Understanding Your Numbers

Steven Lalevich, RD
What’s your objective?

• Surface level objective:
  • Improve health screening results.

• Beyond the surface:
  • Reduce chronic disease risk.
  • Live a long, healthy life.
Numbers are only numbers

• Your health screening results help predict risk.
  • But they are not a perfect predictor.

• Other important factors:
  • Family history
  • Genetics

• Talk with your doctor to better understand your risk.

• Additional lab tests may help provide clearer picture.

• Goal is to reduce risk, not just improve numbers.
What are the risks?

• Abnormal lipid panel (LDL-C, HDL-C, triglycerides)
  • Increased risk of cardiovascular disease and Alzheimer’s disease
• Elevated blood pressure
  • Increased risk of cardiovascular disease and Alzheimer’s disease
• Elevated glucose
  • Increased risk of diabetes, cardiovascular disease, and Alzheimer’s disease
• Elevated BMI
  • Increased risk of cardiovascular disease, diabetes, and cancer
How do abnormal values increase risk?
Oxidative stress and inflammation

• Oxidative stress: Too many oxidants/not enough antioxidants
• Chronic inflammation: Long-term, low-level immune response
• High inflammation and oxidative stress are associated with:
  • Cardiovascular disease
  • Diabetes
  • Cancer
  • Alzheimer’s disease
Oxidative Stress/Inflammation as Root Cause

Root Causes
- Oxidative Stress
- Chronic Inflammation

Altered Screening Results
- High Triglycerides, LDL, Blood Pressure, Glucose
- Abdominal Obesity, Low HDL

Increased Chronic Disease Risk
- Heart Disease
- Diabetes
Oxidative Stress/Inflammation as Root Cause

Root Causes
- Oxidative Stress
- Chronic Inflammation

Improved Screening Results
- Lower Triglycerides, LDL, Blood Pressure, Glucose
- Abdominal Fat Loss, Increase HDL

Decrease Chronic Disease Risk
- Heart Disease
- Diabetes
Oxidative Stress/Inflammation as Intermediate

Altered Screening Results
- High Triglycerides, LDL, Blood Pressure, Glucose
- Abdominal Obesity, Low HDL

Intermediate Cause
- Oxidative Stress
- Chronic Inflammation

Increased Chronic Disease Risk
- Heart Disease
- Diabetes
Oxidative Stress/Inflammation as Intermediate Cause

Altered Screening Results
- High Triglycerides, LDL, Blood Pressure, Glucose
- Abdominal Obesity, Low HDL

Intermediate Cause
- Oxidative Stress
- Chronic Inflammation

Decrease Chronic Disease Risk
- Heart Disease
- Diabetes
How do abnormal values increase risk?

1. Abnormal values may be sign of underlying oxidative stress and inflammation, which are driving risk.
2. Abnormal values may be a cause of oxidative stress and inflammation, thereby increasing risk.

In both cases, decreasing oxidative stress and inflammation will lower risk of chronic disease.
What causes oxidative stress/inflammation?

• Unhealthy diet
• Psychological stress
• Lack of physical activity
• Poor sleep
• Smoking
• Excess weight
How to measure inflammation

• Lab tests:
  • Highly sensitive C-reactive protein (hs-CRP)
  • Others: Erythrocyte sedimentation rate (ESR), TNF-alpha, IL-6, etc.

• If you have abnormal health screening results:
  1. It may be a sign of inflammation.
  2. Your chronic disease risk is higher if inflammation is present.

• Ask doctor about inflammation lab tests to better assess risk and trend results over time.
Event-free Survival among Women with C-Reactive Protein (CRP) and LDL Cholesterol Levels above or below the Median for the Study Population.

Lowering inflammation may help to:

1. Improve health screening results.
   • Addresses root cause of abnormal screening results.

2. Reduce risk of chronic disease.
   • Even if numbers didn’t improve, risk would be lower.
Low Density Lipoprotein (LDL)

- LDL is a transport protein for fat and cholesterol
- Your health screening provided a value of LDL-C
  - LDL-C is the amount of cholesterol carried by LDL.
  - LDL-C isn’t the best measure to predict heart disease risk
- Ask your doctor about other measures:
  - LDL-P (number of LDL particles)
  - ApoB (apolipoprotein B)
LDL-P (LDL particle number)

- Elevated LDL-P is associated with:
  - Heart disease
  - Inflammation
  - Metabolic syndrome
  - High triglycerides and low HDL

- LDL-C doesn’t tell you much about LDL-P
  - LDL-P may be elevated even if LDL-C is normal.
  - LDL-P may be normal even if LDL-C is elevated.
HDL Cholesterol

• Higher levels of HDL-C are associated with lower risk
  • HDL-P is better indicator
• HDL-C decreases in the presence of inflammation
  • If you have low HDL-C, it may be a sign of inflammation
• HDL has anti-inflammatory effects
  • Helps prevent oxidation of LDL
  • Higher HDL may help protect against negative effects of higher LDL
Cholesterol Ratio

• Total Cholesterol to HDL Ratio
  • Takes into account influence of LDL-C, HDL-C, and triglycerides.
  • Better predictor of risk than any of these values individually.

• Example:
  • Total cholesterol = 180
  • HDL-C = 60
  • TC:HDL-C ratio = 3.0

• Goal (the lower the better):
  • Less than or equal to 3.5 is optimal
  • 3.6 to 4.9 is near optimal
  • Greater than or equal to 5.0 is high
RRs for future cardiovascular events among apparently healthy women in the WHS according to baseline values of several biochemical markers.

Nutritional strategies to reduce inflammation

- Increase intake of foods that combat inflammation
- Decrease intake of foods that promote inflammation
Anti-inflammatory compounds in plant foods

• Phytonutrients (plant-based antioxidant compounds)
  • Polyphenols
  • Carotenoids
  • Many others

• Sources of phytonutrients:
  • Whole plant foods: vegetables, fruits, whole grains, nuts, beans, seeds, etc.
  • Herbs and spices: garlic, turmeric, ginger, cinnamon, oregano, rosemary, etc.
  • Others: tea, coffee, dark chocolate, red wine, extra virgin olive oil
Phytonutrients as color pigments

• Choose a variety of colors to get the most benefit
  • **Red**: Beets, Red cabbage, Cherries, Cranberries, Red grapes, Red peppers, Pomegranates, Strawberries, Tomatoes, Watermelon
  • **Green**: Green beans, Broccoli, Brussels sprouts, Lettuce, Kale, Collard greens, Spinach, Green grapes, Honeydew, Kiwi
  • **Orange/Yellow**: Apricots, Squash, Cantaloupe, Mangoes, Oranges, Peaches, Pineapple, Pumpkin, Corn, Sweet potatoes
  • **Blue/Purple**: Blackberries, Blueberries, Eggplant, Figs, Plums, Purple grapes
  • **White**: Cauliflower, Garlic, Onions, Mushrooms, Potatoes
Anti-inflammatory compounds in fish

• Omega-3 fats (DHA/EPA)
  • Anti-inflammatory effects
  • May raise HDL-C and lower triglycerides

• Fatty fish has highest concentration of omega-3s
  • Salmon
  • Tuna
  • Sardines
  • Mackerel

• Recommendation: Eat fish at least twice per week
Fish intake and heart disease risk

• Nurses’ Health Study (84,688 female nurses, from 1980 to 1994)

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<tr>
<th>Fish Intake</th>
<th>Risk Reduction</th>
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<tbody>
<tr>
<td>Less than once a month</td>
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<td>1-3 times per month</td>
<td>21%</td>
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<tr>
<td>Once per week</td>
<td>29%</td>
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<tr>
<td>2-4 times per week</td>
<td>31%</td>
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<td>5 or more times per week</td>
<td>34%</td>
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Fish Oil

• Eating fish is always better than taking a fish oil supplement.

• Fish oil:
  • Not associated with the same health benefits as eating fish
  • May raise LDL-C
  • May be oxidized/rancid

• If you decide to take fish oil:
  • Choose a high quality source
  • Store in refrigerator to slow oxidation
Foods that promote inflammation

• Excessive carbohydrate intake:
  • Sugar (candy, sweets, soda)
  • Refined grains (white bread, white rice, etc.)

• Excessive omega-6 fat intake:
  • Fried foods: French fries, potato chips, etc.
  • Vegetable oils: Soybean oil, corn oil, etc.
Excessive carbohydrate intake

• Associated with inflammation, heart disease, diabetes, cancer, and Alzheimer’s disease.

• Carbohydrate sources
  • Healthy carbohydrates: Whole grains, fruits, starchy vegetables
  • Unhealthy carbohydrates: Refined grains and added sugars

• Signs of excessive carbohydrate intake include:
  • High glucose
  • High triglycerides
  • Abdominal obesity
  • Low HDL-C
  • High TC:HDL-C ratio
  • High LDL-P/apoB
Increase intake of healthy fats

• Healthy fats are those that have anti-inflammatory effects:
  • Extra virgin olive oil
  • Nuts and seeds
  • Avocados
  • Fatty fish (salmon, tuna, sardines, mackerel)
  • Dark chocolate
Extra Virgin Olive Oil

• Nutrients
  • Monounsaturated fat
  • Polyphenols

• Potential health effects
  • Reduce triglycerides
  • Reduce abdominal obesity
  • Reduce elevated glucose
  • Improve blood pressure
  • Reduce inflammation
  • Improve antioxidant function
A healthy fat diet

• Include frequent intake of foods rich in healthy fats and polyphenols:
  • Extra virgin olive oil
  • Avocados
  • Nuts and seeds

• Eat fatty fish at least twice per week

• Total fat intake around 40% of calories. Example:
  • 2,000 calories: 800 calories from fat, or about 90 g fat
    • 4 tablespoons (1/4 cup) olive oil = 54 g fat
    • 1 oz (1/4 cup) almonds = 14 g fat
    • 1 avocado = 21 g fat
Dietary Cholesterol

• Dietary cholesterol is not associated with blood cholesterol levels.
  • Most of the cholesterol in the blood is made by the body, not from food.
Saturated fat – not so bad?

- Sources: dairy fat, fatty meat, coconut oil, chocolate
- Raises LDL-C and HDL-C (neutral effect on ratio)
- May help lower triglycerides
Dark chocolate

• Source of saturated fat
• A great source of flavanols
  • Anti-inflammatory effects
  • May lower blood pressure
• Despite saturated fat content, chocolate intake is not associated with increased risk of heart disease (may even lower it)
• Choose dark chocolate (less sugar): At least 70% cacao content
Saturated fat from dairy foods

- Includes butter, cheese, and other whole fat dairy foods
- Multiple studies have found no association between dairy fat intake and increased cardiovascular risk. But...
- Some individuals (genetics) may be more sensitive to the effects of saturated fat on blood cholesterol levels and heart disease risk.
Apolipoprotein E (ApoE)

- Transports fat and cholesterol in the bloodstream
- Different genetic variants (E2, E3, E4) may influence risk of:
  - Alzheimer’s disease
  - Heart disease
- Everyone carries two ApoE genes (6 genotypes)

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<tr>
<td>Disease Risk</td>
<td>40% less likely</td>
<td>40% less likely</td>
<td>2.6 times more likely</td>
<td>Average risk</td>
<td>3.2 times more likely</td>
<td>14.9 times more likely</td>
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https://theconversation.com/genetic-testing-should-i-get-tested-for-alzheimers-risk-97065
ApoE Distribution

- ApoE 3/3: 64%
- ApoE 3/4: 18%
- ApoE 2/3: 10%
- ApoE 4/4: 5%
- ApoE 2/4: 2%
- ApoE 2/2: 1%

http://www.myapoe.com/how-do-i-test-for-alzheimers/
ApoE Considerations

• E4
  • Associated with higher risk of Alzheimer’s disease and heart disease.
  • Associated with higher LDL cholesterol
  • Carriers may benefit from lower intake of saturated fat and alcohol

• E3
  • Most common allele; neutral effect

• E2
  • Associated with lower LDL cholesterol
  • Carriers may tolerate higher saturated fat intake
Other factors influencing inflammation

• Timing of food intake
• Exposure to artificial light at night
• Sleep
• Alcohol
• Smoking
• Psychological stress
• Sun exposure
• Physical activity
• Gut microbiome
Timing of food intake

• Eating late may raise blood lipids and glucose more than eating earlier.
• Eating late may also impair weight and metabolism.
• Goals:
  • Eat breakfast every day
  • Avoid eating within 3-4 hours of sleep
Timing of light exposure

• Exposure to artificial light at night may promote insulin resistance and increase diabetes risk.

• The blue wavelengths of artificial light reduce levels of melatonin.
  • Melatonin has anti-inflammatory effects.

• Blocking blue wavelengths of light may reduce risk.
  • Blue light blocking glasses
  • Blue light reduction features on devices
  • Orange/red light bulbs
Sleep

• Adults need 7-9 hours of sleep per night.
• Lack of sleep:
  • Increases inflammation
  • Increases risk of heart disease, diabetes, Alzheimer’s disease, and cancer.
  • Can impair every single value from health screening:
    • Lipid panel
    • Glucose
    • BMI
    • Blood pressure
Alcohol

• Moderate alcohol intake (no more than one drink per day)
  • Associated with lower risk of heart disease (except in ApoE4 carriers)
  • May raise HDL-C

• Excessive alcohol intake:
  • Increases inflammation
  • Raises triglycerides
  • Increases risk of heart disease and cancer
Smoking

• Smoking is associated with:
  • Increased risk of heart disease
  • Increased risk of cancer
  • Increased risk of diabetes
  • Inflammation and oxidative stress

• For help with quitting, visit tobaccorefree.iu.edu
Sunlight

• Greater sun exposure is associated with:
  • Lower risk of heart disease
  • Lower blood pressure
  • Lower risk of death from all causes
  • Lower rates of prostate, breast, and colon cancer
  • Vitamin D production (helps regulate inflammatory response)

• Sensible sun exposure
Physical activity

• May help improve all values from health screening:
  • Lipid panel (raises HDL-C; lowers LDL-P and triglycerides)
  • Blood pressure
  • Glucose
  • Weight

• May help improve other factors that affect health screening values:
  • Lowers inflammation
  • Improves sleep
  • Improves resiliency to stress
  • Increases sun exposure (if done outdoors)
Psychological stress

• Excessive stress:
  • Triggers inflammatory response
  • Raises blood pressure
  • Raises blood sugar
  • Decreases metabolism
How to manage stress

- Things we already discussed that can help:
  - Anti-inflammatory diet
  - Getting enough sleep
  - Regular physical activity
  - Spending time outdoors

- Others
  - Mindful Way to Stress Reduction program (healthy.iu.edu)
  - Meditation
  - Listening to music
  - Social connections
Gut microbiome

• Gut microbiome helps regulate immune system and inflammation

• Promote healthy gut bacteria by:
  • Eating whole plant foods
    • Fiber
    • Phytonutrients
  • Limiting intake of highly processed foods
Fiber

• Good sources include whole grains, vegetables, beans, nuts, and fruit.
• Higher intake of fiber may help to lower LDL cholesterol.
• High fiber foods (whole plant foods) are also anti-inflammatory.
• High fiber diet associated with lower risk of:
  • Heart disease
  • Diabetes
  • Cancer
  • Obesity
Blood Pressure Recommendations

• Decrease sodium intake
  • Most sodium in the diet is from highly processed foods or restaurant foods

• Increase potassium intake
  • Whole foods (plant and animal) are usually good sources of potassium

• Relationship to inflammation
  • Inflammation is often underlying cause of elevated blood pressure
  • Highly processed foods (high sodium) are usually pro-inflammatory
  • Whole foods (high potassium) are usually anti-inflammatory
Summary

• If you have altered screening values:
  1. Inflammation may be the root cause.
  2. Lowering inflammation may improve numbers and reduce risk.

• Decrease inflammation by:
  • Eating a healthy fat diet (at the right times)
  • Getting enough sleep (and avoiding blue light at night)
  • Managing stress
  • Being physically active (ideally, outside)
Healthy IU Nutrition Counseling

• One-on-one nutrition counseling:
  • Free of charge to full-time IU employees and spouses who are on the employee’s IU medical plan
  • Appointments available in person or by phone
  • Email askanrd@indiana.edu to schedule
Questions?