This chapter provides the background information you will need to understand how you can use fat to fight cancer. Cancer cells have a metabolism that is different than the normal cells of your body and strategically, we will use that against them:

Human cells can use glucose, glutamine, ketones and fat for fuel.
Cancer cells can only use glucose and glutamine for fuel.

**Normal cells survive on:**
- Glucose
- Glutamine
- Ketones
- Fat

**Tumor cells survive on:**
- Glucose
- Glutamine
Leveraging a Strategic Advantage
A human who wants to eliminate cancer cells can eliminate carbohydrates that metabolize into glucose, take a glutamine-antagonist drug and survive on a high protein and high fat diet using fat and derivative ketones for fuel. Day-to-day tactics that align with this strategy will involve:

- Identifying carbohydrates and eliminating them from your diet
- Identifying protein foods that you like and adding daily quantities you need for your age, gender and level of activity
* Identifying high-quality fats that your body can use for energy or metabolize as ketones

Searching for Good Fats
Fats are one of the most complicated topics in nutrition and it is helpful to review the different types of fats so you select the right ones. Don't be afraid of the chemistry if it's unfamiliar. Fat chemistry will provide details that will help you choose the correct fats.

<table>
<thead>
<tr>
<th>Food</th>
<th>Percent of Usable Protein</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eggs</td>
<td>90%</td>
</tr>
<tr>
<td>Milk Products</td>
<td>76%</td>
</tr>
<tr>
<td>Meat, Poultry and Fish</td>
<td>15-20%</td>
</tr>
</tbody>
</table>

You would need to consume larger quantities of meat, poultry and fish to obtain the same amount of usable protein that is in an egg or dairy product.

Milk and Eggs Are Excellent Sources of Fat and Protein
Research on fats reveals that phospholipids, a form of fat, are critical to cell health. Milk and egg yolks are excellent sources of phospholipids.

Milk and eggs are also excellent sources of usable protein. Cyclists, body builders and poultry farmers seem to be the first to understand the concept of usable protein:

Fats are a rich source of energy, yielding more than twice the energy per weight basis as carbohydrates.
Chemistry is the second geekiest science (after physics) and you'll need patience to tackle this section if the subject is new. Later, you'll realize how much you'll need to know the fundamentals.

**What is a Fatty Acid?**

Fatty acids are short, medium or long chains of carbon atoms attached to hydrogen atoms. The chains occur everywhere in nature and they're considered acids because they are proton (H+) donors. Naturally occurring chains of fatty acids are derived from triglycerides or phospholipids and have an even number of carbon atoms, from 4 to 28. Butyric acid is an example of a short chain fatty acid found in milk, especially goat, sheep and buffalo's milk, butter, Parmesan cheese:

![Butyric acid](image)

**Are Triglycerides Bad For Us?**

Triglycerides are found in vegetable oil and animal fat. If you've heard the expression "elevated triglycerides" it's because high triglycerides are linked to heart disease. What most people don't realize is that these triglycerides are not consumed in the diet. In an article titled, "The Skinny on Fats," Mary G. Enig, Ph.D. and Sally Fallon explain:

_Elevated triglycerides in the blood have been positively linked to proneness to heart disease, but these triglycerides do not come directly from dietary fats; they are made in the liver from any excess sugars that have not been used for energy. The source of these excess sugars is any food containing carbohydrates, particularly refined sugar and white flour._
Classification of Fatty Acids

Two different systems exist to classify fatty acids:

**Degree of Saturation** - Saturation refers to the presence or absence of double bonds:
- Saturated
- Unsaturated

**Chain Length** - The number of carbon atoms forming a chain.

<table>
<thead>
<tr>
<th>Length</th>
<th>Number of Carbon Atoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-chain fatty acid (SCFA)</td>
<td>&lt; 6 carbon atoms</td>
</tr>
<tr>
<td>Medium-chain fatty acid (MCFA)</td>
<td>6-12 carbon atoms</td>
</tr>
<tr>
<td>Long-chain fatty acid (LCFA)</td>
<td>14-20 carbon atoms</td>
</tr>
<tr>
<td>Very-long chain fatty acid (VLCFA)</td>
<td>&gt; 20 carbon atoms</td>
</tr>
</tbody>
</table>

Palmitic acid (common name)
16:0 (16 carbon atoms, no double bonds)
Long-chain fatty acid
*Saturated fatty acid*

Palmitoleic acid (common name)
16:1(16 carbon atoms, one double bond)
Long-chain fatty acid
*Unsaturated fatty acid*
Unsaturated Fats Have Been Harmed With Hydrogenation

The food industry hydrogenates fat because they are concerned about shelf life. Unlike saturated fat, fat that is unsaturated contains an unstable amount of hydrogen atoms. The diagrams on the previous page show a saturated fat that has all the hydrogen it can hold and an unsaturated fat with one double bond. The double bond will make the unsaturated fat a candidate for an attack from oxygen which would turn the oil rancid. Rancid oils often smell bad and can form free radicals that damage cells of the body.

Hydrogenation or Partial Hydrogenation Saturates Bonds
When food companies hydrogenate, they bubble hydrogen gas through tanks of unsaturated fat to artificially create a saturated fat called a trans fat. The food companies produce a new, inexpensive, plant-based oil that has an extended shelf life. And, since the public will most likely never understand hydrogenation, the plaque that is formed by the new trans fat can be blamed on animal fat.

Saturated Fat is a Stable, Healthy Fat
The truth is, saturated fats are the most chemically stable of all the fats. They have the longest shelf life, they can withstand high cooking temperatures and are solid at room temperature. This type of fat is found in tropical oils and animal fats.
**A** healthy diet should consist of fats from all the categories (except trans fats). In this section we'll place fats in the categories where they belong and describe their function.

<table>
<thead>
<tr>
<th>Fatty Acid Category</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Saturated Fat</strong></td>
<td><strong>Sources:</strong> Butter, cream, coconut, palm, cocoa butter, beef tallow</td>
</tr>
<tr>
<td></td>
<td>This important group of fats gives cell membranes necessary rigidity. Fifty percent of a cell membrane saturated fat.</td>
</tr>
<tr>
<td><strong>Monounsaturated Fat</strong></td>
<td><strong>Sources:</strong> Chicken, turkey, goose and duck fat, olives, avocado, and nuts</td>
</tr>
<tr>
<td></td>
<td>This important group of fats can be converted to saturated fats and back as needed. Monoun-saturated fats are known to provide an efficient source of energy.</td>
</tr>
<tr>
<td><strong>Polyunsaturated, Omega 3 Fat</strong></td>
<td><strong>Sources:</strong> Fish oil, cold water fish, grassfed beef, bison, organ meats, and eggs from pastured hens. Flax, hemp and perilla</td>
</tr>
<tr>
<td></td>
<td>This important group of fatty acids (Omega-3 and Omega-6) react with enzymes to form important derivatives that are critical for our metabolism.</td>
</tr>
</tbody>
</table>
**Fatty Acid Category** | **Function**
--- | ---
*Polyunsaturated, Omega-6 Fat* | This important group of fatty acids (Omega-3 and Omega-6) react with enzymes to form important derivatives that are critical for our metabolism.

**Sources:**
Borage, primrose and black currant
Grassfed beef and bison, organ meats and eggs from pastured hens.

**Did You Notice Supermarket Oils Are Not Listed?**
The following supermarket oils are not on the list because the food industry has turned them into trans fats:

- Sunflower
- Safflower
- Corn
- Cottonseed
- Soybean

This group of oils are polyunsaturated oils that are linked to cancer, heart disease, type 2 diabetes and macular degeneration.

**Supermarkets and Restaurants Sell and Use Bad Oils**
In 1995, a Food and Drug Administration (FDA) study, found that 90 percent of those polled were either unaware of the dangers of trans fats, or they mistakenly thought that trans fats are beneficial. Even those who knew that trans fats are something to be avoided were confused about how to avoid them.

Eighteen years later, supermarkets still stock margarine and large clear bottles of vegetable oil. These oils are also used in most restaurants due to their low cost. As this book was being assembled, news sources such as *ABC, Reuters*, and the *LA Times* were producing stories about an FDA move to ban trans fats. However, a close look at the news stories reveals use of words such as "proposed ban."