

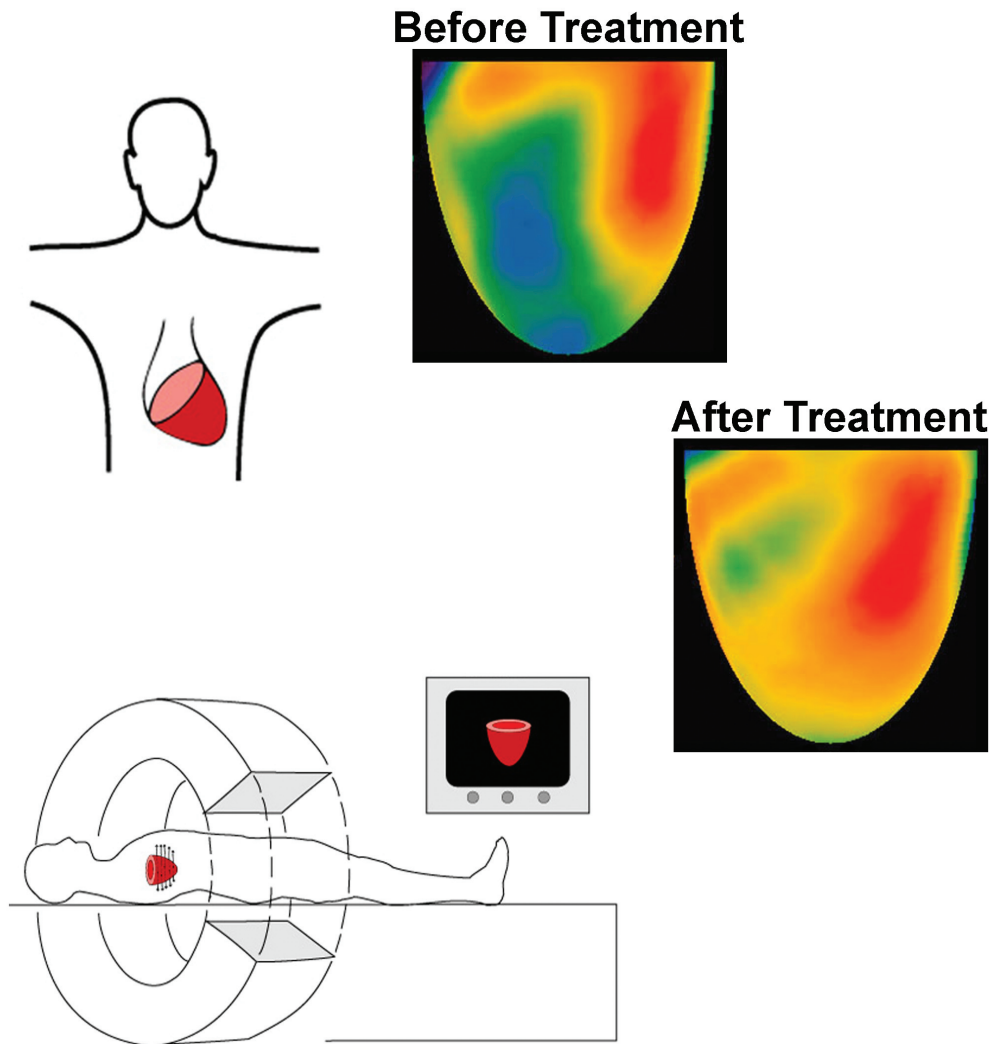
Gould Guidelines for Preventing and Reversing Coronary Artery Disease



THE UNIVERSITY *of* TEXAS
MEDICAL SCHOOL AT HOUSTON

A part of The University of Texas Health Science Center at Houston

See Your Heart Heal



Positron Emission Tomography (PET) of reduced blood flow in the heart (blue) before and after healthy lifestyle with medical treatment. The only program reversing coronary artery disease proven by non-invasive imaging.

Program for Preventing or Reversing Coronary Artery Disease

Assessment and Treatment Guidelines

website: www.healyourheart.info

K. Lance Gould, M.D.

INTRODUCTION

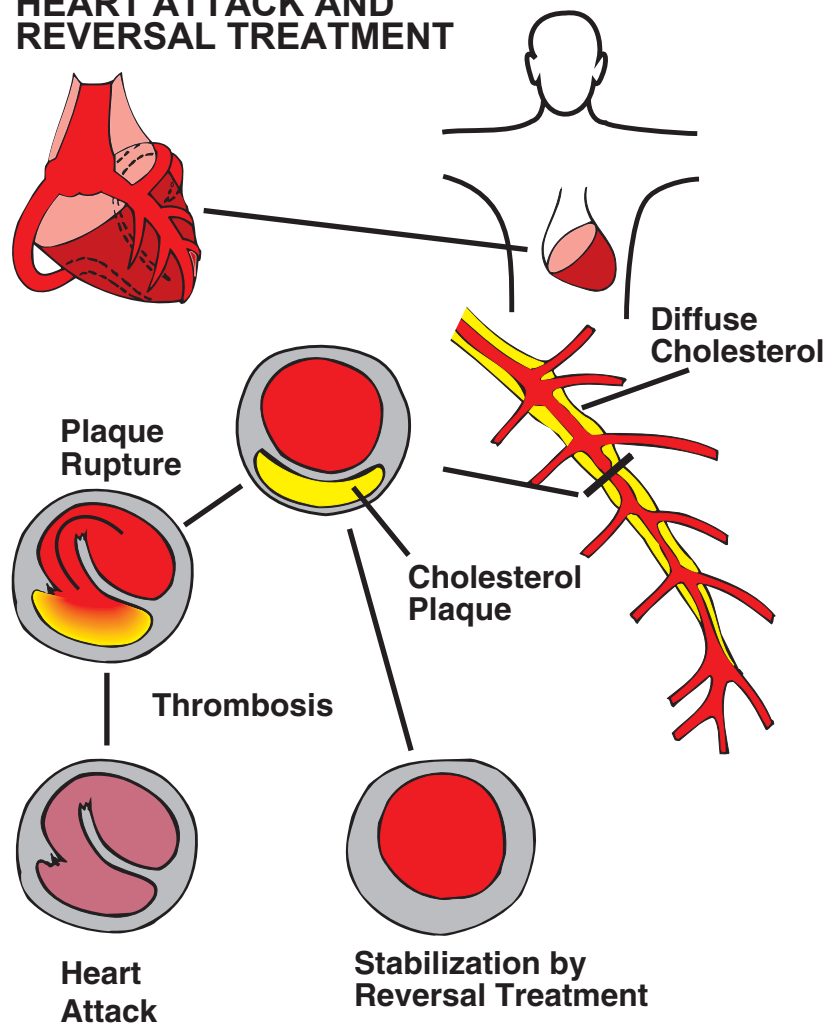
This brochure describes coronary artery disease, how it develops from a slight cholesterol build up in the walls of the coronary arteries to a sudden heart attack without prior warning symptoms. This cholesterol deposition can be identified early or in advanced stages by non-invasive heart imaging called positron emission tomography (PET). It is the most accurate advanced technology for assessing blood flow in the coronary arteries. Guidelines are provided for combined lifestyle and medical treatment proven in our scientific studies to stop or reverse coronary artery disease in most people. In this program, diagnostic evaluation by PET, intense lifestyle and medical treatment are integrated into a comprehensive long term management plan with effectiveness of treatment followed by PET imaging to document regression of coronary artery disease. PET is also used for determining severity of coronary disease as an objective definitive basis for bypass surgery or balloon dilation when needed while avoiding unnecessary procedures.

BACKGROUND

Coronary artery disease is a diffuse process of cholesterol deposition, scarring and calcification (hardening of the arteries) throughout the ma-

ior coronary arteries supplying blood flow to the heart muscle. A cross-sectional view of an affected artery is shown below. The cholesterol is deposited in the arterial wall and is covered by the inner lining of the arterial lumen through which the

CHOLESTEROL, HEART ATTACK AND REVERSAL TREATMENT



blood flows. The fibrous lining or cap over the cholesterol pool in the wall of the coronary artery may break at the shoulder where it attaches to the arterial wall. This tendency to break at the attachment shoulder is due to high mechanical stress and inflammation at the edges and around the cholesterol deposition.

When the fibrous cap over the cholesterol pool breaks, called plaque rupture, the blood in the artery is forced at arterial pressure under the fibrous cap lifting it up into the lumen, causing a narrowing or stenosis of the artery. The blood mixes with the cholesterol deposition and clots. This clot or thrombosis extends into the narrowed lumen of the artery and completely or partially blocks it thereby causing a heart attack, sudden death or chest pain.

Plaque rupture often occurs at sites of cholesterol deposition that did not narrow the artery significantly before the plaque rupture. It explains why an individual may be active with no symptoms even at maximum exercise but have a heart attack a short time later caused by sudden plaque rupture.

When cholesterol is removed from the arterial wall, the severity of any narrowing decreases only modestly. However, the risk of plaque rupture is markedly reduced with a corresponding marked reduction in heart attacks, cardiac death, chest pain and need for bypass surgery or balloon dilation.

Cholesterol removal from

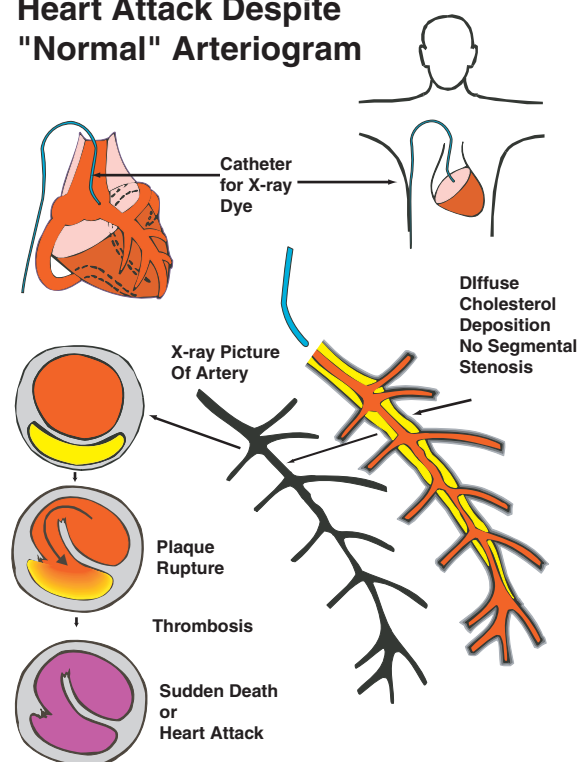
arterial wall occurs optimally at the lowest blood levels of LDL cholesterol (the low density or low down lipid, the bad cholesterol) and at the highest levels of HDL cholesterol (the high density or highly defensive lipid, the good cholesterol) that removes the bad LDL cholesterol from the arterial wall. This reduction of cholesterol in the wall of the artery occurs over a 12 to 24 months period during which the risk of plaque rupture, heart attack and sudden death slowly declines. Blood flow in the heart usually improves sooner with corresponding decrease in chest pain.

The cholesterol plaques in coronary arteries may rupture at any site in the coronary arteries even after a "normal" arteriogram, after bypass surgery or after balloon dilation with a

stent for a severe narrowing, as illustrated below. Consequently, most scientific studies show that these procedures do not prevent heart attacks or cardiac deaths on average in large groups of patients over many years. By comparison in stable coronary artery disease, intense medical treatment with two or more cholesterol altering medications and healthy lifestyle reduce heart attacks and cardiac deaths by 70% to 90%.

Although not clearly defined, there is variable susceptibility to coronary atherosclerosis for given risk factors such as smoking, high blood cholesterol levels, excess weight, inactivity, family history of heart disease, high blood pressure and diabetes. Dietary fat separate from cholesterol also plays an important causal role. Some persons

Heart Attack Despite "Normal" Arteriogram



with risk factors appear resistant to coronary artery disease despite risk factors and/or excess dietary fat whereas many others are susceptible and develop coronary heart disease with even modest risk factors or normal cholesterol levels. Such susceptible people with coronary artery disease and normal cholesterol levels stop progressing and/or partially reverse their disease with more vigorous cholesterol lowering and/or dietary fat restriction than conventional targeted “normal” ranges.

Therefore, control of all risk factors and healthy lifestyle including vigorous cholesterol lowering is necessary for preventing or reversing coronary artery disease. Patients in the control groups of subjects following standard dietary guide-

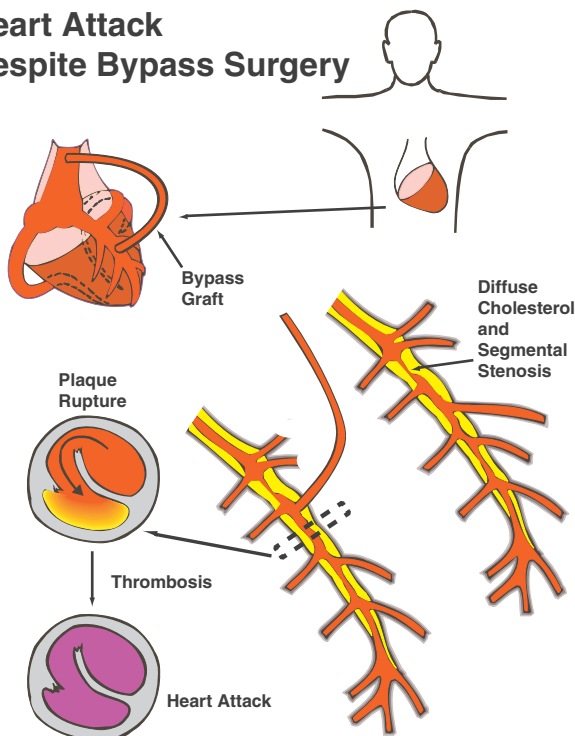
lines of the American Heart Association for 20% to 30% of calories as fat showed greater progression of coronary artery disease compared to those groups treated more vigorously with very low fat diet and/or cholesterol lowering drugs. Consequently, for persons with coronary artery disease we do not aim for “normal” cholesterol levels but reduce total cholesterol and LDL as much as possible well below the “normal” range and increase HDL as much as possible for each individual.

Target goals are LDL below 70mg/dl, HDL above 45mg/dl, triglycerides below 90mg/dl and lean body habitus; total cholesterol will then range 130mg/dl to 150mg/dl depending on the values for LDL, HDL and triglycerides. At these goals main-

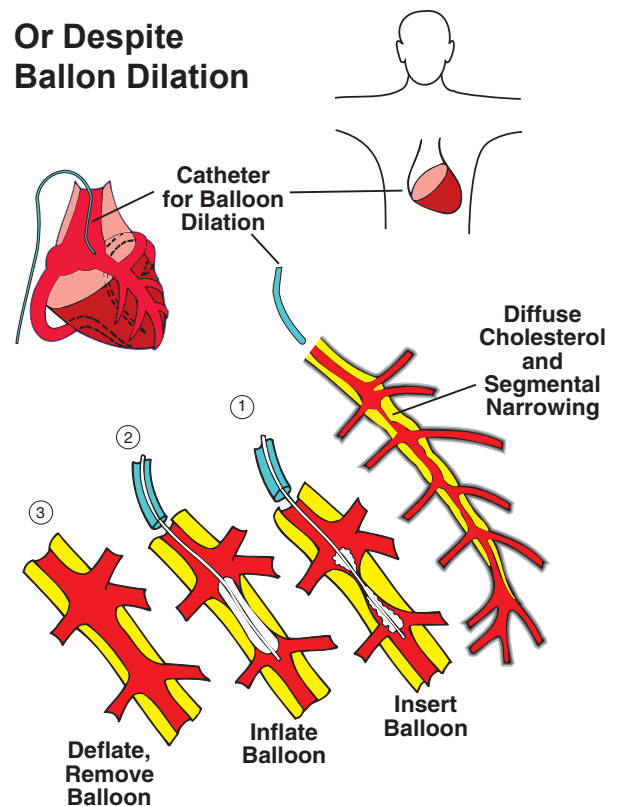
tained for 18 to 24 months, progression of disease, heart attack, or sudden death due to coronary artery disease are uncommon. The American Heart Association goals for cholesterol levels have been progressively lowered to the goals that we have used for many years.

In patients with stable coronary heart disease undertaking strict diet alone or taking a cholesterol lowering drug alone, reversal or stabilization occurs in 30% to 40% of patients with a comparable decrease in clinical events of death, heart attack, bypass surgery or balloon dilation (PTCA). On a combined regimen of strict diet and a cholesterol lowering drug together or two or more cholesterol altering medications, over 90% of patients will partially

Heart Attack Despite Bypass Surgery



Or Despite Ballon Dilation



reverse or stop progression of their disease with comparable decrease in risk of heart attack, death, bypass surgery or balloon angioplasty. In initially stable patients, balloon dilation or bypass surgery are commonly not necessary since the response to this treatment regimen is usually effective.

The abnormal function of blood vessel lining associated with elevated cholesterol and/or coronary artery disease starts to heal within days to weeks after undertaking vigorous treatment, usually with decreased symptoms, increased exercise capacity and increased sense of well being.

However, in people having a sudden plaque rupture, impending heart attack or unstable, rapidly progressive symptoms due to severe narrowing of a coronary artery, immediate balloon dilation with a stent or bypass surgery may be necessary. Although current published medical reports and my personal clinical experience with many patients support the effectiveness and safety of this approach, some risk of coronary events, worsening chest pain or death may remain as with balloon dilation or bypass surgery since stabilization of coronary artery disease requires 18 to 24 months of intense risk factor treatment.

POSITRON EMISSION TOMOGRAPHY (PET) OF THE HEART

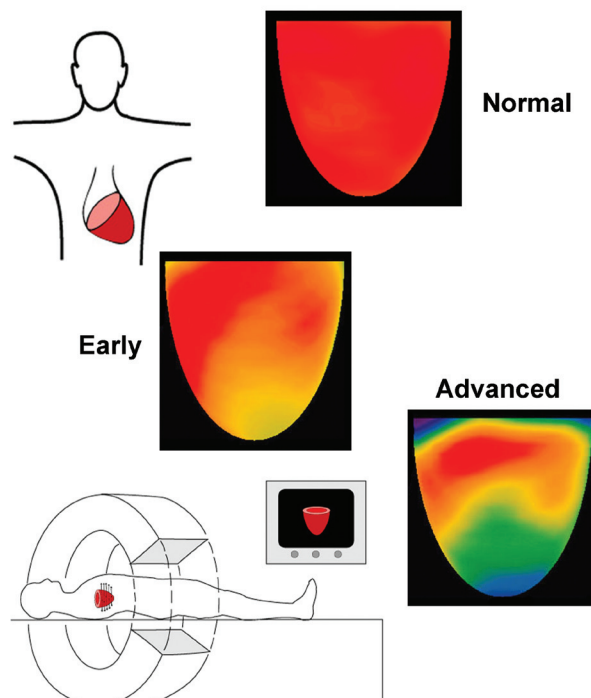
Why have a PET scan of your heart? How does a PET scan fit into the healthy lifestyle and medical treatment for preventing and reversing vascular disease?

PET stands for positron emission tomography, the most advanced accurate technology for visualizing blood flow in the heart muscle supplied by the coronary arteries. Even a slight build-up of cholesterol in the coronary arteries reduces their maximum flow capacity that can be seen as an early abnormal pattern on the PET scan many years before a heart attack, thereby allowing intense preventive treatment. With

PET, pictures of blood flow in the heart muscle are obtained using a low dose radiotracer injected intravenously at resting baseline conditions and after pharmacologic stress instead of exercise.

The pharmacologic stress and application of PET technology for heart imaging was developed first by Dr. Gould and refined over the past 30 years. Under his direction, the Weatherhead Center For Preventing and Reversing Atherosclerosis remains the leading center for definitive non-invasive assessment of coronary artery disease by PET, for reversing it or stopping its progression by intense lifestyle and medical treatment and for documenting the effectiveness of treatment by follow-up PET scans.

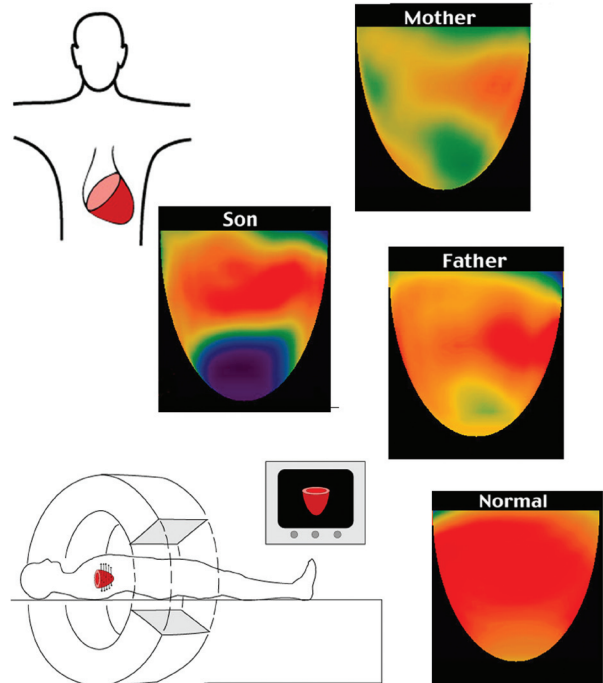
See Your Heart



Find early or advanced coronary disease before a heart attack and prevent it. Positron Emission Tomography (PET) of early reduced blood flow in the heart. The only program with proven non-invasive imaging of early coronary disease.

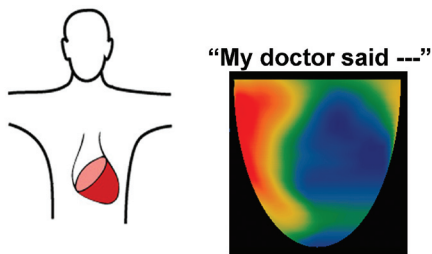
The examples in these figures show very personal reasons for having a PET scan of your heart. Each example illustrates an application to the heart proven by our scientific studies as valid after review by other medical experts and published in the best scientific journals.

Familial Heart Disease?

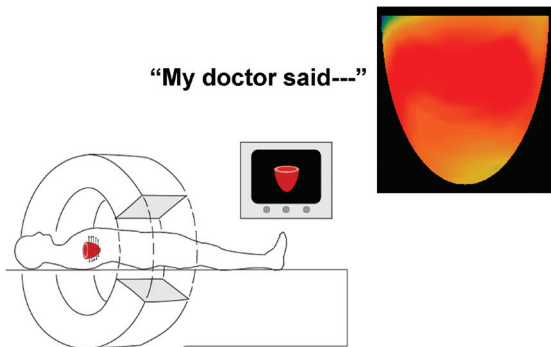


Family history of heart disease? Check it out and prevent heart attacks. Positron Emission Tomography (PET) of reduced blood flow (green or blue) in the heart. The only proven non-invasive imaging for Family screening.

Definitive 2nd Opinion



"My doctor said---"

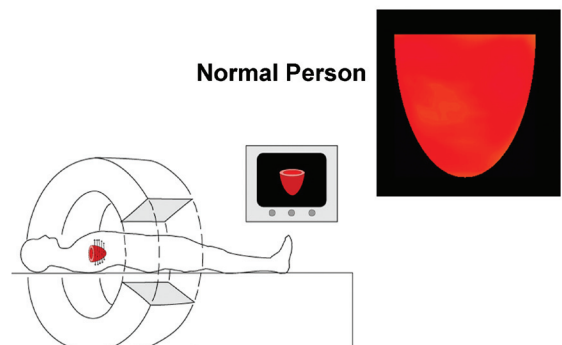


Two patients: "My doctor said I needed bypass surgery". One did, one didn't. Positron Emission Tomography (PET) of reduced heart blood flow (blue). The only program with definitive non-invasive PET imaging before any bypass surgery.

Avoid Heart Surprises

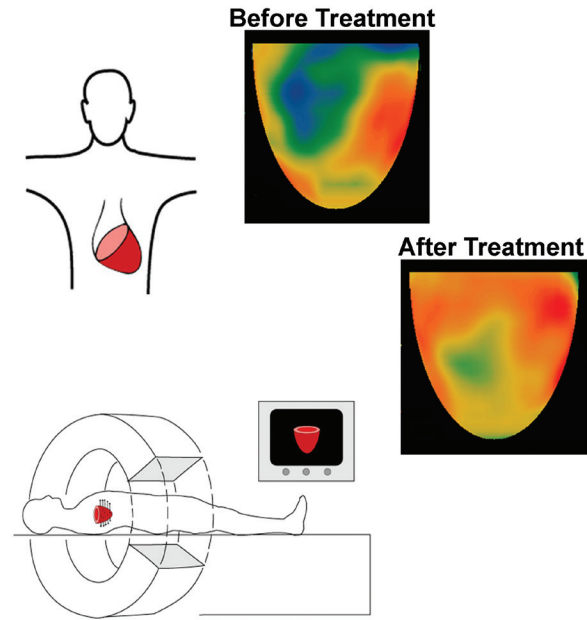


Normal Person



"I refused to believe I had coronary disease." Cardiac arrest in 6 mos. Survived. Treated. Positron Emission Tomography (PET) of early reduced heart blood flow. The only program with proven non-invasive imaging of early coronary disease.

See Your Heart Heal



Positron Emission Tomography (PET) of reduced blood flow in the heart (blue) before and after healthy lifestyle with medical treatment. The only program reversing coronary artery disease proven by non-invasive imaging.

Gould Guidelines for Preventing and Reversing Vascular or Coronary Artery Disease

STOP SMOKING

Smoking incurs a very high risk of coronary artery disease. Stopping smoking is an essential step in this reversal regimen. For those addicted to cigarettes, nicotine patches and medications are available for reducing nicotine craving, both requiring a prescription and medical supervision.

FOOD

There are three principal mechanisms by which food influences coronary heart disease. The first is the effect of food on cholesterol levels measured in blood obtained after fasting for eight hours, as routinely done

in clinical laboratories. The second mechanism by which food influences vascular disease is the surge of very low density cholesterol components and related fats (triglycerides) in blood immediately after eating that lasts eight hours as illustrated by the figure on the next page. This after-eating lipid surge impairs vascular function and contributes substantially to coronary artery disease. The third mechanism is the role of excess food on increasing body weight that increases cholesterol, insulin, blood sugar levels and blood pressure. Increased fasting blood cholesterol levels, an increased after-eating lipid

surge, increased weight, increased insulin, blood sugar and blood pressure are all associated with increased risk of vascular disease, its progression and/or heart attacks. These sections on food and cholesterol lowering drugs show how to control and minimize these causes of coronary artery disease or its progression.

The principal components of food are fat, carbohydrate, protein, fiber, vitamins and minerals. Most foods contain all or most of these components in varying proportions. However, for simplicity, most foods can be viewed as consisting principally of one of these components. These complex nutritional com-

ponents can then be translated into easily remembered daily food guidelines. The simplest way of thinking about foods is to categorize them into the simplified functional categories of fat, protein, bulk carbohydrates, vegetables, and fruit, as shown in the attached tables.

Fats, Oils And Cholesterol

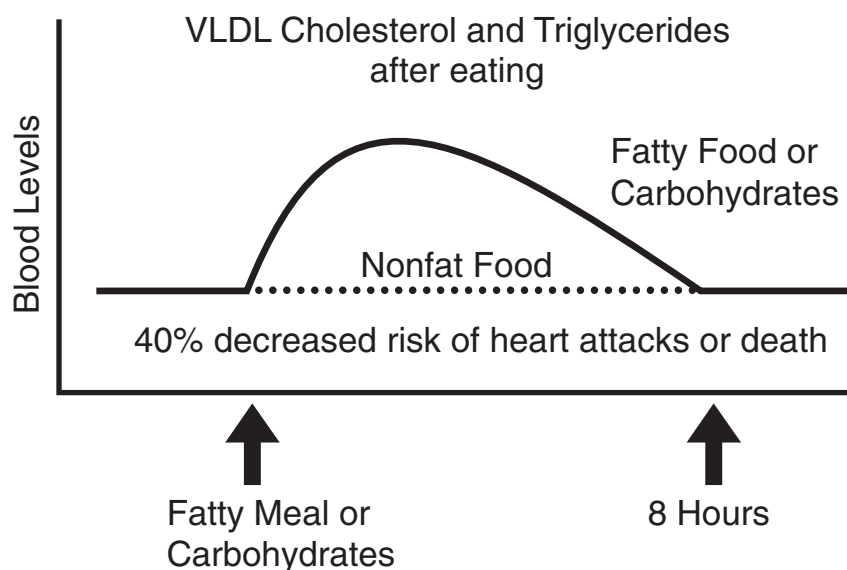
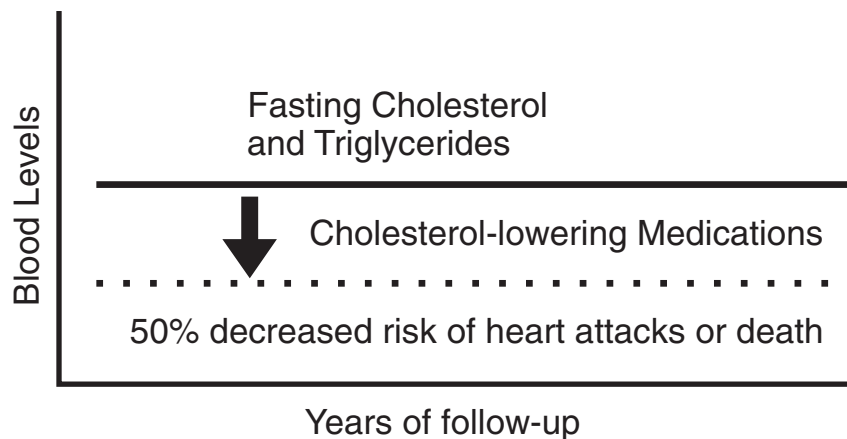
Fats and cholesterol are different molecules unrelated to each other chemically, but the metabolism of fats and cholesterol are closely interrelated in the body. In meat and animal

products, the content of fat and cholesterol tend to parallel each other even though they are separate substances. The fats from animal products are principally saturated fats that are solid or semi-solid at room temperature, like butter. Plants also make fats but not cholesterol. Plant fats may be saturated or unsaturated, either polyunsaturated (multiple double bonds) or monounsaturated (a single double bond). The mono or polyunsaturated fats of plants are liquid at room temperature and therefore called oils. Food

fats are therefore generally categorized as saturated, polyunsaturated or monounsaturated.

Cholesterol in the body is primarily made in the liver rather than due to cholesterol in food. The amount of cholesterol made by the liver depends principally on the amount of fat in the diet particularly saturated fats; food cholesterol adds to cholesterol levels but to a lesser extent. The several different kinds of fat have different effects on the various fraction of cholesterol and fats in blood. These various fats and cholesterol fractions in the blood are collectively called lipids. The lipoprotein fraction refers to the chemical form in which the cholesterol circulates in blood. The most important fractions of lipids, or lipoproteins, for clinical management are the blood levels of total cholesterol, the high density lipoprotein fraction (HDL), the low density lipoprotein fraction (LDL) and a non-cholesterol component of blood fat called triglycerides.

The LDL cholesterol is the fraction causing vascular disease, the bad cholesterol or the "Low Down Lipid." The HDL is the fraction protecting against vascular disease, the good cholesterol or "Highly Defensive Lipid." The HDL exerts its beneficial effect by transporting cholesterol out of the wall of arteries back to the liver and removal from the circulating blood, a process called reverse transport. An LDL that is too high or an HDL that is too low (less than 40-45mg/dl) can



cause coronary heart disease. The triglycerides are fats that are associated with an intermediate risk of vascular disease that increases to very high risk when combined with low HDL. The cholesterol components are related as follows: Total cholesterol = LDL + HDL + Triglycerides/5

In this program, target goals for reversing coronary heart disease or preventing it with the greatest certainty in people at high risk are LDL cholesterol below 70 mg/dl, HDL cholesterol above 45 mg/dl and triglycerides below 90 mg/dl; the total cholesterol will then range from 130mg/dl to 150mg/dl.

In addition to these lipid components of LDL, HDL and triglycerides, several other abnormal forms or sub-fractions of lipids may cause vascular disease that are not measured on standard laboratory blood tests. Type B LDL consists of small, dense particles that are particularly likely to cause vascular disease even if LDL levels are not elevated, as compared to type A LDL consisting of larger particles that are still associated with high risk of vascular disease but not as high as the type B. HDL may also consist of small dense particles that may cause vascular disease instead of protecting against it as does the normal larger beneficial HDL particles called HDL2b. Triglycerides over 100mg/dl are commonly associated with the small dense LDL and HDL types as a clue to these additional lipid abnormalities. Lowering triglycerides

usually converts these adverse LDL and HDL types to the more normal larger less dense forms as a treatment goal.

Another abnormal form of cholesterol is called Lp(a), pronounced "L P little a". It is a cholesterol molecule with an added protein string on it that makes it a major risk factor for vascular disease, is genetically determined unrelated to lifestyle and is lowered by taking niacin.

After the standard measurements of LDL, HDL and triglycerides are corrected by lifestyle and one or more medications, we commonly then measure these abnormal forms by sending blood to the Berkeley Heart Laboratory in California as a guide to final adjustments in medical treatment for these remaining "hidden" lipid abnormalities.

In general, saturated fats cause an increase in LDL and HDL. In people eating an average diet with 30% to 60% of calories as predominantly saturated fat, changing to polyunsaturated fats causes a modest decrease in both LDL and HDL. When substituted for equal amount of saturated fat in food, monounsaturated fat lowers LDL without lowering HDL. Oils high in monounsaturated fat are hazel nut oil (78%), olive oil (74%), almond oil (73%) and avocado oil (71%). Consequently, monounsaturated fats such as olive oil have been viewed as "safe" or not harmful. However, in comparison to a very low fat diet constituting less than

10% of calories, all of these fats, saturated, polyunsaturated and monounsaturated (olive oil) in excess will increase LDL cholesterol with adverse cardiovascular effects.

Another adverse form of fat is called a trans fatty acid. The production of margarine and vegetable shortening uses a process called partial hydrogenation of vegetable oils to make them solid at room temperature. It produces an adulterated type of fat, the trans fatty acid that raises LDL and lowers HDL with high risk for vascular disease.

Optimal lowering of LDL by food management requires reducing all forms of fat in food to less than 10% of calories as fat. For a total of 1800 calories consumed per day, 10% would be 180 calories as fat. Since one gram of fat is equivalent to 9 calories, 180 calories would be equivalent to 20 grams of fat. For many people, 1800 calories per day would be too much, causing weight gain. For a weight reducing 1200 calories per day, 10% or 120 calories as fat at 9 calories per gram of fat would be 14 to 15 gms of fat per day. Achieving this goal requires removing most identifiable fat from one's food. Determining the fat grams in your food easily and practically for each day's eating is simple by reading food labels and using the attached tables.

In addition to the goals of 15 to 20 gms of fat per day, the target for cholesterol intake in food each day is less than 80 to 100mg for the day aver-

aged over a week. This level of cholesterol minimizes the effect of dietary cholesterol on blood levels of cholesterol. This target level of dietary cholesterol flexibly allows a wide range of protein sources. There is a higher caloric burden with pure vegetarian food deriving all protein from high carbohydrate sources such as grains, lentils or beans.

The goal of 10% of calories or approximately 15 to 20 grams of fat and less than 100 mg of cholesterol in food each day in this reversal program is much lower than the guidelines of the American Heart Association at 20% to 30% of calories as fat. While the American Heart Association Guidelines may reduce the overall risk of vascular disease in the general population, as a preventive measure in individuals, they do not predictably prevent, stabilize or reverse vascular disease in any individual with risk factors. In large studies of lowering cholesterol and heart disease, half of the subjects (or control groups) of these studies were treated by placebo and put on diets of 20% to 30% of calories as fat. Vascular disease in these control groups treated by diets of 20% to 30% fat content recommended by the American Heart Association demonstrated overall progression of vascular disease and significant continuing risk of heart attacks, strokes and deaths.

While the American Heart Association diet is much better than the high fat food com-

monly consumed, it is not stringent enough for this program. Consequently, in this prevention-reversal program, dietary fat is reduced to 10% of calories or approximately 15 to 20 gms per day in order to optimize outcomes.

Fatty food carries a significant risk of vascular disease or its progression separate from and independent of the levels of cholesterol measured in blood under fasting conditions. This direct effect of fatty food separate from fasting blood cholesterol levels is due to an immediate surge in fats in the blood called very low density lipoprotein cholesterol (VLDL) and in the triglycerides after a fatty meal as illustrated in the previous figure. This after-eating surge in blood lipids is highly atherogenic, that is, prone to cause atherosclerotic vascular disease. It also inhibits the function of the lining of arteries during the eight hours after the meal. The after-eating lipid surge lasts eight hours after a single fatty or starchy meal. With three such rich meals per day, the exposure of the coronary arteries to atherogenic material may be substantially more than apparent from blood cholesterol levels measured after fasting for eight to twelve hours before blood tests as normally done.

Although the statin class of cholesterol lowering drugs reduce blood cholesterol levels measured after fasting, these drugs used alone do not affect the after eating fat surge in the

blood. Low fat food eliminates the after eating lipid surge and thereby reduces the exposure of the arteries to this fatty material that causes vascular disease. Reducing carbohydrates also reduces the after eating lipid surge in carbohydrate sensitive people. The combination of medications, a statin plus niacin or statin plus fenofibrate also lowers the after eating lipid surge.

Essential Fatty Acids are two specific fats, linoleic and alpha linolenic fatty acids, essential to body functions in very small amounts. They are required in small amounts in food since the body cannot make them. For people consuming less than 10 to 15 gms of fat per day, I recommend that the small amount of fat consumed contain a daily source of essential fatty acids by one of several alternative regimens as follows:

- (a) one teaspoon (4.7 gms fat) of soybean oil or four soya lecithin capsules each containing 1.2 gms of oil, either of which provides 2.4 gms of linoleic and 0.38 gms of alpha-linolenic acid, the minimum essential fatty acids requirements.
- (b) one teaspoon (4.7 gms fat) of walnut oil providing 2.4 gms of linoleic and 0.25 gms of alpha linolenic acid in addition to a fish meal once per week or a fish oil capsule once per day or an extra teaspoon of walnut oil to increase to the alpha-linoleic acid intake.
- (c) one teaspoon (4.7 gms fat) of canola oil containing 1.22

of linoleic acid and 0.47 gms of alpha-linolenic acid in addition to the small amounts of linoleic acid in vegetables since vegetable oils are rich in linoleic acid, or two teaspoons of canola oil.

Excess amounts of all these oils raise LDL with potential adverse cardiovascular risk. Olive oil contains very little essential fatty acid. It is less harmful than saturated fats. However, excess olive oil adds calories to the diet and is not specifically beneficial in excess.

In this food program, prolonged fasting and hunger should be avoided, since hunger causes loss of food control. Whenever you get hungry, a snack of protein in some form, protein with fruit or protein with vegetables should be eaten. The protein food suppresses appetite and produces satiety at a lower caloric consumption than bulk carbohydrates. For most people it is easy to over eat and consume excessive bulk carbohydrates. However, it is harder and therefore less likely, for most people to over eat protein because it produces a greater sense of fullness and satiety.

Carbohydrates consist of starches and sugar that provide calories to the body. In excess they cause weight gain and fat accumulation. Because of the great individual variability in the amount of carbohydrate needed to achieve and maintain lean body build, a target number of grams of carbohydrate is not useful. On low fat food, the best guide to volume

of carbohydrate is weight. For overweight people, the first step is to eliminate entirely the large bulk sources of carbohydrate until reaching desired weight or lean body habitus. These large bulk sources of carbohydrate include rice, bread, potatoes, pasta, cereal, candy, pastries, alcohol, sugary fruit juices and bananas. While vegetables, dairy products and other low fat foods may contain some carbohydrates, the amount is low enough that weight will fall if the large bulk sources are eliminated. The optimal rate of weight loss is an average of 1 to 2 lbs per week.

On reaching target weight, non fat carbohydrate should be added back in just enough amounts to hold weight constant at the target level. Excess carbohydrates cause weight to increase which is an indication that carbohydrates in food should be readjusted downward. If weight falls below target, more non fat carbohydrates should be added to food. Depending on weight loss needed and/or rate of weight loss achieved, this elimination of bulk sources of carbohydrates may be moderated. For example, it is reasonable to eat one small serving of either rice, bread, pasta, potatoes, cereal, alcohol, juices, or bananas each day (one of these, not all of them) as a special treat while otherwise adhering to the regimen. However, the cumulative calories of fruit juice, bananas, cereal, bread, pasta and wine, for example, are simply too

much for most people and cause weight gain.

One pound of body weight is equivalent to 3500 calories. Therefore, just 250 calories in excess over daily metabolic needs add up to a pound gained every two weeks. Or, 250 calories per day reduced below daily metabolic needs causes a pound lost every two weeks. Only 500 calories per day over or under daily metabolic needs will cause a pound gained or lost EVERY WEEK. Therefore, a small amount of food such as a bagel, a bowl of cereal, two slices of bread in a sandwich, a glass of wine each day, over or under daily metabolic needs may cumulatively add or, if omitted, may lose a pound every week or two.

In many people carbohydrates, particularly alcohol, cause a marked rise in triglycerides with adverse risk of vascular disease. In such people, excess carbohydrates or starches in food may cause a marked after-eating lipid surge, like fatty food. Commonly, vascular disease may be due to the combination of excess weight, low HDL, elevated triglycerides and elevated LDL. These abnormalities are associated with elevated blood sugar and insulin levels, called the “insulin resistance syndrome”, all worse on high carbohydrate calories. In a functional sense, such people have a “double metabolic defect” such that high fat food increases LDL and low fat, high carbohydrate food increases triglycerides and lowers HDL

having equal or worse cardiovascular risk. In such people, both carbohydrate calories AND fat restriction with weight loss are essential for lowering triglycerides, lowering LDL, increasing HDL and reducing vascular disease or its progression. Usually two different medications together such as a statin and niacin or a statin and fenofibrate in addition to healthy lifestyle and lean body weight are all required to prevent vascular disease in people with this problem.

SUMMARY OF FOOD GUIDELINES

1. Eliminate all major sources of fat including margarine, animal fat (saturated), but also reduce monounsaturated (olive oil) and polyunsaturated oils. The aim is to reduce fat intake to less than 10% of calories or about 15 to 20gms fat/day, which means removing most identifiable fat from your food. Of the 15 to 20 gm of fat consumed per day, 3 to 4 grams of the essential fats should be consumed from sources outlined above. The remaining dietary fat should consist of mono or polyunsaturated fat including omega-3 or fish oil in fish as food. Consuming excess omega-3 as capsules will raise LDL cholesterol levels. The target for dietary cholesterol is less than 80-100mg/day. There are many low or no-fat, no-cholesterol foods currently marketed. Read the labels
- on food products for fat and cholesterol content since FDA rules require accurate labeling. There are low-fat or no-fat, no-cholesterol salad dressings, butter substitutes, mayonnaise, cheeses, stews, soups and protein sources listed in the attached tables.
2. Maintain a protein source of at least 60 to 80 gm protein/day from non-fat dairy products, vegetburgers, yolk-free egg products, protein supplements, fish, some beans and some meats such as chicken or turkey breast and extra lean pork. Fish such as salmon and deep sea fish are desirable sources of protein and should be grilled, baked, sautéed in wine, without oil or butter, five to eight ounces (large palm sized) serving/day or several times per week depending on other protein sources. In addition to foods listed below, no-fat protein supplements can be obtained as a protein powder for mixing with skim milk, yogurt, juices or other drinks. Protein intake of less than 40 gm/day is commonly associated with fatigue, lack of energy and poor stamina.
3. Make proteins, vegetables and salads the main component of food, steamed or grilled, not fried or seasoned with excess oil. Eat salads and/or several varieties of vegetables at lunch and at supper, in satisfying amounts served warm or cold with some protein food. Beans and grains are low in fat and
- cholesterol, but as the sole source of adequate protein have relatively high carbohydrate calorie content. These include lentils, white, pinto, lima, kidney, green, yellow, pork, and garbanzo beans. Consequently, for overweight people beans and grains should not be the major source of protein since adequate volumes of these foods for enough protein also add excess calories and weight.
4. Reduce or eliminate the large volume, bulk carbohydrates or starches, such as rice, bread, potatoes, pasta, pastries, sweets, sugary fruit juice, wine and bananas in order to reach ideal weight, reduce triglycerides and increase HDL. Substitute protein, vegetables and up to three fruits per day for the reduced bulk carbohydrates. After reaching lean body habitus, then increase these carbohydrates just enough to maintain weight.

The intake of carbohydrates or starches such as rice, bread, potatoes, pasta, cereals, sweets and fruit should depend on weight. If a person is overweight, most starches except some beans should be eliminated with the aim of weight loss at one to two pounds per week until lean stature is achieved. Excess calories even as fat free carbohydrates may increase or maintain excess weight and high cholesterol levels. If you are currently

already lean, more carbohydrates may be necessary to maintain weight as fat is removed from the food.

Reduction of carbohydrates is important since individuals with low HDL and high triglycerides may markedly increase triglycerides and decrease HDL on low fat, high carbohydrate food. If grains, beans and rice are the only source of adequate protein, carbohydrate calories may be high enough to prevent reaching lean body habitus and optimal cholesterol lowering with adverse effects on HDL and triglycerides in some people. A modified semi-vegetarian food with good protein sources described here or a low fat, low cholesterol, high meat diet helps keep HDL high and triglycerides low in such people with carbohydrate sensitivity.

5. Avoid being hungry. Snack often if needed. Frequent small healthy meals reduce appetite and maintain low calories with “shrinkage” of the stomach so that you are satisfied with smaller amounts of food. If still hungry, eat larger amounts of the right kinds of food, principally vegetables and non-fat protein with some fruit. Add back rice, bread, potatoes, pasta or other carbohydrates in modest amounts only after reaching ideal weight.
6. For restaurant dining, the solution is simple. Don't even look at the menu;

request from the wait staff low-fat food, such as steamed or grilled vegetables, grilled or baked fish or turkey, salads without dressing. Even fast-food outlets have low-fat food available. The availability and demand for low-fat, low calorie food is so diverse that most occasions provide some options. The secret to maintaining low-fat, low calorie food on such occasions simply requires thinking about it without being distracted by social environment, stress eating or considering it polite to eat multiple or big servings of rich fatty or high calorie food.

Protein Sources - Non-fat dairy products include:

Non-fat cheese slices, typically with 5 gm protein per slice (21 gm) or 6.7 gms per oz. (1 1/3 slices) with only 30 calories per slice or 40 calories per oz. is an excellent low cholesterol, low calorie, high protein source. Eat no-fat cheese slices as main meal protein melted on vegetables, in yolk free scrambled eggs or omelets, as a snack with fruit, chopped in salads, soups, for breakfast, lunch or supper. The less than 5 mg cholesterol per oz. is acceptable. Low fat cheese is acceptable as long as total fat is under 20 gms per day.

Skim milk has 8 gm protein, 80 calories per cup (8 oz), and no cholesterol.

Non-fat yogurt has high protein content of 8 to 10 gms for 90-100 calories per 8 oz. container (1 cup), either plain

or mixed with fruit. Look at the labels to pick the right brand. The 5 mg cholesterol per 8 oz. serving is acceptable.

Non-fat cottage cheese has 13 gm of protein and 70 calories for a four ounce serving (half cup). It is one of the highest protein sources per calorie of any food. As main meal protein, a full cup should be eaten with fruit or vegetables, providing 26 gms of protein. The 5 mg of cholesterol per four ounce serving is acceptable.

Non-fat Philadelphia cream cheese has 4 gm protein per 1 oz. serving with 25 calories and 5 mg of cholesterol.

Low-fat cheddar, mozzarella and Swiss cheese sticks (1 oz or 28 gm) are also available with 6 to 8 gm protein and 2.5 gm of fat per 1 oz serving. They are reasonable protein sources if the total fat per day remains under the 20 mg limit. The less than 5 mg of cholesterol is acceptable.

Protein Sources - Low-fat meat sources of protein have more cholesterol per gram of protein compared to non-fat dairy products:

Low-fat franks are made with beef, turkey, or lean pork. Each frank has 50 calories, 6 gms of protein, 1 gm of fat and 15 mg of cholesterol per frank (1.6 oz). An amount providing daily protein requirement of 60 gms has 11 gms of fat and 150 mg of cholesterol.

Turkey breast, skinned, grilled or baked. An amount providing daily protein requirements of 60 gms has 5 gms of

fat and 143 mg of cholesterol. Chicken breast, skinned, grilled or baked, is similar to turkey with slightly more fat and comparable cholesterol content. Most grocery stores carry pre-packaged grilled chicken breast strips ready to eat. Extra lean pork is comparable to chicken breast in terms of cholesterol and fat.

Buffalo, venison, emu, elk, longhorn beef, grilled or baked providing daily protein requirements of 60gms has 3 gms of fat and 68 mg of cholesterol, the lowest of any meat. Of meats, these meats have the highest protein, lowest cholesterol and fat content. Some of these meats marketed in ground patties in local stores have fat added and should be avoided by reading the label on the meat package for fat content.

Fish, particularly deep sea fish such as salmon, tuna, haddock, sole, swordfish are good sources of protein with cholesterol content comparable to buffalo. Fat content of fish may be higher than buffalo or no fat dairy products but even if salmon were the sole source of the daily requirement of 60gms of protein, it would add only 12 gms of fat per day. In addition, the fat added is an omega 3 fish oil which is associated with less adverse effects than animal fats. Cholesterol content of fish is comparable to buffalo but higher than non meat protein sources. Therefore, fish can also be eaten daily or several times per week with other protein coming from lower cholesterol

sources.

Meats or fowl should be grilled or baked with fat dripping out; never fried, served as a 4 to 5 oz. Serving. The attached Tables compare various protein sources for total calories, fat and cholesterol content for an amount providing 60 gms of protein per day. Non-fat dairy products, yolk free egg, veggieburgers, protein supplements and vegetable sources should be the primary source of protein since they have the lowest fat and cholesterol content augmented with fish or low fat meats depending on individual tastes.

Protein Sources - Other:

Non-fat veggieburgers, yolk free eggs and protein powder drinks have high protein content with no fat or cholesterol and low calories. Veggieburgers are made from soy protein. A typical 78 gm veggieburger patty contains 11 gms of protein, 70 calories and no cholesterol compared to 68 mg cholesterol and 16 gms of fat in a comparable meat hamburger. If the entire daily 60 gm requirement for protein were obtained from 5.5 soy patties, total fat and cholesterol would be zero with 382 calories.

Yolk free egg products are available in one cup cartons (55 gm) containing four yolk free eggs, each egg white providing 6 gms protein and 30 calories each for a total of 24 gms of protein and 120 calories per one cup carton with no cholesterol or fat. This egg product typi-

cally has low sodium content, much lower than the no fat dairy products and is the best protein source per calorie than any other food with no fat and no cholesterol. These egg products can be prepared as scrambled eggs, omelets or soufflés with added no fat cheese, no fat veggieburgers, vegetables, parsley, dill or other herbs. The soufflés are particularly good served with chopped fruit topping flavored with fruit liqueur.

Protein powder from soy beans, eggs or from dairy products is an excellent source of relatively concentrated pure protein without cholesterol or fat. Two tablespoons of protein powder typically contain 20 to 24 grams of protein. Since the protein powder can be obtained without added carbohydrate, the calorie content is that of protein 4 calories per gram.

Protein drinks can be made in a wide variety of ways. Two scoops of protein powder added to a glass of skim milk blended with 4 or 5 strawberries or a teaspoon of no fat chocolate is a delicious high protein supplement. Juices such as cranberry, apple or orange juice or other fruit can be used. Yogurt is a good additive to thicken the protein drink. Some protein powder has carbohydrate added which may add calories. If weight loss is important, protein powder without added carbohydrate should be used. However, protein drinks alone as the main nutrition is not appropriate. They are nutritional supplements to augment low fat, low cholesterol food.

For cereal lovers, a product called Nutlettes is available by direct order from Dixie USA, Inc., (call 1-800-233-3668). It resembles grape nuts but is predominantly soy protein with a half cup providing 25 grams of protein. It is good with fruit such as strawberries, blueberries, cantaloupe, small bunch of grapes and skim milk.

CHOLESTEROL LOWERING MEDICATIONS

In general, cholesterol lowering medications are used for people with an established diagnosis of coronary artery disease or with significant risk factors for vascular disease such as elevated cholesterol, a strong family history of coronary artery disease, diabetes, hypertension or other specific high risk circumstances. A healthy lifestyle with low-fat food, stopping smoking etc without cholesterol lowering drugs is preferable for people without known coronary artery disease or risk factors.

Cholesterol lowering drugs will not compensate for continuing a high fat, high calorie intake. For individuals with coronary artery disease or high risk factors, this program uses a vigorous regimen of healthy lifestyle combined with one or more cholesterol altering medications to optimize all the blood lipid components and risk factors with the goal reducing risk or reversing of vascular disease with 90% certainty.

Why both low fat food and cholesterol lowering medica-

tions? In people with coronary heart disease or children of parents with coronary heart disease, blood lipids (VLDL and triglycerides) surge to abnormally high levels after eating a fatty or high carbohydrate meal. This after-eating (post prandial) lipid surge is high risk for vascular disease. Since it not altered by the statin class of cholesterol lowering drugs, the after-eating lipid surge causes vascular disease independent of and separate from fasting blood cholesterol levels. Taking a statin type of cholesterol lowering medication will not protect against the adverse effects of the after-eating lipid surge.

Additionally, in many people, excess dietary carbohydrate and weight cause an increase in triglycerides, a fall in HDL and increased insulin levels, all of which cause progression of disease. High triglycerides are associated with type B LDL particles that are small, dense and cause high risk even if LDL levels are not markedly elevated. Lowering triglycerides raises HDL and converts this adverse LDL type B pattern to the LDL type A pattern of larger, less dense LDL particles that are less atherogenic. Therefore, the optimal treatment for stabilizing or partially reversing coronary artery disease combines one or more cholesterol-lowering medications with optimal low fat, low carbohydrate calorie food to reach ideal weight.

When clinically indicated one or more or all of the following drugs are used to augment

the effects of healthy lifestyle.

The “**statin**” class of drugs reduces synthesis of cholesterol in the liver. These include Lipitor, Zocor, Crestor, Pravachol, Lescol and Mevacor taken with or without food except Pravachol should be taken without food at bedtime. Advicor contains a combination of Mevacor and Niaspan that improves LDL, HDL and triglycerides. Vytorin contains a combination of Zocor and Zetia that enhances cholesterol lowering of the Zocor by blocking gut absorption of cholesterol. Potential side effects of all lipid altering medications include elevation of liver enzymes and a rare condition called myositis associated with aching muscles, weakness and CocaCola colored urine. It requires stopping the medication for several weeks. A different medication or a change in dose can then be tried usually without return of that side effect. Accordingly, after starting the drug or after increasing the dose, liver function tests and cholesterol levels are checked monthly for 2 months and every 6 to 12 months thereafter.

Niacin is one of the oldest lipid altering drugs. It increases HDL, lowers triglycerides, enhances LDL lowering of statins, converts type B LDL to type A LDL and lowers Lp(a). Potential side effects include itching, flushing and increased liver enzymes. Niaspan is the most effective, best tolerated, once per day preparation taken at bedtime. Gradual increasing doses in steps and aspirin taken

at supper or with the Niaspan at bedtime minimizes the flushing or itching that may occur in some people. For persistent flushing or itching despite aspirin or for people who cannot take aspirin, over-the-counter Benedryl 25 to 50mg taken at bedtime with the Niaspan usually prevents these side effects.

The **fibrate** class of medications primarily lowers triglycerides with a secondary increase in HDL. The two single-dose-per-day formulations are fenofibrate 145 mg (Tricor) with or without food or 200mg (Lofibra) optimally taken with food. Potential side effects also include inflamed or aching muscles called myositis associated with dark color colored urine that require stopping the medication temporarily and reassessing the treatment regimen.

Cholestyramine is a drug that binds pre-cholesterol components in the bowel thereby removing them from the body. Questran light or Colestid 2 to 6 scoops, packages or tablets with each meal two to three times per day. Potential side effects are gastrointestinal symptoms. It also binds other drugs that have to be taken at a different time. In the same class, colesevelam (Welchol), in 625mg capsules does not bind other medication and is therefore easier to use, taken as 3 to 6 capsules daily. It is used as an addition to other cholesterol medications in people who may not tolerate full doses of the other medications.

After starting these medi-

cations, check liver enzymes every month for the first 2 to 3 months and thereafter every 6 months. If you get a viral infection like the "flu", check the liver enzymes more often since the virus may further inhibit cholesterol synthesis in the liver and cause a profound fall in total cholesterol to 50 or 60mg/dl and an increase in liver enzymes. In these circumstances, even though uncommon, simply stop the drugs for two weeks, check the liver enzymes again and re-introduce the drugs back up to the same previous dose level after liver enzymes are normal. Liver enzymes usually remain normal after the viral infection is cleared when back on the original full dose of drugs. This syndrome is called the "cholesterol flu."

VITAMINS AND ASPIRIN

You should take a multi-vitamin daily with at least 400 micrograms of folic acid. For people with elevated homocysteine, large doses of folic acid are needed up to 4 to 6 mg daily. A number of good scientific studies have demonstrated no benefit from taking vitamin C, vitamin E or beta carotene. If you do not have adverse reactions to aspirin, you should take one aspirin or one baby aspirin or equivalent daily which improves the function of the coronary artery lining, retards stickiness of blood elements (platelets) and decreases risk of atherosclerotic plaque rupture associated with blood clots or

thrombosis in the arteries.

EXERCISE

Do any exercise you like to do and will do regularly (4-6x/week) within the limits of your medical status. The baseline is walking 30 to 45 minutes per day. When medically appropriate, an exercise stress test to evaluate exercise limits, potential adverse effects and/or a supervised or monitored exercise program may be necessary. Jogging or swimming is excellent. Repetitive lifting light weights for both arms and legs is a strong stimulus for raising HDL. A simple routine with light bar bells of 10 to 25 lbs each includes repetitive arm curls, overhead lifts, one foot toe lifts, push ups, half knee bends, sit ups, all repeated for a total of at least two sets. Aggressive competitive athletics, heavy weight lifting and excessive running are not needed or optimal from a cardiovascular point of view.

ALTERNATIVE TREATMENT

For severe narrowing of the coronary arteries by coronary arteriograms (angiogram), balloon dilation of the narrowing in your coronary arteries with insertion of a stent may be necessary, as preferred by many cardiologists. For acute unstable coronary syndromes (increasing chest pain, evolving heart attack) balloon dilation and/ or clot busting medications may be essential. With the new coated stents, recurrent narrowing of

the artery is very low compared to the older uncoated stents having 30% to 40% recurrence of coronary artery narrowing within 6 months after initial success. Bypass surgery may also be necessary, particularly for patients with poorly contracting heart muscle that is damaged but salvageable if blood flow is restored by bypass grafts. However, both balloon dilation and bypass surgery are associated with some risk of death, heart attack or stroke and do not stop the progression of coronary artery disease. Therefore, for such patients, these procedures combined with intense medical-lifestyle treatment are essential for preventing heart attacks and cardiac death.

No treatment has guaranteed outcome and some risk of clinical coronary events remains during reversal treatment as with bypass surgery and balloon dilation. Either with or without these procedures, the optimal treatment for stabilizing or partially reversing coronary artery disease combines one or more cholesterol lowering medications, optimal low fat, low carbohydrate-calorie food to reach ideal weight and control of all risk factors. In several scientific studies including our own, achieving these goals on multiple lipid medications reduces the risk of heart attack, balloon dilation, bypass surgery, stroke or cardiac death by 70% to 90%.

ADDITIONAL READING

1. Gould KL: Heal Your Heart: How You Can Prevent or Reverse Heart Disease, a paper back pictorial manual for preventing and reversing vascular and coronary heart disease for the general non-medical reader, Rutgers University Press, 1998 (to order call 1-800-446-9323).
2. Sdringola S, Nakagawa, K, Nakagawa Y, Yusuf W, Mullani N, Haynie M, Hess MJ, Gould KL: Combined intense lifestyle and pharmacologic lipid treatment further reduce coronary events and myocardial perfusion abnormalities compared to usual care cholesterol lowering drugs in coronary artery disease. J Am Coll Cardiol 41: 262-272, 2003 chosen for Highlights Of The Year In JACC 2003 (JACC 2003;42:2164).

Goals Of Heart Disease Prevention—Reversal Program

- Food with 15 to 20 grams of fat and 80 to 100mg cholesterol or less
- Lean body weight by reduction in carbohydrate calories
- Cholesterol Lowering Medications, commonly more than one
- Total Cholesterol <140, triglycerides <90, LDL <70, HDL >45mg/dl
- Moderate Exercise five times per week
- Stop Smoking

Gould Guidelines For Food

No Fat	No oils, whole milk products, whole eggs, red meat, fatty salad dressings, fried food, fatty cereals, fatty sauces, "fast" food
Protein	Sources of no or low fat protein: yogurt, cottage cheese, mozzarella string cheese, light cheeses, skim milk, fish, turkey or chicken breast, lean pork, low or non fat processed meats, buffalo, venison, emu, yolk free eggs, veggie-soy burgers, protein powder supplements from soy, eggs or whey.
Carbohydrate	Reduce bulk carbohydrates to achieve lean body weight such as rice, bread, pasta, potatoes, cereal, alcohol, sugary fruit juice (OJ), bananas, pastry, candy, desserts
Vegetables	Raw or cooked, several kinds each meal for volume food
Snack	On protein foods to suppress appetite, multiple small meals
Read Labels For	Fat and calorie content, particularly cheese, salad dressing, milk products, protein foods, cereals, food bars

3. Brown BG, Zhao XQ, Chait A, et al. Simvastatin and niacin, antioxidant vitamins, or the combination for the prevention of coronary disease. *N Engl J Med.* 2001;345:1583-1591.
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5. Gould KL, Nakagawa Y, Nakagawa K, Sdringola S, Hess MJ, Haynie M, Parker N, Mullani N, Kirkeeide R. Frequency and clinical implications of fluid dynamically significant diffuse coronary artery disease manifest as graded, longitudinal, base- to-apex myocardial perfusion abnormalities by noninvasive positron emission tomography. *Circulation.* 2000;101:1931-1939.
6. Nakagawa Y, Nakagawa K, Sdringola S, Mullani N, Gould KL. A precise, three-dimensional atlas of myocardial perfusion correlated with coronary arteriographic anatomy. *J Nucl Cardiol.* 2001;8:580-90.
7. Henderson RA, Pocock SJ, Clayton TC, Knight R, Fox KA, Julian DG, Chamberlain DA. Seven-year outcome in the RITA-2 trial: coronary angioplasty versus medical therapy. *J Am Coll Cardiol.* 2003;42:1161-1170.
8. Hueb W, Soares PR, Gersh BJ, Cesar LA, Luz PL, Puig LB, Martinez EM, Oliveira SA, Ramires JA. The medicine, angioplasty, or surgery study (MASS-II): a randomized, controlled clinical trial of three therapeutic strategies for multivessel coronary artery disease: one-year results. *J Am Coll Cardiol.* 2004;43:1743-1751.

Non Meat Sources of Protein Providing 60 Grams of Protein Daily

Source	Amount	Cholesterol (mg)	Fat (gm)	Calories (kc)
Yolk free egg	2.5 cups	0	0	300
Cottage Cheese, no fat	2.3 cups	23	0	323
Yogurt (no fat)	6.6 cups	33	0	600
Cheese (no fat)	9 oz (12 slices)	<37	0	360
Skim milk	6.6 cups	26	0	600
Veggie Burgers	5.5 patties	0	0	382
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Garbanzo beans	4.2 cups	0	14	1056
Kidney beans	4.2 cups	0	4.5	909
Rice (white)	14.7 cups	0	6	3234

Meat Sources Providing 60 Gram of Protein

Source	Amount	Cholesterol (mg)	Fat (gm)	Calories (kc)
Beef steak	7.8 oz	210	44	639
Wieners, no fat	10 links	150	0	400
Turkey or chicken breast	6.5 oz	143	5	291
Pork tenderloin, lean	7.5 oz	168	10	348
Buffalo, venison	6.0 oz	68	3	303
Tuna, water packed, steak	7.5 oz	100	4	270
Salmon	7.0 oz	78	12	374

Beef Providing 60 grams of Protein

Type of beef	Amount (oz)	Cholesterol (mg)	Fat (gm)	Calories (kc)
Regular fat beef	12	261	85	1027
Lean beef	8	180	19	429
Longhorn beef	8.4	148	9	350
Beefalo	7	113	12	368
Lean beef jerky	3	53	3	276

The Weatherhead Center
For Preventing and Reversing Atherosclerosis
at
The University of Texas Medical School at Houston
and
Memorial Hermann Hospital



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