

1992

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Recommended Citation

Dunn, Maureen, "'LECHAIM!' Understanding Cholesterol" (1992). *Volume 1 - 1992*. Paper 6.
<http://preserve.lehigh.edu/cas-lehighreview-vol-1/6>

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“LECHAIM!” Understanding Cholesterol

Maureen Dunn

“LECHAIM!” The bat mitzvah had begun as a celebration of love and life. Mr. Silverman looked around the room at his family and friends. “TO LIFE!” he shouted again. “Everyone please enjoy the dinner and help our family celebrate this momentous day!” After a year of preparing for the event, it was finally time to sit back and enjoy the festivities on a day his youngest daughter would never forget. It seemed like only yesterday that Marla, his oldest daughter, was thirteen and now she is twenty-one. But looking back, not much had changed. It seemed impossible to believe these times could ever change. Attempting to converse above the harmonious buzzing of laughter and music, the Silvermans remarked proudly on the strength and vitality of the family unit. A piercing scream drew the quieting crowd to the dance floor.

Marla Silverman awoke to the smiling face of a very white man standing in a very white room. Not only did this man wear a white shirt and white jacket, he was close to an albino with white hair and a beard to match. Heaven was the only option that Marla could dream of. Wait . . . of course, a dream! Now this explanation was supported by a continual and annoying beeping noise that was sure to be the alarm clock. The one problem, however, was Marla’s inability to move in order to stop the terrible noise. The man kept looking, smiling and moving his mouth until the whole scene went white once again.

Marla awoke a second time to more smiling faces. They almost looked relieved. These faces were a norm in Marla’s life. The parents, the grandparents, the aunts and uncles . . . yes they were all here in Marla’s bedroom. It must be another one of those family gatherings. But why relieved faces, especially in her bedroom? Mama was the first to speak. “Marla, darling, you will be just fine. Please lay still and don’t fuss. The doctor will be right back. We are all here with you.”

From nowhere, the white man reappeared. Ah, the doctor, he was back and had hardly exchanged pleasantries before the family sat in silence and listened about this “condition” as the doctor called it. “There is a high possibility of a genetic disorder. We must run some tests . . .” As the word sunk in, Marla realized they were talking about her “mild heart attack.”

April 6

Dear Diary,

Today I was released from the hospital. It was such a wonderful feeling to be in my own room after the scary and cold atmosphere of the hospital. I was surprised that I was released after only two nights, but Dr. Thornton assured me that even those patients with multiple heart attacks are released after only a few days. Upon my dismissal, Dr. Thornton stressed the severity of my condition. Even though I had only had a mild heart attack, my cholesterol level was around 500 mg/dL, well above the acceptable level of 200 mg/dL. My entire lifestyle and diet must change. He went on to tell me that medication might be needed at a later date to reverse the effects of high cholesterol in my blood. The tone of Dr. Thornton's voice really made me believe that this situation was life threatening. With my cholesterol pamphlets and suitcase in hand, I headed for the door wondering how exactly I could change my entire lifestyle.

Until later,
Marla



April 7

Dear Diary,

I just returned from dinner at Grandma and Grandpa's. I was trying to convince them of the importance of a cholesterol test. If there are genetic disorders in my family, everyone should be tested. It's true, though, that it is hard to teach an old dog new tricks. Even with the horror that the family felt just last week, they are convinced that they are immune to any harm. Grandma told me that she just got off the phone with Mrs. Simon who knew for a fact that all of this talk about cholesterol was just a passing fad! Of course, Mrs. Simon didn't really know a lot about genetic diseases, but both Mrs. Simon and Grandma decided that if a heart attack had not killed her by now, it surely never would. I could hardly believe my ears! Heart attacks were the number one killer in America. High cholesterol was no passing fad. In fact, heart disease has been a leading cause of death in the United States since 1920.¹ Since the 1970's the recommended fat intake for an adult was reduced from 40% to 30% of daily calories. Americans, however, have increased the actual amount of fat intake from 32% in 1909 to 42% in 1980.² The national campaigns to educate the American public on heart diseases have helped to lower many American's cholesterol levels. I went on to tell her that previously it was believed that men were mostly at risk, but new statistics showed that women also were at very high risk, especially those later in life.³ I showed Grandma a pamphlet that Dr. Thornton had given me to explain genetic disorders, specifically Familial Hypercholesteremia.⁴ Not only are there other genetic disorders, but heart attacks caused by improper eating also will contribute to an estimated 500,000 deaths in 1992. This topic of conversation proved to be an unpopular one, and I decided to abandon the subject as we sat down to dinner. In the back of my mind,

however, I made a mental note to read about cholesterol and heart attacks so I will be able to present a convincing argument to my family. The dinner Grandma prepared

Until later,
Marla



April 8

Dear Diary,

Today I had a meeting with Barbara Bielska and Gene Nau. They are two researchers who are interested in studying a person with cholesterol disorders, and I felt it was a perfect opportunity to learn something about the current research on cholesterol's effects on the body. I am still having a hard time understanding exactly what my body was going through.

Dr. Thornton believes it is important to certify that genetic disorders are present and to test all members of my family since Familial Hypercholesteremia is the most probable genetic disorder affecting my family. Since Barbara and Gene are studying genetic disorders, Dr. Thornton thought they would be interested in running some tests on my blood. It will be interesting to get to know them better as I learn about their research.

Gene and Barbara began by informing me that they were studying cholesterol metabolism in normal adults as well as those individuals who have genetic defects or those individuals who have defective metabolism due to a poor diet. They began by explaining that LDL stood for low density lipoprotein, a type of cholesterol. They quickly became aware that I was unfamiliar with cholesterol and brought out three vials containing very different samples of blood. The first vial was a deep red color, characteristic of normal LDL metabolism in the blood. The second was a bright orange, characteristic of excessive amounts of LDL; the third looked like a strawberry milkshake. It was cloudy white due to the excessive amount of fats (triglycerides) in the blood. The level of LDL in the blood is linked to the risk of heart disease. In a healthy person, the body produces enough receptors to keep LDL bound and therefore unable to form hard plaques which might cause a heart attack. Once the LDL is bound to its receptor, it is brought into all types of cells in the body and used for many different purposes. Even though I had always thought cholesterol was a negative word, the cells in our bodies need LDL to function and grow.

Barbara and Gene questioned me about my life history and health. I told them I was an average 21 year old. I drank occasionally, did not smoke, exercised about four times per week and ate an average diet. "Average diet? On that note, we'll begin the next interview and decide just what is an average diet!" Gene joked. Dinner at Grandma's

made me wonder. . . did I really eat right? I always thought I did. I ate like everyone else I knew. . . .

Until later,
Marla



April 15

Dear Diary,

By now I am feeling much better. I was looking forward to my second interview with Barbara and Gene. I had done some reading on LDL and the different ways in which cholesterol can affect one's body. Over the past week I wrote down what I had eaten, hoping to prove both to myself and to Gene and Barbara that I ate a well balanced diet.

"Yes, it is a well balanced diet in the fact that all four groups are represented," Gene said. "But it is the extra condiments that can really make or break one's cholesterol level as well as the amount of food that one eats. If I were to give you a piece of bread, would you butter it?" "No, I would MARGARINE it!" I answered confidently. Gene pulled out a big piece of bread and some margarine, and I began to prepare. I put the margarine on, satisfied that I was being healthy. For as long as I remembered, the TV advertisements were drilling into my head that margarine was "heart-smart." As I was about to settle back with my healthy snack, Barbara shouted "NO!" I knew she was a woman of few words, but that outburst seemed very out of character! She went on to say that margarine was even being questioned about its healthiness in respect to cholesterol.⁵ She suggested that maybe some new TV advertisements should promote eating a low fat diet instead of switching from one fat to another, and that maybe I should try putting honey on my bread instead of a variation of fat.

So, even though my diet looked acceptable on paper, there were parts of my diet that I should examine more closely. They gave me a sample diet which included a lot of fruit and vegetables, high fiber and low fat, including low fat oils like olive oil but no tropical oils. I am very excited to show the sample diet to my Grandparents. I think they will be shocked to find the hidden downfalls in their diets.

Until later,
Marla



April 22

Dear Diary,

This week I went to visit Barbara and Gene's lab. As I walked in, Barbara was finishing up an experiment. As she explained her experiment, I realized that I really

was interested in the project also. Both Gene and Barbara had a way of making biology come to life. Before, I had always pictured researchers as a group of lonely individuals who worked quietly day after day by themselves. Obviously, I was wrong.

I expressed my concerns today about my family's risk of heart disease. I had read an article about the concern over the validity of cholesterol testing, and I was interested to know exactly how a cholesterol test was performed.

Barbara explained the procedure of measuring cholesterol, both LDL and HDL (high density lipoprotein) in the lab. It really sounded quite easy. First a blood sample is taken and the lipoproteins are separated from the serum by an ultracentrifuge, which acts a lot like a washing machine on the spin cycle. After the LDL is labeled with a dye, samples are collected, and from them, a cholesterol test is performed. A small amount of each sample is added to a small amount of cholesterol reagent, and after twenty minutes the samples are ready to be read by a spectrophotometer. Instantly, the cholesterol level is available. However, since HDL is good for the body and LDL in excess is bad for the body,⁶ the ratio of HDL to LDL is much more important than a number representing total cholesterol. Therefore, the test must be performed again once LDL is separated from HDL.

Gene explained that even though this test was easy to perform in a lab, the cost of the equipment used in the test totaled over \$50,000! Gene photocopied an article for me about a new home cholesterol test which has not been put on the market yet. This home test is accurate, cheap and simple to use.⁷ If only I could convince my family how easy, but essential, these tests were!⁸

Until later,
Marla



April 26

Dear Diary,

Yet another week has gone by and I still haven't succeeded in testing my grandmother's cholesterol level. I have made some impact, however, on my grandmother's cooking habits. I noticed that "light" olive oil had replaced butter as a cooking oil.⁹ A fruit salad was served in place of potato salad with mayonnaise. (When Grandpa complained about the missing potato salad, I suggested trying a low cholesterol mayonnaise.)¹⁰ Everything looked so delicious that I couldn't help but take this opportunity to point out that our weekly Sunday night dinner had not lost any of its flavor, and the whole family could walk away feeling lighter and healthier.

Until later,
Marla



April 29

Dear Diary,

Gene and Barbara were surprised to see me again so soon. They had said they would call if they needed more blood samples, but I enjoyed talking to them about how to decrease my chances of another heart attack. I walked into the lab during a lively conversation on Transcendental Meditation. Gene explained that he became interested in TM some time ago as a method of relaxation. Meditation in any form will help to reduce stress by lowering oxygen intake. In fact, meditation is a great exercise for patients with hypertension.¹¹

Gene and Barbara had just finished the tests they had run on my blood. Familial Hypercholesteremia was the culprit, resulting in the primary cause of my LDL problem. Because my body only produces half the number of needed receptors, a lot of LDL remains unbound. Gene explained the process by reading an article, "Coronary arteries feed oxygen into the heart muscle. If [unbound] LDL is oxidized en route, it gets trapped in the artery walls and becomes the source of damage that gives rise to diseases of the heart and arteries."¹²

Until later,
Marla



May 1

Dear Diary,

Since Barbara and Gene were certain that I suffered from FH, and my cholesterol level was increasing even with a new diet, Dr. Thornton has decided that certain drugs are necessary to reverse the effect cholesterol has on my body. There are several drugs to choose from. A new drug, Lovastatin, was just released last November and has been shown to reduce plaque from the arterial wall almost magically with practically no side effects. Dr. Thornton said that to most people Lovastatin would be the obvious choice, but the drug was too new for his liking, and he preferred to stick to the "old standbys." Lovastatin has not been written about in any medical journal yet. With other drugs, he knew exactly what the long term effects were, and there were no sudden "discoveries" that could endanger my life twenty years down the road.

The "old standbys" had a few minor side effects. Cholestyramine, for example, caused "constipation and bloating."¹³feldman

¹³ Dr. Thornton also told me that oral contraceptives led to an alteration in triglyceride metabolism which may result in another heart attack since I am already in such a high risk group. He also mentioned that both my mother and grandmother, if their cholesterol levels were high, were at an increased risk during menopause.¹⁴

“However,” he added in conclusion, “your mother and grandmother were both tested today for high cholesterol, and luckily for them, they are both within the normal range.” He put down my chart, smiled and asked “Now, are there any questions?” “No,” I replied and meant it. All of my reading and researching of cholesterol with Gene and Barbara's help had really paid off. Not only could I control my chances of another heart attack, but I had convinced my relatives of the importance of good health and low cholesterol. I had succeeded in teaching an old dog new tricks. I had changed my life style as well as my family's, and grandmother finally realized, even at 80 years of age, that no one can escape the perils of cholesterol. As I left Dr. Thornton's office, I felt so relieved and so alive. LECHAIM!

NOTES

¹ Neville, Janice N. 1990. “On Matters of the Heart: Past, Present and Future,” *Journal of the American Dietetic Association* 90:211.

² Welsh, S. O. and R. M. Marston. *Journal of the American Dietetic Association* 81:120.

³ “One in seven women aged 45 to 64 has some form of heart disease, and this escalates to one in three over age 65. Heart disease is the second leading cause of death for women by age 40 and assumes the lead by age 67. Overall, about 10.4 million women of all ages suffer from heart disease, and 1.4 million have hardening of the arteries. More than 25 million women have high blood pressure. The prevention of cardiovascular disease, therefore, is a pressing personal concern for every woman” (Neville).

⁴ Three genetic disorders result from hypercholesteremia: Familial Hypercholesteremia, Familial defective Apo B-100 and type III hyperlipoproteinemia.

Familial Hypercholesteremia is a dominant trait which results in the absence of some or all of the LDL receptors needed for proper cholesterol metabolism. Familial Hypercholesteremia can cause heart attacks even in childhood.

Familial defective Apo B-100 also is characterized by defective binding of the LDL molecule to its receptor. However, this disorder is more frequent in patients with “moderate” hypercholesteremia (250-300 mg/DI).

Characteristically, type III hyperlipoproteinemia patients do not have a high level of LDL in their blood. Rather, there is an elevation of remnant lipoproteins.

⁵ Elaidic acid, a type of unsaturated fat, has been discovered to be as detrimental to cholesterol levels as saturated fatty acids. Any fat that is chemically constructed in a “trans” configuration will increase the cholesterol level of a normal subject. Trans fatty acids are found in dairy products and certain types of margarines, margarine based products, shortenings and fats used for frying. “Cis” configurations are found in most natural fats and oils. Cis configurations have less of a chance of contributing to high cholesterol.

⁶ A high level of HDL is symptomatic of very efficient metabolism. High metabolism or a quick turnover rate allows for little chance of toxicity by oxidation. Since LDL does not metabolize quickly, it is more likely to be oxidized resulting in atherosclerosis (hardening of the arteries).

⁷ Podolsky, Doug. "A Self Test for Cholesterol," *U.S. News & World Report*, December 30, 1991, p. 64.

⁸ Chem Traks AccuMeter and Crystal Medical's Clinimeter are still waiting to be approved. After pricking a finger, the blood is used to measure the cholesterol level within 5% accuracy. The test is very fast, only taking about 15 minutes and has results that are comparable to a laboratory test which can take well over several hours.

⁹ Kleiner, Susan M. 1991. "Have Your Cake and Eat It Too," *The Physician and Sportsmedicine* 19:15.

"Trying to save calories or fats by eating products touted as 'lite' or 'light' requires consumer caution, since advertising in this regard is poorly regulated. Terms such as these have a variety of meanings, from 25 percent less fat than the regular product, in the case of bologna, to lighter color or texture, in the case of some other products."

¹⁰ Dayton, Leigh. 1991. "'Doughnut' molecule puts healthier food on the market," *New Scientist* 130:28.

Australian researchers are currently working on an affordable "doughnut-like" polymer to which cholesterol is attracted. Once attracted, the cholesterol molecules fit inside the doughnut's hole. The food is centrifuged, and the parts which contain the polymer and cholesterol doughnut are separated from the rest of the food. This technique can be carried out at low temperatures which prevents spoiling and the growth of microorganisms.

¹¹ Orme-Johnson, David W. and John T. Farrow. 1977. *Scientific Research on the Transcendental Meditation Program*, Maharishi European Research, University Press, Livingston Manor, N.Y.

¹² O'Donnell, Michael. 1990. "Consult a Greengrocer," *International Management* 45:78.

¹³ Silberner, Joanne. "Old Heart Drug, New Value," *U.S. News & World Report*, December 30, 1991, p. 64.

¹⁴ Caggiula, Arlene W. and Rena R. Wing. 1989. "Menopause and risk factors for coronary heart disease," *The New England Journal of Medicine* 321:641.