

Better Eating Through Chemistry

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Abstract:

American food culture has boiled down food into a short list of universal ingredients. Macronutrients like sugars, fats, and proteins are looked at through an oversimplified lens. These parts are isolated and reassembled into edible substances that have left a legacy of health problems. Promise is found, however, in foods already provided by nature. New sustainable ways of providing fresh, healthy food should be a resource available to everyone. The best way to combat a health epidemic revolving about food is to examine the cultural relationship with eating. A simple community garden can serve as a source to provide better food, education to prepare that food, and social relationships that make the garden a functioning fixture within a neighborhood.

Introduction:

Health is an obsession to people living in the United States. Countless dollars are spent annually on fad meal plans, diet pills, and surgery. Every cent of this goes toward the hope of living a better, healthier lifestyle. Low fat and zero calorie foods clog grocery store shelves. Television runs rampant with ads promising textbook physiques. There is so much focus on what we eat and how it impacts us, and yet, we remain one of the unhealthiest countries in the world. What is it about the western diet that makes us so unhealthy? How could a culture so obsessed with proper eating be so unhealthy? Americans obsess about food and diet, but somehow manage to lose more control in the overall process along the way. Issues persist at every step along the food chain. Attempts to mitigate side effects of this obsession have simply caused more issues. Studies are released daily, telling us what causes and prevents cancer.

Statistics are tossed around in short news breaks between hamburger commercials. Some piece of the puzzle has gone missing in the treatment of health.

Poor health is a growing epidemic around the globe. The result of this can be seen explicitly in cultures that have adopted the western diet. Countries that open McDonalds adopt a lifestyle, not just a fast food joint. Evidence comes in the form of increased obesity rates and higher death rates from afflictions such as heart disease and cancer. This epidemic has not always existed. Within the problem itself, there are clues for fixes. A greater standard can be assembled when the same, ineffective system is applied to different contexts. Once a larger picture is assembled, the problem can be appreciated to its full extent, but this view is not the only one in which the western food system should be investigated.

Human beings are complicated organisms. In such a complex system, it can be difficult to analyze the root cause of any malady. It makes sense to think that reducing fat intake is the best way to keep someone from gaining more fat. However, things may not be so simple. Fatty tissue, called adipose, exists for a reason. It is problematic to label all things as either bad or good. You probably need that adipose for something, or your body would have just gotten rid of it in the first place! A living organism is a system. A system that is dependent on other systems, like the food system, to operate properly. Yes, foods consist of sugars, fats, protein, and other nutrients, but surely there is something more intricate about how these individual pieces work together. An individual is made out of more than four basic pieces. For this reason, it is important to examine the overall extend of the processes involved in greater terms than what is listed on a food label. If controlling saturated fat intake was the solution, fewer people would be dying from heart disease.

This paper will focus on the broad reaching consequences of looking at something as complicated as food through the lens of oversimplification. Quantification of individual nutrients is not helping the western diet succeed. One cannot eat better through chemistry alone. Seeking this principle has even led the American food system to create health problems through indirect means. Society, environment, and economy need to be taken into account to better the health of an individual. A living thing cannot be broken down into separate parts without examining the whole, and the whole itself is comprised of many intricate subsystems. It is not necessary, however, to treat each symptom individually. This is, in fact, how everything went wrong in the beginning. A real solution ends up being one in which loose ends tie up themselves. For this writing, the first step is understanding the power behind the whole reason living things consume food.

Sugars:

Sugar is necessary for living cells to create reserves of chemical energy. Glucose, the most recognizable sugar, is manipulated through many forms by a series of enzymes to create adenine triphosphate (ATP). ATP is then used by most cellular processes to provide fuel for reactions. Plants create sugars, like glucose, through photosynthesis, and animals eat plants instead of making their own. Sugar purchased in bulk consists of sucrose. Sucrose is a disaccharide. This means it consists of two sugars: One glucose and one fructose. Fructose is created from glucose during glycolysis, but this presents a larger problem. Glucose is not always destined to become energy. Sometimes, it is used to make other chemicals that cells use for different reasons. Consuming simply fructose, therefore, severely limits the potential types of products an animal's metabolism can create. Unlike glucose, fructose does not stimulate insulin release or leptin production properly; since these two chemicals are used to help tell eaters that

they are full, it is likely that inhibition of the processes is a cause of increased energy intake and weight gain (Akram and Hamid 91).

Processed foods contain fructose. Why? It is cheap. Subsidized corn can easily be turned into the infamous serum high fructose corn syrup (HFCS). Corn syrup has become one of the most common ingredients in processed foods today. It is an abundant, inexpensive sweetener and is present in everything from soda pop to jam. “HFCS now represents >40% of caloric sweeteners added to foods and beverages” (Akram and Hamid 91). This sugar has taken the American food system by storm. The issue with fructose is the result of the glycolytic pathway described above. People that do not feel full will continue to eat, and this plays into other factors of American food culture.

Energy is good, but when one produces more than is used, the excess is stored for later. It is a good strategy when you are hunting gazelle on the savannah for a living but is not so much when you work primarily in a cubicle. In fact, fructose has been linked to a number of health issues. “It has been observed now that obesity, diabetes mellitus, insulin resistance and hypertension are associated with chronic consumption of fructose” (Akram and Hamid 92). Boiling this nutrient down to its basic form creates negative consequences. Controlling the levels of sugar in food is not as simple as isolating fructose syrup from abundant sources of corn. The issue is much more complicated than thinking that all sugars are created equal. Complex starches include even more kinds of sugar. Throwing things like galactose and maltose into the mix only makes the search for a solution more complicated. This web will be echoed as other nutrients are examined.

Fats:

Nutritional labels give more distinction between different kinds of fats as opposed to sugars. Generally, fats are divided between saturated and unsaturated. Structurally, saturated and unsaturated fats differ in bond types between carbon atoms in the fatty acid chains of the molecule. Saturated fats consist of single bonds between those carbons, and unsaturated fats contain greater numbers of double bonds between carbons. Fatty acid chains with single bonds are able to pack more tightly together because double bonds create kinks in the chains that make neighboring fat molecule more spread out. Unsaturated fats can be turned into saturated fats by a process called hydrogenation. “In the late 1800s, a French chemist discovered that an unsaturated fatty acid can be converted to a saturated fatty acid by bubbling hydrogen through a heated vegetable oil in a closed vessel” (Kummerow 458). Hydrogenated oils isolated from soybeans are a common ingredient in many foods today. Like high fructose corn syrup, hydrogenated soybean oil is a cheap, subsidized way to add fat to an engineered food. However, also like high fructose corn syrup, ingestion of these fats have consequences.

Fats have recently generated a stigma in American food culture. Supermarket shelves are lined with products that promise to be free of or have reduced fat content. The issue there is that fats are necessary for cellular function. It is not simply enough to compensate for eating too much hydrogenated fats by replacing some foods with the fat free version. Several unsaturated fats are essential fatty acids (EFAs). Hydrogenation destroys the structure of these molecules in such a way that they are no longer useable by cells in their original way. Two specific kinds of EFAs are discussed further by Kummerow in his examination of saturated and unsaturated fatty acids:

...linoleic and linolenic acids... cannot be synthesized in the human body; they must come from a diet that includes natural fats and oils. The 14 isomers in hydrogenated fat can be used as a source of energy but they cannot substitute for EFA because they do not have the required double bond structure. (Kummerow 459)

Again, the body is being flooded with energy that is not being used. However, at the same time, essential nutrients are being replaced.

Hydrogenated fats have even been linked to additional health problems. “The inflammatory process in the arteries is presently believed to be a risk factor in heart disease, and studies show that hydrogenated trans fats increase the inflammation in the arteries” (Kummerow 460). Again, boiling down a food into a component part only serves to complicate the problem. Fats isolated from soybeans and hydrogenated are increasing energy intake and causing unwanted side effects. Consumption of essential fatty acids in natural foods is necessary for a proper diet, but this information is lost when the food is broken down and reengineered. Fats, like sugars, are not as simple as they initially appear. A nutritional information label is not big enough to detail this kind of importance!

Proteins:

Proteins are essential to cell function. They do everything from catalyzing reactions to allowing electrolytes to pass through the cell membrane. Proteins are made up of long chains of amino acids. There are only twenty amino acids that make up the countless protein structures that allow human beings to function. Nine of these are not produced within the human body and, therefore, must come from dietary sources. Nutrition labels list overall protein content in grams. Again, the quantification of an entire macronutrient in all its complexity is provided a single line

to inform eaters of the value of devouring a specific food. The situation is more complicated than the back of a Cheerios box entails.

It is widely believed that many of the essential amino acids can only be properly provided by consumption of food from animals. Meat is considered to be an integral part of any American meal. Humans are animals, so it makes sense that other animals are made of the stuff we need. Right? How would a human being be able to function if these important building blocks were not provided? It turns out that consuming animal protein is not necessary to complete a diet. A breakdown of several essential amino acids and their presence in different foods, both animal and plant, by Bar et al. illustrates this point. The recommended daily allowance (RDA) of four types of amino acids were compared to the individual diets of vegetarian and non-vegetarian athletes:

The literature is consistent in reporting that vegetarians' protein intakes are lower than those of omnivores. However, protein intakes are generally well above the RDA in both groups, suggesting that in most cases adequacy of protein intake is not a concern. (Barr and Rideout 697)

Folks that do not eat meat are getting just as much protein of the essential types as they need. Even athletes who consume greater amounts of food during training can still live on a steady diet of plants. Eating meat is not required to maintain proper health.

Overall Problem:

Sugars, fats, and proteins are each individually complicated subjects. It is hard to quantify the overall implications of eating a specific food by looking at a small label. This is where the western approach to diet fails. There is a gross oversimplification of the processes of

metabolism. It is hard to look at any one meal and say what effects it will have on the person who consumes it. The bigger picture cannot be viewed by breaking down crops into unique macronutrients and reconstructing a new edible. There is something greater than the sum of the parts. There is some kind of “foodness” that is lost during the engineering of the substances found on supermarket shelves. There are, of course, additional nutrients with which this paper does not go in depth, but even then there is something missing. The effect, as with the three macronutrients discussed, is the same. Each part of the food works in conjunction with each other part.

There is something simply advantageous to eating an apple. A quantity resides in foods unchanged from the vine. An apple is made up of many cooperating employees; it is not simply a bag of randomly assorted nutrients. That fruit has evolved to provide the animal that eats it with a whole symphony of nutrition. Fat free and low-carb meals have led us astray. The boxes of sustenance offered by dozens of companies are not exactly what human beings need to eat on a daily basis. In many cases, those concoctions are making people sick. High fructose corn syrup and hydrogenated soybean oils are freely available and delicious, but there is something more sinister than one’s taste buds can detect. The negative health effects are common news stories and stare Americans in the face every day.

This is not to say that engineering foods is always valueless. There is simply too little information at the moment to tell people exactly how to construct the perfect meal. Corporations just end up building a poor version of what nature already provides. More research needs to be done to explore the long-term health effects of processed food. The food culture surrounding processed foods also shows a biased view of the situation. High fructose corn syrup and hydrogenated soybean oil have invaded every street corner and every television network. It is

hard to go a day without getting bombarded by images of people consuming processed foods.

This psychological conditioning is convincing people to overlook the obvious negative aspects of the western diet. Why not grab a burger through the drive-through on the way to the emergency room?

Growing Solutions:

The answer is straightforward. Eat more basic foods. That sounds easy enough, but in a world filled with Twinkies, it is not. Many farmers in the United States have a standard crop rotation of corn and soybeans. This is not an accident but, rather, a consequence of government subsidies. It makes sense to grow a subsidized crop financially. The result is that the market is flooded with cheap corn and soy. The best way to have variety is to figure out how to boil each crop down and reconfigure it into many different presentations. Eaters need to be given better options than this.

Grow more fresh food! That is the first step. Subsidize the foods people can eat without developing the heart disease, diabetes, and cancer trifecta! Grow more apples and fewer pop tarts! If only things were so simple. The first step is access, yes. The next step that must immediately follow is education. People need to know how to incorporate these newfangled apples into meals. That problem presents another set of issues.

Admittedly, even those with access may need to learn more about how to prepare fresh fruits and vegetables and how to cook with whole grains; working and/or single parents may have an especially hard time carving the hours out of their day to prepare more nutritious meals for their families. (Hesterman 30)

People need help figuring out ways to incorporate healthy food into their lives, as well as their meals. Apples, however, are not terribly good at teaching. So far, the plan is fresh food and the knowhow to use it.

The food also needs to be from nearby. It is nice to walk into a supermarket any day of the year and find pineapples. That January tropical fruit, however, had to embark on an adventure to get there. In the course of that journey, the pineapple loses some of its dietary benefits. The macronutrients within the fruit begin to denature over time as soon as it is harvested. “Studies are starting to show that fruits and vegetables eaten many days (and sometimes weeks) after harvest have significantly lower nutrient density than those eaten within a day or two of harvest” (Hesterman 15). Food needs to reach plates quickly or to be preserved in such a way that does not require overt processing. It does no good to provide food that has lost its ability to provide sustenance.

There is one thing that can fit all of these bullet points. A nearby source of fresh food that helps folks learn how to prepare that same produce. The solution is a community garden. Community gardens are excellent hubs for physical and mental nutrition. It is a comprehensive solution. The produce provided is inexpensive and requires physical labor to be grown. This not only provides the gardener with fresh, nutritious food but with a workout. A community garden also entails that more experience growers can show new folks how to plant, take care of, harvest, and cook the fruits and vegetables.

An excellent example of this plan in action exists right here in South Bend, Indiana. Unity Gardens has been doing all of these things and more. The first Unity Garden took root in

2009 and became 13 by the end of the season. The number of gardens within the network has grown exponentially since then.

The Unity Gardens Inc. is a collaborative network of community gardens originated to increase the availability, awareness, and accessibility of healthy, locally grown food...

The mission is to improve community health -- physically, socially, and economically.

The Unity Gardens will reduce chronic illness and obesity within the community via education and increased accessibility of fruits and vegetables. (Stewart)

Unity Gardens is a successful example of a community coming together to free itself from processed foods. Each component is there. Food is grown by community members and is free for anyone to pick. Education classes are provided frequently to teach people how to grow and prepare the harvested food. Everything provided is locally available to all those who live near one of the many Unity Gardens. In Public Produce, Darrin Nordahl states, "Access to healthful food should not be a privilege, but a fundamental right" (Nordahl 149). Community gardens present an enormous benefit to those who work and harvest. A community garden provides this fundamental right. Those boxes of over-processed food lining supermarket shelves have met their match.

Making It Work:

Community gardens are wonderful things. They provide everything an active neighborhood needs to keep its residents healthy. It is necessary, however, to ensure that this overall model is sustainable. The economic strength of this system comes from biological sources. "One principle of nature is that a more diverse system is more resilient, better able to withstand disruption, and more sustainable long term" (Hesterman 77). A garden is a diverse

system. Many different vegetables and fruits are grown in a small area. It is simple to introduce crop rotations between plots that encourage healthy soil habits. Composting is a great way to close the system of the garden. Food scraps are turned back into soil that is in turn used to grow more food. In short, a garden is a cheap thing to run. Unity Gardens, for example, collects seed packets from local donations. Seeds can then be saved between years for crops that are successful and in-demand. Compost can be collected from the city of South Bend's leaf composting efforts. The most difficult problem becomes finding the land on which to put the garden.

Land for garden use can be acquired through a variety of means. Municipalities tend to jump on opportunities to make vacant lots more productive locations. "The argument for vacant lot cultivation is quite sensible: It allows land that nobody is interested in developing (at the time) to return to productive use, while lessening visual blight and bolstering community pride" (Nordahl 59). Essentially, the argument must be made to city officials about the vast number of benefits providing space for a community garden presents. When other, successful gardens begin popping up in an area, more will be soon to follow. Neighbors perform all of the work needed on a volunteer basis but are eventually paid at harvest time. As people begin benefitting from the community garden, its place in the area is cemented, and the system feeds itself. The payment comes in the form of fresh food, lower medical bills, and a more involved local community.

Summary:

Processed foods cause a host of health problems. Processed sugar in the form of high fructose corn syrup is not metabolized properly by the body, and its consumption generally

results in weight gain and physical ailments. Hydrogenated oils from processed soybeans also cause similar problems. Meat is not necessary for proper nutrition; plants of certain types can provide the same benefits. Mistreatment and misunderstanding of these macronutrients has created a system where foods are boiled down to component parts and reconstructed into strange new diets. The problem results in high obesity rates and decreased availability to nutritious, fresh food.

Hope comes in the form of individuals growing food within their own communities. A local source of fresh, affordable produce is something that should be a facet of every neighborhood. With this new diet, a cultural shift comes in the form of reeducating eaters to utilize this precious new food source. As community gardens take hold, they will become self-sustaining hubs for healthy eating. People nearby will grow less dependent on finding subsidized, engineered sustenance.

Many people will not be able to invest the necessary time to start and maintain a garden, and preparing a fresh meal takes longer than ordering at the drive-through. However, it is a national health imperative to examine and attempt a new source of edibles. The western food system currently in place emphasizes quick and easy calories. It is important to create a culture that forces individuals to reexamine the role food plays in their lives. Something must be done to counteract the unhealthy cascade of problems presented by processed foods. Local efforts have been shown to be successful and are continuing to gain steam. The initiative must be taken to tackle this current crisis and the inequity it creates. Fresh food is the answer to countless health problems; it is simply a matter of finding a way to make the answer easy and available to everyone.

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