

# AU InforMed

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## Key Inforbits

- History of Diabetes
- Diagnosing Diabetes
- New Non-Refrigerated Insulin
- Dapagliflozin
- Once-Weekly Byetta
- Cinnamon vs. Chromium



November is...  
Diabetes Awareness  
Month



## HISTORY OF DIABETES



Diabetes received its name from Aretaeus of Cappadocia, a Greek physician who named diabetes after the word dia-bainein which means “to siphon” after noticing patients with diabetes often passed excessive amounts of urine. In ancient times diabetes was characterized as the “sweet urine disease” because ants were typically attracted to a diabetic person’s urine. Diabetes was first recorded as a disease in an English medical text in 1425.

- 1750 – Cullen, added *mellitus* term to diabetes, which means “honey-sweet” in Latin
  - 1869 – Islet cells of the pancreas were discovered by Paul Langerhans
  - 1901 – Diabetes was linked to ability of islet cells to make insulin
  - 1921 – Insulin was discovered as a diabetes medication by Frederick Banting and Charles Best by utilizing bovine/porcine pancreas.
  - 1936 – NPH (Neutral Protamine Hagedorn), named after inventor Hans Hagedorn, was created by adding neutral protamine to regular insulin.
  - 1956 – Oral medications of sulfonylurea were developed for people with type 2 diabetes.
  - 1977 – The first genetically synthesized “human insulin” was produced by Herbert Boyer using *E. coli* in combination with recombinant DNA technology.
  - 1979 – The hemoglobin A1C test was created for the precise measurement of blood sugar control.
1. Diabetes Health. [homepage on the internet]. Novato, CA: The History of Diabetes. [updated 2008 December 17; cited 2010 November 2]. Available from: <http://www.diabeteshealth.com/read/2008/12/17/715/the-history-of-diabetes/>

2. Enjoying-life-with-diabetes.com [homepage on the internet]. History of Diabetes: Timeline of Diabetes History. [cited 2010 November 2] Available from: <http://www.enjoying-life-with-diabetes.com/history-of-diabetes.html>

### **HOW DO I KNOW IF I HAVE DIABETES?**

Several tools can be used in the diagnosis of diabetes. The principle method for diagnosing diabetes is through the use of a finger stick blood glucose meter. The following measures of blood glucose can be used in diagnosing a person with diabetes – each requires a second reading at a different time before the patient can be definitively diagnosed.

- Fasting Plasma Glucose: a glucose reading after no caloric intake for at least 8 hours prior to the test.
  - Normal: <100 mg/dL
  - Impaired: 100 – 125 mg/dL
  - Diagnostic for diabetes:  $\geq 126$  mg/dL
- 2 – Hour Post-load Plasma Glucose (Oral Glucose Tolerance Test)
  - Normal: <140 mg/dL
  - Impaired: 140 – 199 mg/dL
  - Diagnostic for diabetes:  $\geq 200$  mg/dL
- Casual Plasma Glucose Concentration: blood glucose level without regard to time since last meal.
  - Diagnostic for diabetes:  $\geq 200$  mg/dL
- Hemoglobin A1C is considered the gold standard for following long-term glycemic control. It assesses glucose control for 2 to 3 months based on the amount of glucose attached to red blood cells.
  - A1C diagnostic value for diabetes: >6.5%

1. Kroon LA, Assemi M, Carlisle BA. Chapter 50: Diabetes Mellitus. In: Koda-Kimble M.A., Young LY, Alldredge BK, Corelli RL, Guglielmo BJ, Kradjan WA, Williams BR, editors. Applied Therapeutics: The Clinical Use of Drugs. 9<sup>th</sup> ed. Baltimore: Lippincott Williams & Wilkin; 2009 p50-7.

### **WHAT ARE MY BLOOD GLUCOSE GOALS AND HOW OFTEN SHOULD I MONITOR?**

- A1C: <7%
- Preprandial blood glucose: 70-130 mg/dL
- Postprandial blood glucose: <180 mg/dL

Monitoring should be done regularly.

- Self-monitoring of blood glucose: several times daily
- Foot exams
  - Self foot exam daily
  - Podiatrist visit yearly
- Eye exams: yearly



### **NEW DEVELOPMENTS IN DIABETES:**

#### **Insulin that doesn't need refrigerating!**

Bianca van Lierop and her colleagues from Monash University, located in Melbourne, Victoria (Australia), claim to have successfully strengthened insulin's chemical structure without affecting

the activity of the drug. The implications being that this new insulin will not require refrigeration. Traditionally, the poor stability of insulin has required that the drug product be stored at temperatures below 4 °C. This limits the ability to supply insulin to areas where refrigerators are scarce. The new insulin may offer improvements in patient compliance due to less stringent storage requirements. Using a series of chemical reactions, Bianca and colleagues replaced the unstable disulfide bonds with stronger, carbon-based bridges. This replacement leaves the natural activity of insulin unchanged and appears to significantly enhance the stability of insulin. Bianca claims that storage at higher temperatures for several years has not resulted in degradation or loss of activity with this new form of insulin. Further evidence from pharmaceutical trials is necessary to evaluate both the efficacy and safety of this promising new insulin formulation.

1. Monash University [homepage on the internet]. Clayton, Vic. Imagining insulin that doesn't need a fridge or a needle. [updated 2010 June 15; cited 2010 Nov 3]. Available from: <http://www.monash.edu.au/news/monashmemo/assets/includes/content/20100616/stories-more-uni-news1.html>
2. Blanch D. Innovation: New Insulin That Survives Warmth: A breakthrough for diabetics in creating insulin that needs no refrigeration. ABC radio Australia. 2010 [Internet]. Accessed from <http://www.abc.net.au/ra/innovations/stories/s2952498.htm>

### **Dapagliflozin – New Drug on the Horizon**

Dapagliflozin is an orally administered selective sodium-glucose cotransporter 2 (SGLT2) inhibitor nearing approval and undergoing phase 3 trials. It works to help diabetic patients manage their hyperglycemia by preventing glucose reabsorption, thereby increasing its excretion. Studies have shown it to be effective in helping to improve glycemic control. One of these studies was a randomized study that compared varying doses of dapagliflozin (5, 25, and 100 mg) to placebo among a total of 47 patients. The authors found that fasting glucose levels were significantly reduced in the 100 mg group (-9.3%,  $p < 0.0011$ ) and that the reduction increased as the dose increased (-11.7%, -13.3%, and -21.8%, respectively – all statistically significant). All doses produced a significant reduction following an oral glucose tolerance test.<sup>1</sup> Another study looked into the effect of dapagliflozin in diabetic patients who were not controlled with metformin. This study included 546 patients and was a phase 3, multicenter, randomized, double-blind, parallel-group, placebo-controlled trial. The patients were randomly assigned to one of three doses (2.5, 5, or 10 mg) of dapagliflozin or placebo (metformin only). Reductions in A1C were significantly greater in each of the groups receiving dapagliflozin than in the placebo group at week 24 (-0.67%, -0.7%, -0.84%, respectively compared with -0.3% in the metformin only group). Each of the dapagliflozin groups also achieved a significantly greater reduction in fasting plasma glucose than the placebo group (-17.8, -21.4, and -23.4 mg/dL respectively compared with -5.9 mg/dL in the placebo group). In addition, dapagliflozin did not seem to induce hypoglycemia, and patients receiving any dose experienced weight loss of 5% or more.<sup>2</sup> The results of these trials show dapagliflozin as a great potential new alternative in helping uncontrolled type 2 diabetic patients manage their hyperglycemia.

1. Komoroski B, Vachharajani N, Feng Y, Li L, Kornhauser D, Pfister M. Dapagliflozin, a novel, selective SGLT2 inhibitor, improved glycemic control over 2 weeks in patients with type 2 diabetes mellitus. *J Clin Pharm Ther.* 2009;85(5):513-19.
2. Bailey CJ, Gross JL, Pieters A, Bastien A, List JF. Effect of dapagliflozin in patients with type 2 diabetes who have inadequate glycaemic control with metformin: a randomized, double-blind, placebo-controlled trial. *Lancet.* 2010;375:2223-33.

### **Once-Weekly Byetta: A Promising Alternative**

A new formulation of the drug Byetta® (exenatide) offers the possibility for once weekly dosing versus twice daily dosing. The DURATION-1 trial found that the once-weekly formulation caused a significantly greater A1C reduction than the twice-daily formulation. This trial also offered an extension phase where patients could continue the weekly or switch to the twice-daily dosing

schedule. After completion of this phase, patients in either group experienced similar effects with regards to A1C levels.<sup>1</sup> Recent studies (DURATION-2 and DURATION-3) have also shown the once weekly formulation as being equally effective if not more effective than currently available oral antidiabetic agents. DURATION-2 compared the long-acting exenatide to sitagliptin or pioglitazone. The patients who were given the exenatide experienced a significantly greater drop in A1C as opposed to the patients given either sitagliptin or pioglitazone. DURATION-3 compared the exenatide once weekly to once daily insulin glargine. The patients receiving either drug experienced a similar drop in A1C (1.5% drop with exenatide versus -1.3% drop with insulin glargine).<sup>2</sup> These studies show that the once-weekly exenatide is effective and possibly more effective than current adjunctive therapies for uncontrolled diabetic patients. It also does this with a decreased number of required injections; therefore, it shows promise as a preferred option once it becomes available.

1. Douglas D. Once-weekly exenatide effective in diabetics. Reuters Health Information. 2010. Accessed from <http://www.medscape.com/viewarticle/719198> on 11/1/2010.
2. Osterweil N. Once-weekly exenatide lowers HBA1c more than daily oral antidiabetics or insulin glargine. Medscape Medical News. 2010. Accessed from <http://www.medscape.com/viewarticle/724233> on 11/1/2010.

### **Cinnamon vs. Chromium Therapy**

Cinnamon and chromium are natural, non-traditional treatment options that have been suggested as having benefit in managing diabetes. The effect of cinnamon on blood glucose was evaluated in several studies and results are conflicting. Some studies suggest it as having benefit and recommend incorporating it into the diets of diabetic patients who need extra help in managing their diabetes.<sup>1</sup> Other studies have found cinnamon to have no significant effect on blood glucose levels.<sup>2</sup> Studies of chromium's effect on blood glucose have had mixed results as well. One study found that chromium was not effective in helping to manage blood glucose levels in diabetic patients. Chromium was found to have no additional benefits to placebo.<sup>3</sup> On the other hand, a meta-analysis of chromium's effect on blood glucose levels, found that it did have a beneficial effect on blood glucose levels in diabetic patients.<sup>4</sup> Based on these studies, neither cinnamon nor chromium can claim superiority over the other. Either one could be easily added to a diabetic patient's diet. If the addition helps the patient with glycemic control, then the addition should be continued; if it doesn't, the addition should be stopped.

1. Khan A, Safdar M, Ali Khan MM, Khattak KN, Anderson RA. Cinnamon improves glucose and lipids of people with type 2 diabetes. *Diabetes Care*. 2003;26(12):3215-8.
2. Baker WL, Gutierrez-Williams G, White CM, Kluger J, Coleman CI. Effect of cinnamon on glucose control and lipid parameters. *Diabetes Care*. 2008;31(1):41-3.
3. Kleepstra N, Houweling ST, Bakker SJ, et. al. Chromium treatment has no effect in patients with type 2 diabetes in a western population. *Diabetes Care*. 2007;30(5):1092-96.
4. Balk EM, Tatsioni A, Lichtenstein AH, Lau J, Pittas AG. Effect of chromium supplementation on glucose metabolism and lipids: a systematic review of randomized controlled trials. *Diabetes Care*. 2007;30(8):2154-63.

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## The Last Dose

**"Develop success from failures. Discouragement and failure are two of the surest stepping stones to success. ~Dale Carnegie (1888 – 1955)**

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