

# Say NO to Disease

## Leader's guide



### Objectives:

Participants will learn:

- what nitric oxide is and what it does to prevent disease in the body
- ways to increase nitric oxide production using whole foods
- additional ways to boost nitric oxide

### Materials for the lesson:

- Say NO to Disease Leader's Guide, 1 per leader
- #1 NO dilates blood vessels diagram, 1 per leader not using PowerPoint (*see gray box below*)
- #2 Pathway diagram, 1 per leader not using PowerPoint
- #3 Digestion and absorption diagram, 1 per leader not using PowerPoint
- Say NO to Disease handout, 2-sided, 1 per participant
- Go Green brochure, 8 1/2 x 14 two sided brochure, 1 per participant
- Kale and beet salad recipe, 1 per participant

### Additional Resources

- Say NO to Disease PowerPoint presentation is an option for those who are comfortable with using PowerPoint. The numbering in the script aligns with the PowerPoint slides. There are 39 slides which should take less than 30 minutes.

### Optional Resources:

- 7 ways to Say NO to Disease bookmarks
- Books: NO More Heart Disease by Louis J. Ignarro, The Nitric Oxide Solution by Dr Nathan Bryan and Janet Zand, Beet the Odds by Nathan Bryan
- OSU Nitric Oxide Specialist, Dr Norman Hord, College of Public Health and Human Services, 541-737-5923, [norman.hord@oregonstate.edu](mailto:norman.hord@oregonstate.edu)
- Neo40 Lozenges [www.neogenis.com](http://www.neogenis.com)

**Notes to the Leader:** The core lesson should take about 30 minutes.

The lesson is fully scripted. If you choose to use the script with the PowerPoint presentation, you will find each numbered script matches the numbering on the PowerPoint slide. Be sure to practice clicking through the slides to see how they advance since they are "animated" meaning some lines come in only when clicked. If you use the PowerPoint, you do not need to print the 3 diagrams.

If you are not using the PowerPoint, grey boxes indicate when to use the 3 visual aid diagrams.

Two suggested activities to include at the end of the lesson are 1) a brainstorming session to discover ways to add more greens to your daily diet and 2) a food demo creating a delicious kale and beet salad for tasting. These options would add 10 and 15 minutes respectively. Or you could make the recipe in advance and have the discussion while tasting.

Participants would receive the Go Green brochure, Say NO to Disease handout and the kale and beet salad recipe. An optional gift would be the "7 Ways to Say NO to Disease" bookmark which the Extension office may be able to print and laminate for you.

Be sure to practice saying NITRIC OXIDE (Ny-trick Ox-side) so you don't confuse it with nitrous oxide.



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**What is NO?**

- 1) 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 for short. By saying YES to nitric oxide production, you may be saying NO to many of today's chronic diseases.
- 2) In 1998, 3 men were awarded the Nobel Prize in Physiology or Medicine for their discover of "the most significant molecule in the body." They discovered that nitric oxide has implications for preventing and reversing heart disease, cancer, diabetes and much more.
- 3) What is NO?  
NO is the shortened name for **Nitric Oxide** which is one molecule of Nitrogen and one of Oxygen. NO is a gas that disperses rapidly into tissues. It is found naturally in the body.
- 4) What NO is not... Don't confuse nitric oxide with *nitrous oxide* or laughing gas used in the dentist's office. It is also not *nitrogen dioxide*, an air pollutant.
- 5) What does NO do?  
NO is a chemical messenger which signals the muscles which line the arteries to relax, resulting in widened arteries and increased blood flow. This is called "*vasodilation*." The immediate result is lower blood pressure and improved circulation of blood to the muscles, organs and brain.  
  
NO also tells the immune cells to kill off harmful bacteria and may destroy cancer cells. And it helps brain cells to communicate. But there's much more.
- 6) NO can prevent high blood pressure, keep arteries young and flexible and lower cholesterol. It can reduce the formation of blood clots and prevent, slow or even reverse the build up of plaque in the arteries. But wait, there's still more.
- 7) NO has been shown to reduce risk of complications from diabetes like kidney disease, blindness and neuropathy (numbness in the extremities which can lead to the development of gangrene and even amputations). It can limit swelling and pain of arthritis, protect bones from osteoporosis and protect the skin from sun damage. Because it increases circulation to the brain, it may reduce risk of developing dementia.
- 8) NO can kill bacteria and can inhibit the growth of cancerous tumors. It can be used to identify risk of inflammatory disease, asthma and colitis and is important for our sense of smell.
- 9) It's no wonder that the Nobel Prize committee named nitric oxide "the most significant molecule in the body."

**Chronic Diseases**

- 10) Researchers have discovered that those with diseases like heart disease, diabetes and high blood pressure have impaired ability to make nitric oxide.
- 11) Heart Disease is the number one killer of Americans. Despite our awareness of this, and all our medical advances, we are still no closer to eliminating this chronic disease. Maybe it's because most Americans don't produce enough nitric oxide.

More 11) Research shows that NO is produced in the *endothelium*, the inside lining of our arteries. It lowers blood pressure, prevents clots and keeps cholesterol from sticking to the walls. NO also heals plaques and keeps them from rupturing causing heart attack and stroke.

12) Show picture #1 of arteries, endothelium and vasodilation.

### 13) Mechanism of Nitroglycerin pills

Maybe you've heard of heart patients with chest pain taking nitroglycerin pills. These pills, when placed under the tongue, work with your saliva to increase the diameter of the arteries so more blood gets through, decreasing the pain. Nitroglycerin pills help the body create nitric oxide.

Viagra pills are based on the same principal. Wouldn't it be great if we could make nitric oxide and improve our circulation without medications by just using food? The good news is that WE CAN.

### 14) NO and Diabetes

Patients with diabetes are at high risk for vascular disorders like high blood pressure, nephropathy (kidney disease) and retinopathy (disease of the retina). Improving nitric oxide may improve diabetes symptoms.

15) Patients with both Type 1 and Type 2 diabetes have the decreased ability to generate nitric oxide, which could explain why their circulation is compromised leading to problems with their eyes, kidneys as well as extremities like hands and feet.

Diabetic patients also tend to suffer from heart disease at a higher rate than the general population, namely high cholesterol, plaque build-up, heart attacks and stroke. Sugars in their blood make it thick like syrup, forcing the heart to work harder to push blood through arteries, especially the capillaries, tiny arteries in the eyes and kidneys.

Nitric oxide helps widen the arteries, increasing circulation, lowers inflammation and reduces the amount of work necessary for the heart to pump the blood.

### 16) The Immune Response

When nitric oxide is secreted as an immune response it is can begin to kill bacteria and virus.

### 17) NO and Exercise Performance

Nitric oxide lowers the demands for oxygen during exercise, so physical activity is easier. Beet root juice was fed to athletes and was shown to also improve muscle efficiency and extend time to exhaustion during exercise.

### 18) Who's at risk for low NO production?

People with diseases like these we just mentioned, as well as asthma, osteoporosis, obesity and erectile dysfunction are at higher risk. Unfortunately, even being over age 40 is a risk factor. That's because one of the two pathways that we use to produce nitric oxide diminishes in efficiency as we age.

### 19) Who can benefit from increasing NO?

People with heart disease and diabetes, as well as asthma, osteoporosis, obesity, skin disorders, insomnia and erectile dysfunction. Even depression and risk of dementia can improve with NO.



## 20) How does NO work?

We make nitric oxide in our bodies from certain types of food.

## 21) There are 2 ways the body can make nitric oxide from food.

The L-arginine pathway works with oxygen to produce nitric oxide. However this pathway decreases its capacity after age 40, which is why age is a risk factor for low NO.

**21) Bring out the pathway visual aid #2**

*This diagram shows the two different pathways. Note how few steps there are to produce nitric oxide. This demonstrates how important the NO is to the body for quick, uncomplicated production.*

The Nitrate pathway uses nitrates found naturally in our food to produce NO. This is the major pathway for creating nitric oxide, especially as we age. and the focus of this class.

22) Nitrates begin the conversion to NO by reacting with healthy bacteria in our saliva. As we chew these foods, the bacteria convert **niTRATES** to **niTRITES**. We swallow, and in our stomach, the acid environment converts nitrites into nitric oxide which is then absorbed immediately into our blood stream and starts to work.**22) Bring out the digestion cycle visual aid #3**

*This diagram shows the pathway that nitrates make starting with food in the mouth and going through the digestive system into the blood.*

## 23) Tongue bacteria

Healthy bacteria that live on our tongue are vital to the conversion of nitrates into nitric oxide. So it becomes important that we maintain healthy bacteria in our mouths. Mouthwash that kills bacteria interferes with NO production and can reduce NO production by at least one third.

**Enough Bad News! What's the good news?**

## 24) Which foods make Nitric Oxide?

We can make nitric oxide by choosing foods naturally high in nitrates. Foods that are good sources of natural nitrates are vegetables, and some fruits.

## 25) High NO producers

The best sources of the nitrates that make NO are dark leafy green vegetables like kale, Swiss chard, arugula and spinach. Other good sources are beets, bok choy, radish, parsley and cruciferous veggies like cabbage, cauliflower and broccoli.

## 26) Nitrate Confusion

Some people may have heard nitrates are dangerous. Sodium nitrates are salts used to preserve meats like ham, bacon, lunchmeats and hot dogs. These salts can be converted to nitrosamines in the stomach, which have been linked to cancer. You are more likely to create nitrosamines in the presence of saturated fat, which is found in these products. They can also be created by frying these foods at high temperatures.



## 27) Nitrates in Greens

Nitrates in fresh greens will not produce nitrosamines. They contain no saturated fat and nitrates are destroyed when fried at high temperatures. The nitrates in greens are best at producing nitric oxide if they are consumed raw.

28) The capacity to produce nitric oxide is reliant on nitrates found in **RAW** vegetables and fruits. Cooking, boiling, steaming, broiling, baking and blanching all destroy the nitrates. Eating fresh raw greens daily will provide the nitrates for producing NO.

## 29) Go Green

Research from the Harvard School of Public Health has shown that those who ate the most dark green leafy vegetables had 21% lower risk of stroke. Those who ate the most cruciferous vegetables (kale, Brussels sprouts, cabbage, broccoli) had 32% lower risk of stroke. Just one serving of dark green leafy vegetables can decrease risk of heart disease by 23%.

These are all foods which help the body create nitric oxide.

## 30) Warfarin and other blood thinners

Some people with a history of heart disease or stroke may be taking blood thinners like *Coumadin* or *Warfarin*. Their doctors have advised them to avoid foods high in vitamin K, which tend to be those foods high in nitrates needed for NO production.

To make NO, you will want to consume a specific amount of raw greens daily but in order to do this, you will need your medication adjusted for the added vitamin K.

Consult with your physician before adding greens if you are taking these medications.

## 31) Boosting NO production

It's easy to help your body produce nitric oxide by just eating healthy foods like fresh salad greens daily. Here are some tips get the most out of your NO furnace.

Consume fresh vegetables like raw kale and spinach daily. Juicing or putting them in smoothies doesn't give your saliva a chance to break down the nitrates. It's best if you chew the raw greens.

32) Add a source of vitamin C (antioxidant) to keep the NO gas from oxidizing too quickly. Foods like grapefruit, oranges, Brussels sprouts, kiwi and cantaloupe work well. Juice is not the best option. Eat the whole food which gives you the nutrients and fiber you need without jacking up your blood sugars.

33) Consume other antioxidants like *polyphenols* (poly- FEEN-ols) which reduce inflammation and also protect cholesterol from oxidizing. Find these powerful antioxidants in dark fruit like blueberries, blackberries, strawberries, dark grapes and dark chocolate. Yes, even chocolate can provide antioxidants to protect nitric oxide.

34) Oxygen will help you use the L-arginine pathway. Exercise, deep breathing and relaxation techniques will improve NO production, even if you're over 40.



35) The bottom line is to do what your mother always told you, "Eat Your Vegetables."

36) The Big Payoff

Louis Ignarro, one of the 3 Nobel Prize winners for discovery of nitric oxide wrote this very long, very important quote:

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.*

### **Conclusion**

Nitric oxide is a powerful chemical messenger that tells arteries to widen, which increases blood flow and circulation. It heals arteries and lowers cholesterol. It kills bacteria and virus and inhibits growth of cancer cells. Diseases like diabetes, heart disease and cancer are fought off by the many jobs that nitric oxide can accomplish in our bodies. But we have to consume the raw materials for making nitric oxide on a daily basis.

We can increase our capacity to make nitric oxide naturally and without drugs or side effects by consuming raw dark green leafy and cruciferous vegetables every day. We'll improve the lasting effects of NO by also consuming sources of vitamin C like cantaloupe and citrus fruit and polyphenol antioxidants from dark fruit like berries, red wine and even dark chocolate.

And we can boost the other pathway for producing NO (L-Arginine pathway which diminishes after age 40) by getting plenty of regular exercise like walking, and learning to breathe deeply to increase the oxygen in our blood.

Nitric oxide is truly a necessity for good health and might well be "the most important molecule in the body" so concentrate on getting your daily greens. Dr Louis Ignarro, winner of the Nobel Prize for nitric oxide, states most people who focus on increasing their nitric oxide can see improvements in their energy and circulation in just two weeks.

Let's brainstorm some ways to include more raw, dark leafy greens into our daily menu plans.

**You may want to review the list of foods that generate nitric oxide production for discussion (found on the Say No to Disease participant handout).**

### **Optional Demo**

#### **Making a Nitric Oxide powerhouse kale and beet salad (15 minutes)**

Raw kale and raw beets are high in nitrates which generate nitric oxide production. The lemon juice is high in vitamin C which protects the nitric oxide molecule. This recipe is low fat and high in nutrients. Plus it's delicious, and can be enjoyed even by people who don't think they like kale.

**The trick is** to massage the kale with lemon juice for about 2 minutes or until it condenses to about 1/2 its volume. This removes bitterness and makes even firm, leafy kale tender and delicious.



## Reference Reading

- No More Heart Disease, Dr Louis J Ignarro, Nobel Prize winner for discovery of Nitric Oxide
- The Nitric Oxide (NO) Solution, Dr Nathan Bryan

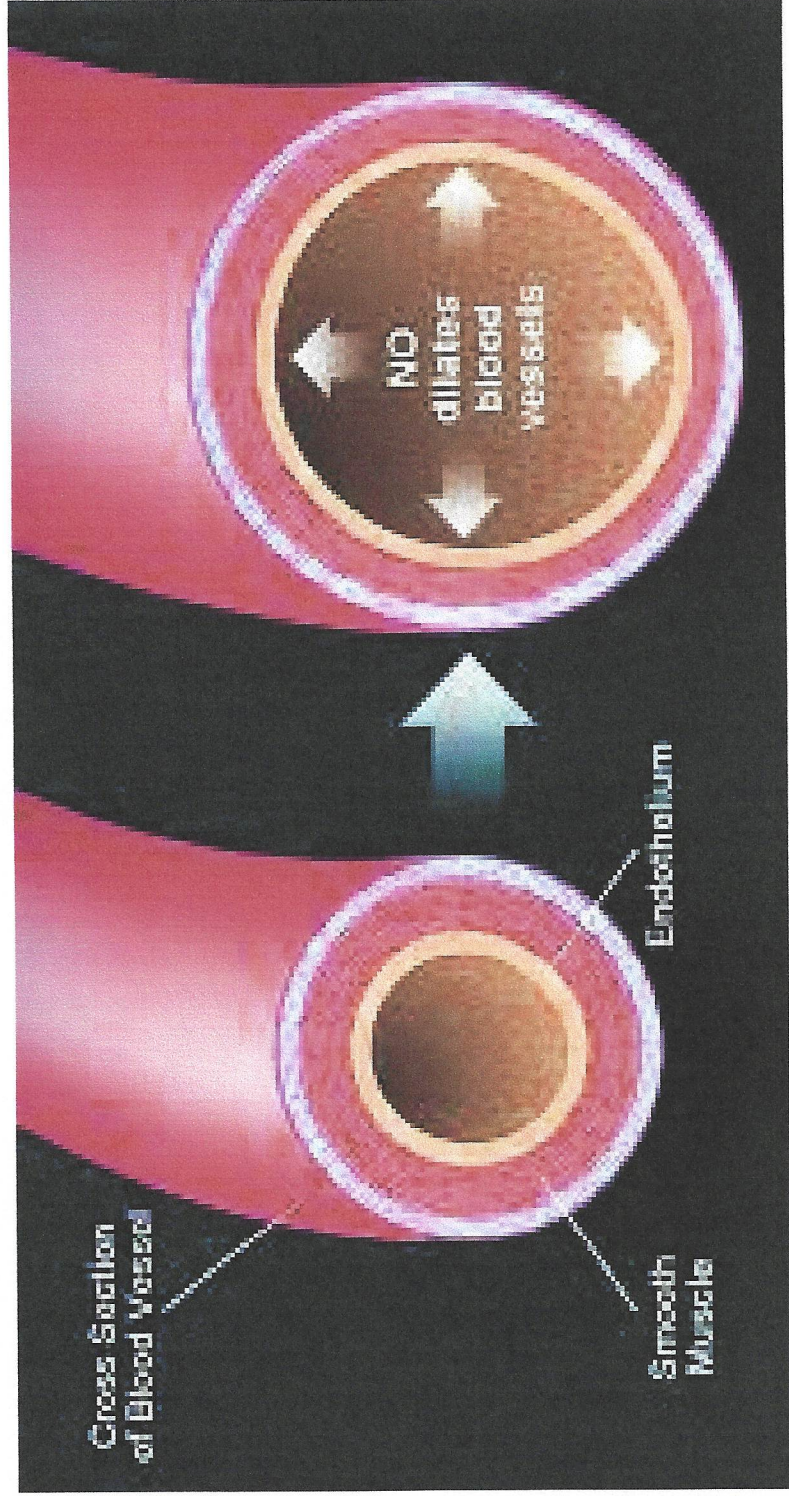
## Presentation References

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- Jacobs, L; Nawrot, TS; De Geus, B; Meeusen, R; Degraeuwe, B; Bernard, A; Sughis, M; Nemery, Benoit N; Int Panis, L. (2010). Subclinical responses in healthy cyclists briefly exposed to traffic-related air pollution. *Environmental Health* 9 (64): 64.
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- Naseem, KM. (2005). The role of nitric oxide in cardiovascular diseases. *Molecular Aspects of Medicine* 26 (1-2): 33-65.
- Traub, O; Van Bibber, R. (1995) Role of nitric oxide in insulin-dependent diabetes mellitus-related vascular complications. *Western Journal of Medicine* 162 (5): 439-445.
- Vanhatalo, A; Bailey, S; Blackwell, JR; DiMenna, FJ; Pavey, TG; Wilkerson, DP; Benjamin, N; Winyard, PJ; Jones, AM. (2010). Acute and chronic effects of dietary nitrate supplementation on blood pressure and the physiological responses to moderate-intensity and incremental exercise. *American Journal of Physiology—Regulatory, Integrative and Comparative Physiology* 299 (4): R1121-1131.
- Willett, WC; Sacks, F; Trichopoulou, A; Drescher, G; Ferro-Luzzi, A; Helsing, E; Trichopoulos, D. (1995). Mediterranean diet pyramid: a cultural model fo rhealthy eating. *The American Journal of Clinical Nutrition* 61 (6):14025-14065.



Say NO to Disease

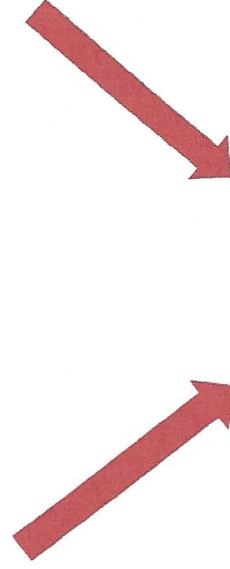
# NO and Heart Disease





## 2

## NO Pathways

Nitrate  $\text{NO}_3$ Nitrite  $\text{NO}_2$ 

NO

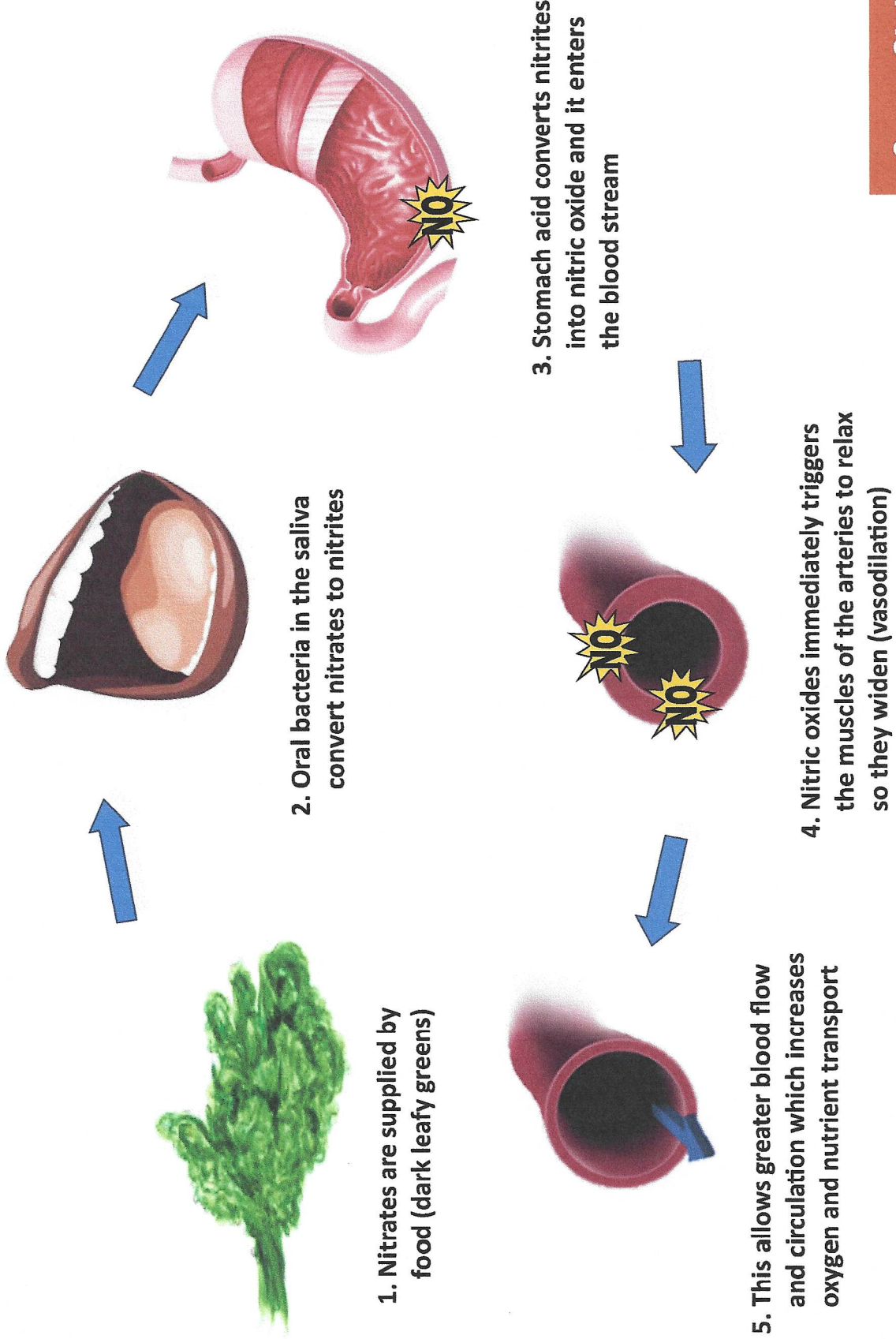
◆ L-Arginine

◆ Nitrates



# #3

## Digestion and Absorption of Nitrates to Nitric Oxide





# Say **NO** to Disease

Preventing and reversing disease  
by generating **Nitric Oxide**  
with **WHOLE FOODS**

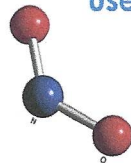
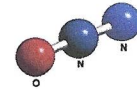
## What is **NO**?



**NO** stands for Nitric Oxide, a combination of one molecule of Nitrogen and one molecule of Oxygen **NO**

## What **NO** is not

**not** nitrous oxide, "Laughing gas" used in the dentist's office **N<sub>2</sub>O**



**not** nitrogen dioxide, an air pollutant **NO<sub>2</sub>**

## What does **NO** Do? **NO** is a chemical messenger that signals

- arteries to relax and expand
- immune cells to kill bacteria and cancer
- brain cells to communicate
- oxygenation of tissues

## **NO** can:

- prevent high blood pressure
- keep arteries flexible
- lower cholesterol
- limit swelling and pain of arthritis
- prevent, slow or reverse arterial plaque
- reduce risk of diabetes and complications like kidney disease, blindness and limb amputations
- protect bones from osteoporosis
- help protect skin from sun damage
- reduce risk of developing dementia
- reduce formation of blood clots
- reverse erectile dysfunction

## Where do we find **NO**?

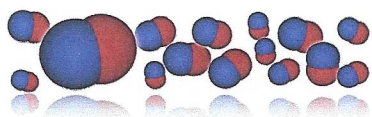
**We make NO in our bodies from nitrates and nitrites in our food**

## I thought **nitrites** and **nitrates** were dangerous?

Nitrites and nitrates found naturally in our food contribute to making **NO**. Nitrates and nitrites added as a preservative to meats, can make nitrosamines which are carcinogens. Amines from protein, in the presence of saturated fat and cooked at high temps can create nitrosamines. Foods to avoid would include cured and smoked meats like lunch meats, hot dogs and bacon. **Eating raw veggies does not contribute to cancer-causing nitrosamines.**



## Which foods make **NO**?



**vegetables,**  
especially dark green leafy  
beets and some fruits

### High **NO** producers

Kale, Swiss chard, arugula, spinach, chicory, wild radish, bok choy, beet, lettuce, cabbage, mustard greens, raw cauliflower, parsley, kohlrabi, carrot and broccoli

### Medium **NO** producers

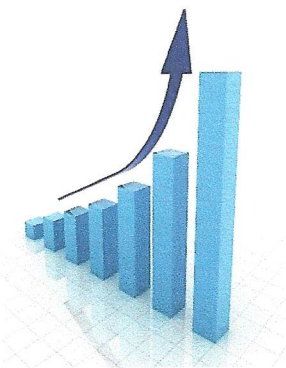
Coleslaw, asparagus, celery, watercress, artichoke, eggplant, strawberry, potato, garlic, tomato, vegetable juice, vegetable soup, melon



### Low **NO** producers

String beans, figs, prunes, sweet potato, raspberries, raisins, bananas, cherries, onion, bean sprouts chickpeas, red wine

## Boosting **NO** production



1. Have **RAW** greens at every meal or at least daily
2. Cooking and dehydrating destroy **NO**-building capacity
3. Accompany greens with a source of Vitamin C
4. Consume foods high in polyphenol antioxidants like dark colored fruit, (berries), red wine or grapes, and dark chocolate (65% cacao or more)
5. Include exercise in your daily routine, 30 minutes is recommended
6. Fish oil and other unsaturated oils boost **NO** production
7. Refrain from using mouthwash since it can decrease **NO** production by at least 1/3

**CAUTION**

Steer clear of L-arginine supplements that boost **NO**.  
They can be harmful, especially if you are over 40.

### References

No More Heart Disease, Louis J. Ignarro  
The Nitric Oxide Solution, Nathan Bryan and Janet Zand

This publication will be made available in accessible formats upon request.  
Please call 541-572-5263 for information.





## 2016 FCE Lesson: Say NO to Disease

Please assist us in evaluating today's class. Check the box that best describes your knowledge BEFORE and AFTER this class:

BEFORE today's class, how knowledgeable were you in answering these questions:	No knowledge	Low	Good	Very Good	High knowledge	Comments
1. What is nitric oxide?						
2. How does nitric oxide improve circulation?						
3. Who benefits from increasing nitric oxide?						
4. What foods increase nitric oxide production?						

AFTER today's class, how knowledgeable are you in answering these questions:	No knowledge	Low	Good	Very Good	High knowledge	Comments
1. What is nitric oxide?						
2. How does nitric oxide improve circulation?						
3. Who benefits from increasing nitric oxide?						
4. What foods increase nitric oxide production?						

After today's lesson, which behaviors will you begin to adopt? Check all that apply.

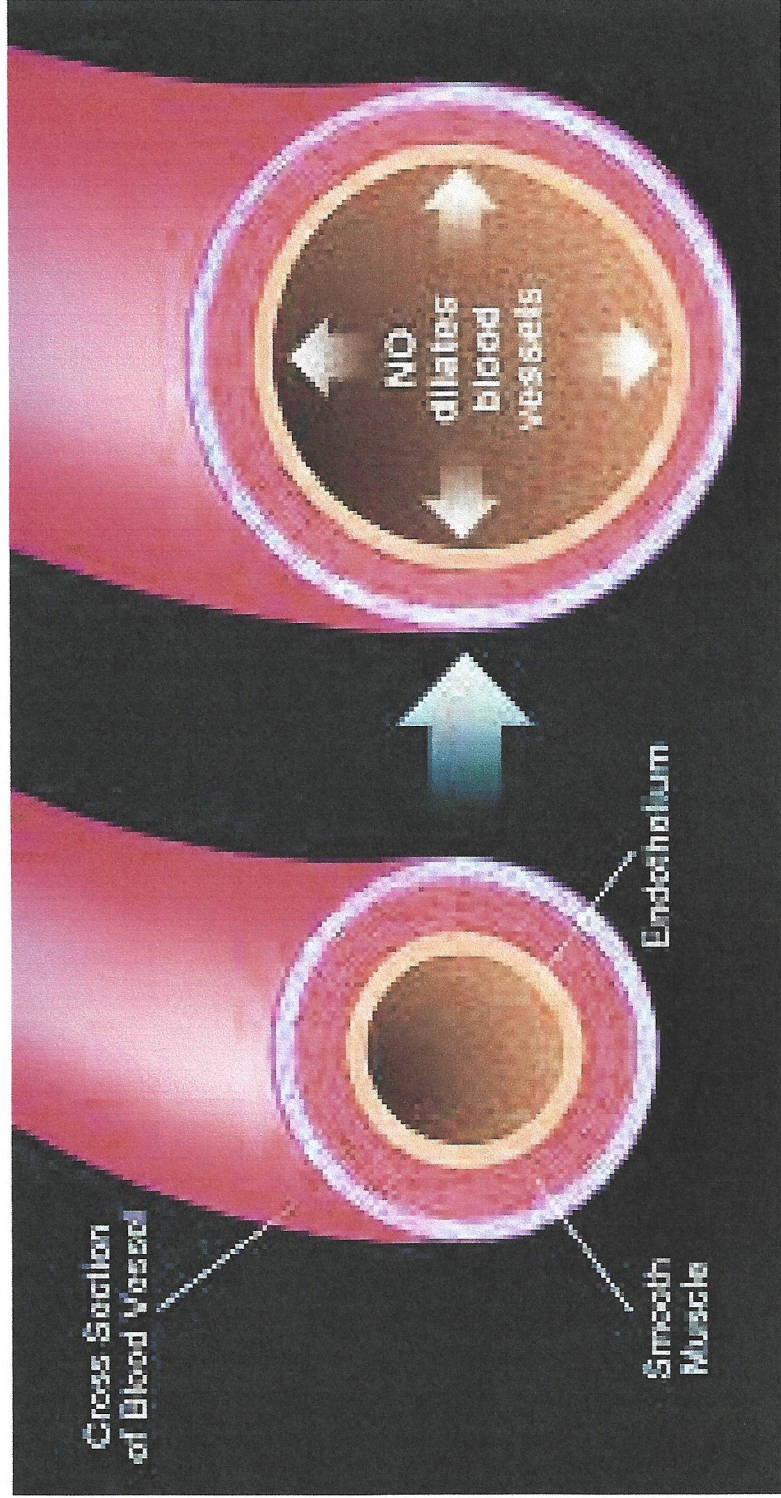
N/A = Not Applicable

- Include more raw greens into my daily meal plan  Yes  No  Maybe  N/A
- Make the kale and beet salad recipe for my family/friends  Yes  No  Maybe  N/A
- Make an effort to move more or practice deep breathing  Yes  No  Maybe  N/A
- Speak to my doctor about risks associated with my medication and eating greens  Yes  No  Maybe  N/A



Say NO to Disease

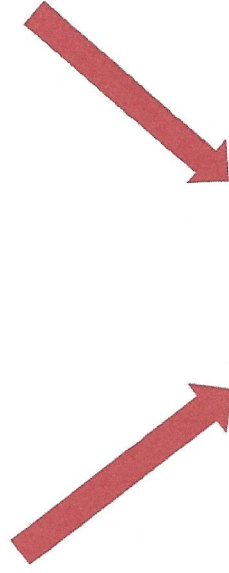
# NO and Heart Disease





## 2

## NO Pathways

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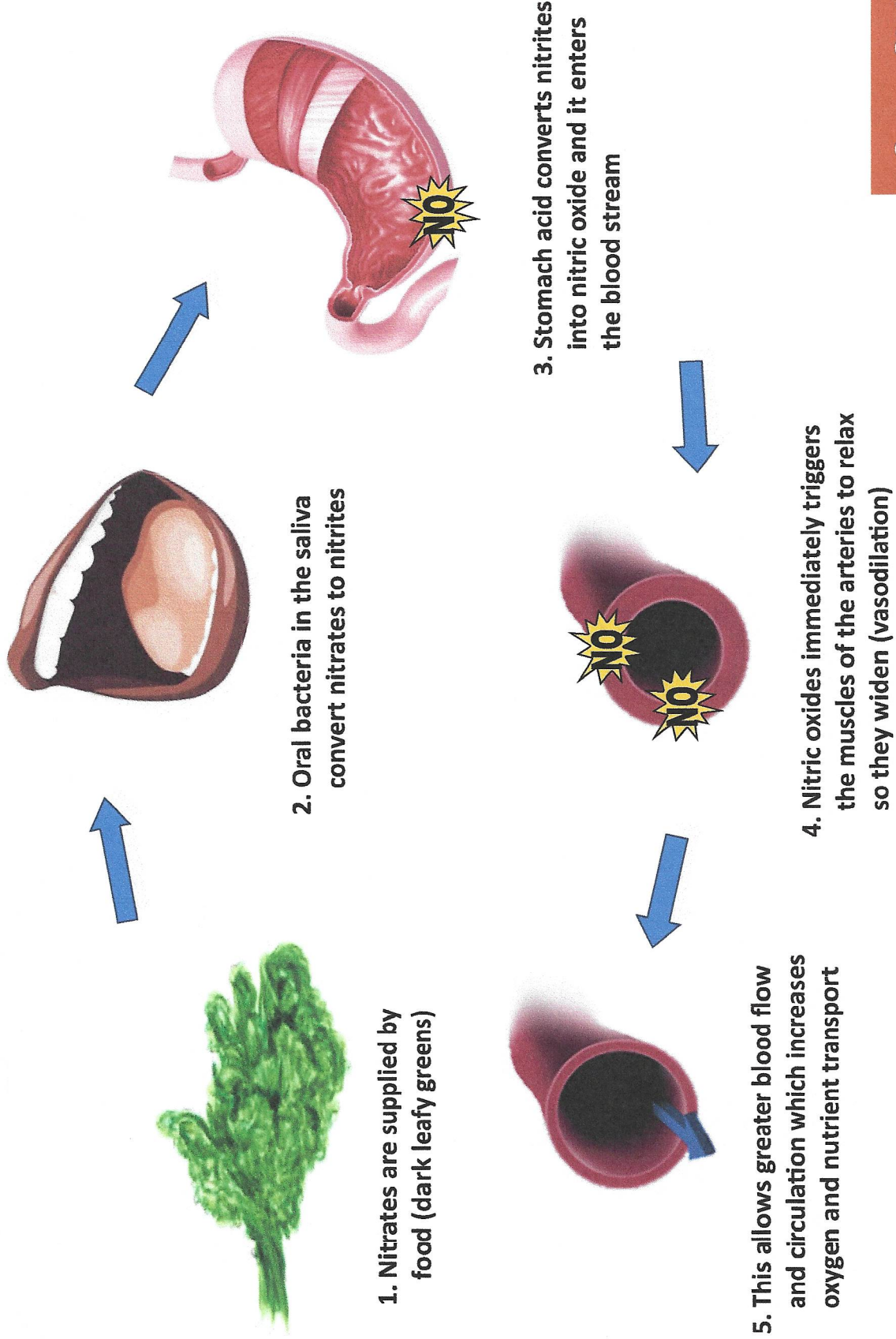
♦ L-Arginine

♦ Nitrates



# #3

## Digestion and Absorption of Nitrates to Nitric Oxide





- 4 and flossing daily. Rinse with water or a non-astringent mouthwash.
- 5 Reduce consumption of processed meats that convert nitrates to nitrosamines known to be carcinogens. Lower saturated fats by reducing meat and fat. Use nuts and seeds for healthy fats.
- 6 Include both cardio and strengthening exercises in your daily routine. Exercise increases nitric oxide production and conversely, nitric oxide also makes exercise easier and improves performance.
- 7 If you're taking blood thinners, tell your doctor you are going to consume 2 cups of raw greens daily. Your medication can be adjusted as long as you keep your consumption steady.

- 4 Avoid killing healthy oral bacteria with anti-bacterial mouth wash. Practice good oral hygiene by brushing and flossing daily. Rinse with water or a non-astringent mouthwash.
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## ways to say

# NO disease

NO, short for Nitric Oxide, is a gas that widens arteries and increases blood flow. It is produced by the body when you ingest healthy nitrates found in fresh produce like greens and cruciferous vegetables.

- 1 cruciferous like kale, broccoli, arugula, Swiss chard and different kinds of cabbage.
- 2 Include a daily dose of vitamin C, especially from darkly colored fruit like berries. You'll also get vitamin C in bell peppers, kiwi, citrus and potatoes.
- 3 Chew your green thoroughly, making sure you have broken down the fiber in the greens, giving time for the oral bacteria to break down nitrates.

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- 1 Eat a fresh dark, leafy green salad every day. Include cruciferous like kale, broccoli, arugula, Swiss chard and different kinds of cabbage.
- 2 Include a daily dose of vitamin C, especially from darkly colored fruit like berries. You'll also get vitamin C in bell peppers, kiwi, citrus and potatoes.
- 3 Chew your green thoroughly, making sure you have broken down the fiber in the greens, giving time for the oral bacteria to break down nitrates.