep breathing, especially through the nose
- ◆ maintain friendly bacteria on skin, in mouth, in digestive tract
- ◆ relaxation techniques

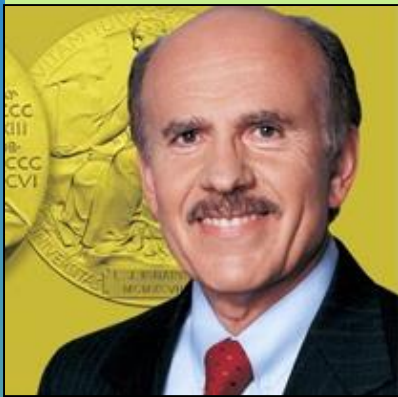




**Eat  
More  
Veggies**







## The Big Payoff

“If you combine a **NO**-friendly diet, moderate exercise, and the proper amino acids and antioxidants, your body will become a **NO**-producing powerhouse, keeping endothelial cells well nourished and vessels relaxed, which can lower your blood pressure and cholesterol, discourage the formation of plaques, ensure blood flow, and reduce inflammation which can lead to atherosclerosis **often in as little as two weeks.**”



# Thank You!



*Lesson prepared by*

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