

Diabetes & its Complications

Proper Protein Intake in Diabetes Treatment

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ABSTRACT

Diabetes is a highly prevalent disease in The United States. While insulin shots and prescription drugs are very expensive, diet treatment can be helpful. This paper will be about one aspect of diet treatment. One of the current diabetes diet treatment focuses on high quality of protein intake. However, this treatment ignored a balance of the whole body. Also, not everybody can afford those expensive sources of protein. This research will be about how low-income people can afford to take in normal amount of the high-quality protein.

Keywords

Diabetes, Protein foods, Diet treatment, Oysters.

Introduction

Managing diabetes is very costly. To make it worse, American diabetes rate is going up. For type II diabetes, the prevalence increased from 4.9% in 2007 to 6.3% in 2014. For Patients with diabetes, their all-cause medical cost is higher or at least as high as their diabetes-related health care cost. In the year 2014, the direct cost of diabetes among US population is \$314.8 billion dollars [1]. Everybody eats. Therefore, diet treatment will be more cost-effective than expensive drugs [2]. In a research done by Holmes, Coppey, Davidson, and Yorek [3], on rat models, when placed on normal diet, the rats improved the glucose utilization and weight loss. However, for some low-income people, having a balanced diet can be difficult. For instance, in Massachusetts, 652,760 people are worrying about what to put on their dinner table; and among those starving people, 167,450 are children. That translate to one in ten people and one in eight children are struggling with hunger [4]. This research will be about how to take in proper amount of protein on a budget.

Protein Requirement in Current Plans

A good method of making a diabetes diet plan is to fill up half of the plate with non-starchy vegetables, one quarter of the plate with protein, and the other quarter with starch [5]. Although overload of protein can be a cause for type two diabetes, different types of protein makes a big difference. Plant-based protein does not elevate blood sugar level, while red meat makes diabetes worse

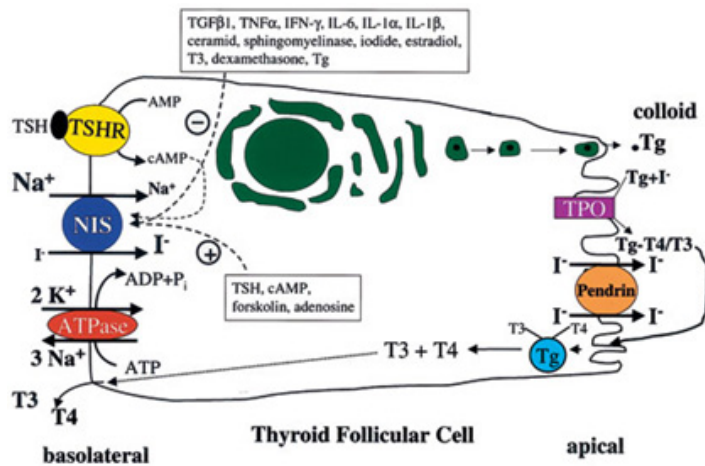
[6]. According to American Diabetes association [7], protein foods are as follows:

- Plant-Based Protein including beans, soy, nuts, and their products.
- Fish and sea food including omega-3 fatty fish such as salmon, tuna and mackerel; and shell fish such as oysters, shrimp, lobster and crab.
- Poultry including skinless chicken or turkey
- Cheese and eggs including low fat cheese, cottage cheese and whole eggs.
- Game meat including buffalo, ostrich, dove, or duck.
- Red meat such as beef chuck meat, lamb chop, Canadian bacon and pork tenderloin.

Diabetes, Thyroid, Iodine and Protein

Other endocrine problems such as thyroid dysfunction can affect diabetes treatments [8]. In Panveloski et al.'s research, the researchers treated diabetic rats with functional form of thyroid hormone, T3. The result showed that T3 treatment lowed blood glucose level; increased insulin sensitivity; and it took effect on gene expression level [8]. However, in recent years, iodine deficiency is coming back to the US. The reason for this endemic iodine shortage is people's salt consumption habit. People do low salt diet and do not take iodized salt. Sea salt looks good but does not have added iodine. Processed food usually contains non-iodized salt [9]. On the other hand, iodine and protein are important building blocks for thyroid hormone [10], as shown in the following graph, iodine enters thyroid follicular cell through sodium iodine symporter. Inside the cell, iodine and two tyrosine molecules react and form

a thyroid hormone molecule [10]. Therefore, iodine and protein are both important in thyroid hormone synthesis; and sodium also plays a role in this procedure.



Iodine content of all foods

All foods are not created equal in their iodine contents. According to a research done by Haldimann, Alt, Blanc, & Blondeau [11], among dry goods, milk powder and egg powder have the highest level of iodine content: 2.42 ± 0.07 and 1.99 ± 0.07 ng/g respectively. Among basic food groups, rice and bread have the highest iodine content 333 and 393 ng/g respectively. Among meat and proteins, marine fish is the highest, over 2100 ng/g; egg is the second highest, over 1600 ng/g. Milk is about 690 ng/g; and fruit and veggies' iodine content is non-significant [11]. Among all the foods, sea weed has the highest iodine content ranging from 16 to 2984 ng/g. Cod has the most iodine among all the marine fish, 99ng per three ounces [12]. Oysters has a high iodine content of 160 ng/100g, while beef, lamb, and pork have less than 1.5 ng/100g [13].

Best Iodine Source

Although sea weed contains high level of iodine, it might not be the best source of iodine. The reason is their bromine content. Sea weed bromine content is about the same or higher than their iodine content [14]. However, after testing the bioavailability of iodine and bromine content of Wakame (A kind of seaweed), Romarís-Hortas et al. found out that 8.72 ± 3.07 ug/g of iodine is usable for an animal cell; while the availability of bromide was 148.55 ± 5.7 ug/g, and iodine in table salt has 100% of bioavailability [14]. This is to say, although sea weeds are high in iodine, they might not be the best forms of iodine for human body. On the other hand, bromine content in Wakame is too high. When iodine and bromine exist in the same biological environment, bromine is in the dominant position. When a thyroid hormone molecule is in a bromine rich environment, it will not work right even if there are enough iodine around [15].

In human body average bromine serum concentration is about 3.2-5.6 ng/ml [16], while serum iodine normal range is 40-92ng/ml [17]. That is to say, a normal human body has very low level of bromine, while bromine rich sea weed does not have the similar

chemical environment as that of human body. On the other hand, fish might have a better iodine/bromine profile than sea weed. In a research done by Arafa, Beje, Etwir, & Das [18], the researchers found out that among fish meat, iodine concentration range is about 1.6 ± 0.1 to 6.6 ± 0.3 ppm; while bromine concentration 1.5 ± 0.1 to 18.5 ± 1.8 ppm. 1.6ppm is 1600 ng/ml; while 1.5ppm is 1500ng/ml. Therefore, fish meat is a good source of iodine, but it does have high content of bromine.

Conclusion

- Plant-Based Protein does not deteriorate diabetes, but has very low iodine content.
- Fish and sea food are good sources of iodine, but also high in bromine, which is toxic.
- Cheese and eggs are good sources of protein and iodine.
- Game meat and red meat are not good sources of iodine and they are not good for diabetes due to their high fat content.

Therefore, for people living on a budget, they should use cheese, eggs, and plant-based protein as their major protein sources. Also, they should have couple meals of fish and sea food every week. Poultry can a good lean protein source according the budget. Game meat and red meat as protein sources are not suitable for diabetes treatment; and they are expensive too. Also, iodized salt is good source of iodine in a normal diet. Further research will focus on bioavailability of iodine in fish and how to increase the iodine bioavailability through cooking. Also, how to eat carbohydrate will be an important aspect.

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