A History of Diabetes

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How to Take This Course

Please take a look at the steps below; these will help you to progress through the course material, complete the course examination and receive your certificate of completion.

1. **REVIEW THE OBJECTIVES**

   The objectives provide an overview of the entire course and identify what information will be focused on. Objectives are stated in terms of what you, the learner, will know or be able to do upon successful completion of the course. They let you know what you should expect to learn by taking a particular course and can help focus your study.

2. **STUDY EACH SECTION IN ORDER**

   Keep your learning "programmed" by reviewing the materials in order. This will help you understand the sections that follow.

3. **COMPLETE THE COURSE EXAM**

   After studying the course, click on the "Course Exam" option located on the course navigation toolbar. Answer each question by clicking on the button corresponding to the correct answer. All questions must be answered before the test can be graded; there is only one correct answer per question. You may refer back to the course material by minimizing the course exam window.

4. **GRADE THE TEST**

   Next, click on "Submit Test." You will know immediately whether you passed or failed. If you do not successfully complete the exam on the first attempt, you may take the exam again. If you do not pass the exam on your second attempt, you will need to purchase the course again.

5. **FILL OUT THE EVALUATION FORM**

   Upon passing the course exam you will be prompted to complete a course evaluation. You will have access to the certificate of completion **after you complete the evaluation**. At this point, you should print the certificate and keep it for your records.

Introduction

The management of diabetes can be quite a challenge-for both healthcare providers and the people who suffer from this life-altering illness. There is much knowledge and many skills to be learned. There's a lot to learn over time, with important skills to master. We have come a long way in our understanding of just what happens in one's body if one has diabetes, and in its treatment. Diabetes has been recognized for nearly 4,000 years!

Have you ever wondered what it was like to live with diabetes at other times in history? Let's take a journey through the history of diabetes, starting with some of the earliest records of the disease. This course will help the nurse to gain information about healthcare providers' understanding of the pathophysiology and treatment of this long standing human illness.

About the Author

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Jacquelin Deatcher NP, CDE is an Adult Nurse Practitioner and Certified Diabetes Educator, with over 20 years' experience in diabetes clinical management and self-management education. After 23 years with a large multi-specialty medical group in White Plains, New York, she now lives and works in the rural setting of Alexander, in Western New York.

Her goal is to offer diabetes services in an area where there is a significant need. She is currently in the process of establishing an independent and primarily fee-for-service practice, providing both individual consultation and group education, as well as home visits. Ms. Deatcher believes that nurses have a very significant opportunity and responsibility to empower those with diabetes to attain and maintain maximum wellness.

Objectives

Upon completion of this course, the learner will be able to:

- State the symptoms identified by early Egyptians, Indians, Chinese and Greeks regarding diabetes.
- Describe how early research led to understanding of diabetes.
- Discuss the discovery of insulin.
- Discuss the value of glucose monitoring and testing.

The Early Perspective

There are references to diabetes in the ancient literature of Egypt, India and China, showing physicians recognized it nearly 4000 years ago.

In ancient Egypt, books were written on material made from the papyrus plant, called "papyri." Egyptian medicine was relatively highly developed; the papyri were similar to medical textbooks. One such book, called the Ebers Papyrus (approximately 1550 BC) described provisional diagnoses for various diseases, explained how to examine the patient and the signs to look for, and gave prognosis and treatment instructions. Treatment typically included manipulation, drugs, magic formulas and prayers. Diet was not used as a treatment modality. This papyrus describes a condition resembling diabetes, with its copious flow of urine.

In pre-Buddhist India, the Vedic medical treatises describe a condition which sounds like diabetes. Two types were described, one in early life, and one in later life. The symptom of polyuria was recognized, and the disease itself was thought to be incurable but possibly manageable. Interestingly, diabetes was recognized to be hereditary, and associated with obesity, indolence, lethargy and overindulgence in sweets, rich foods and milk products (large quantities of milk do contain a significant amount of sugar). Treatment involved dieting and purging.

In sixth century BC India, there was a close interconnection between religion, medicine and astrology. The diagnostic aspect of medicine was relatively highly developed, instructing in methods of thorough inspection. The sweetness of urine from the person with diabetes was noted, and was identified by tasting the urine of the person in question. (This diagnostic method wasn't seen in western literature until the 17th century). It was also noted that the person's perspiration and expectoration "acquire a sweet taste and smell like that of honey" (Duke,1991, p.103). Dieting and purging were thought to be important treatments, as was the use of iron in some form. It was recognized, however, that the prognosis was poor, and little was done to treat those with no hope of cure.

Chinese medicine saw its beginnings around 2900 BC. Disease was thought to be due to a lack of harmony between five fundamental organs and their connection to the planets, seasons, colors and sounds. Diagnostic methods were quite detailed, with 51 different types of pulse identified (strong, weak, etc.) and 37 different shades of discoloration of the tongue. Medical literature was quite extensive, and diabetes was reportedly well described.

Later, in the 2nd century AD, the Greek physician Arataeus of Cappadocia described, in great detail, the clinical presentation of diabetes. He used the name "diabetes", from the word "dia-bainein", which means "to siphon", "because the fluid does not remain in the body, but uses the man's body as a ladder… whereby to leave it." (McGrew, 1985, p. 91). His clinical description of the disease is amazing in its depth of understanding:

> "Diabetes is a strange affection, not very frequent among men, being a melting of the flesh and limbs into urine. Its cause is of a cold and humid nature, as in dropsy. The course is the common one, namely, the kidneys and bladder; for the patients never stop making water, but the flow is incessant, as if from the opening aqueducts. The nature of the disease, then, is chronic, and it takes a long period to form; but the patient is short-lived; if the constitution of the disease be completely established; for the melting is rapid, the death speedy. Moreover, life is disgusting and painful, thirst unquenchable; excessive drinking, which, however, is disproportionate to the large quantity of urine, for more urine is passed; and one cannot stop them either from drinking or making water. Or if for a time they abstain from drinking, their mouth becomes parched and their body dry; the viscera seem as if scorched up; they are affected with nausea, restlessness, and a burning thirst; and at no distant term they expire. Thirst, as if scorched up with fire. But by what method could they be restrained from making water? Or how can shame become more potent than pain?" (Ackerknecht, 1982, p. 71-2).

Medical treatment advocated by Arataeus at the time included the use of oil of roses, dates, raw quinces (a type of fruit) and gruel.

The Identification of Diabetes

Our modern approach to diabetes saw its beginnings in the 1600's, when Thomas Willis, personal physician to King Charles II of England, noted that the urine of a person with diabetes was "wonderfully sweet as if it were imbued with Honey or Sugar."(McGrew, 1985, p. 92). He added the term "mellitus", Latin for "honey sweet." The presence of sugar in the urine was confirmed by evaporating the urine, leaving the sugar behind.

In the early 1800's, diagnosis of diabetes relied on chemical tests of urine (rather than the old taste test), looking for the presence of sugar. It was noted, however, that white spots of dried sugar on pants or shoes would sometimes "give it away." The chemical test for glycosuria (sugar in the urine) became a routine one for hospitalized patients as well as for life insurance exams by the early 1900's. However, there was no agreement as to the exact definition of diabetes (exactly how much sugar in the urine was required for a diagnosis), which made it difficult to determine the incidence of diabetes during that time with certainty.

By 1900, the expected life span of a child with diabetes was less than one year, and that of an adult approximately ten years. It was expected that the afflicted person would have a decreased resistance to other diseases, such as TB, pneumonia and other infections, and that wound healing would be poor. For this reason, amputations were rarely done during this period, because the patient was not expected to recover. In the final stages of the disease, the patient became very ill, with acetone or "fruity" breath, and an air hunger, or "internal suffocation." The patient lapsed into a coma and death came within a few hours. Sodium bicarbonate was sometimes used to combat the acidosis, but with little effect.

Diabetes was beginning to be looked at differently. Before the late 1800's, it took a relative back seat to the much larger danger of infectious disease, which took many more lives. Most illness was felt to be terminal, not being discussed openly due to the assumption that it would admit one's inadequacy. With the eradication of much of the infectious disease prevalent during this time, and the subsequent "mortality transition," noninfectious, or chronic diseases became more evident and prevalent. People who weren't dying from typhoid fever or dysentery were living long enough to be affected by more chronic conditions, such as diabetes.

With people living longer and becoming better nourished, the incidence of diabetes was due to rise. It has been estimated that the average consumption of sugar in this country doubled between 1860 and 1960, while the average consumption of fat rose 40% during that time. With an understanding that aging and obesity are among the risk factors for type 2 diabetes, it is understandable that diabetes would become a more important medical challenge. By the early 1900's, diabetes was most prevalent in the wealthiest countries, for example Germany and the United States. By 1920, the incidence of diabetes was 0.5-2% of the population in the industrialized nations.

Early Diabetes Research

In 1775, Matthew Dobson confirmed there were abnormal amounts of sugar in both the urine and the blood of people afflicted with diabetes, which changed the understanding of diabetes from being a problem of the kidney to a more systemic one. Studies done by French physiologist Claude Bernard in the late 1800's showed that some sugar was produced in the liver, which led to the thought that diabetes may be a liver disease.

In 1869, Paul Langerhans found small clusters of unusual cells in the pancreas (the islet cells), but he didn't understand their function. (Today, we know that these "isles of Langherhans" are the cells which produce insulin.) Twenty years later, in 1889, Oskar Minkowski and Joseph vonMering of Strassburg University made the accidental discovery that a pancreatectomy (removal of the pancreas) produced diabetes in a dog. This caused speculation that diabetes may be associated with the pancreas. In 1901, a Johns Hopkins University pathologist named Eugene Lindsay Opie noticed that people who died from diabetes had pathological changes in these islet cells of the pancreas. Something was lacking in these cells in people with diabetes. Thus began the search for this substance.

As early as 1855, extracts of animal endocrine glands (or "internal secretions," later known as hormones) were used in treatments for various disorders. Initially, the purpose of these extracts was mostly general or systemic, but over time their intended uses became more specific. The use of these extracts rose dramatically as the nation became richer, better nourished and less vulnerable to death from infectious disease. In 1889, the French physician Charles-Édouard Brown-Séquard touted the "remarkable rejuvenating properties" of testicular extracts from young guinea pigs, which he reportedly injected into himself. This type of work with hormones also led to abuse by opportunists, as one might expect.

In 1908, in Berlin, Dr. George Ludwig Zuelzer made an extract from the pancreas which, when injected into a laboratory animal, decreased the amount of sugar in its urine. Unfortunately his extract had toxic side effects due to impurities, which he was unable to correct. Others did similar work, including Romanian N.C. Paulesco, who made a pancreatic extract which worked successfully in pancreatectomized dogs. His work was interrupted, however, by the First World War.

Early Treatment of Diabetes

Treatment for diabetes in the early 1800's was not very effective, with bleeding, blistering and "doping" commonly employed. These and other "heroic therapies" dominated medical practice during this period. Doping referred to opium, used to dull one's despair, and was still used into the early 1900's. During this time, it was thought by some that because the patient was "starving," more nourishment was necessary to replace the lost calories. Most approaches, however, involved restricting calories, sometimes with intermittent fasting. Patients' unwillingness to follow strict diets was the most significant problem with this therapy (and is still a major challenge today).

Some physicians isolated their patients under lock and key, and many advocated diets with particular foods predominating, like the German "oat cure" of 1902, or the Italian high fat diet in the late 1800's. Others included diets rich in bananas, milk, rice or potatoes. It was soon recognized that people with diabetes were particularly intolerant of large amounts of carbohydrates (bread, pasta, potatoes, rice, etc.). Severe restriction of carbohydrates did reduce glycosuria, which soon returned with the resumption of a normal diet. This made treatment efforts very frustrating.

Dr Frederick Allen, studying carbohydrate metabolism at Harvard Medical School, advocated under-nourishment, or cutting back on not just carbohydrates, but everything else as well. He published his "Total Dietary Regulation in the Treatment of Diabetes" in 1919, recommending an initial fast with liquids only until the glycosuria disappeared. Food was then added little by little until the glycosuria returned, which indicated the patient's limit, or tolerance. Another fast day followed, and then the resumption of calorie intake at a level which was just under the amount causing glycosuria. This became known as the "starvation treatment" of diabetes, which seemed ironic during a time when being well fed was a sign of prosperity and health. Patients' symptoms of hunger and weight loss were of course aggravated by this diet, and even more so by the prescription of exercise to burn up additional sugar. Patients with severe diabetes effectively had a choice: death by diabetic coma or death by starvation, or "inanition." It was felt (by Allen) that the latter involved less suffering.

Following Dr. Allen's diet prescription was very difficult for most patients. Diets were comprised of as little as 750 calories a day, with adult weights falling to the level of sixty or seventy pounds in some cases. Despite the risk of death from uncontrolled diabetes, many patients found ways to obtain forbidden foods, requiring vigilance on the part of those caring for them. One twelve year old blind boy reportedly augmented his meager food allotment with toothpaste and with birdseed from his canary's cage. When his glycosuria continued, his diet was cut back even further, resulting in his death from starvation at a little under 40 pounds. Despite the harshness of this type of regime, however, it was the only thing proven to prolong the lives of people with diabetes.

Dr. Allen's ruthless control of his patients made his treatment controversial, in an environment of other ineffective experimental treatments. Another diabetologist (or diabetes specialist) in Boston, Dr. Elliott Joslin, was a friend and strong advocate of Dr. Allen's plan of under-nutrition. However, he had a more optimistic approach, with more warmth, conveying a sense of hope to his patients. A major center for diabetes care in Boston bears his name today.

By the early 1900's there was a general understanding that diabetes was caused by the body's inability to utilize food (especially carbohydrates). It was also recognized that the pancreas was somehow involved in carbohydrate metabolism. An "external secretion" of the pancreas was already identified (digestive enzymes, which left the pancreas through ducts into the gut). Was there another secretion, which enabled the body to use fuel?

The Discovery of Insulin

After Mering and Minkowski's work in 1889, (discovering that removing the pancreas of a dog resulted in severe diabetes), Dr. William McCallum, in 1909, reported the results of an experiment, again on a dog, showing that a substance in the islet cells of the pancreas had an anti-diabetic effect. Many tried to extract this substance unsuccessfully over the next ten years however, it was not until Dr. Frederick Banting of Ontario, Canada succeeded, in 1920.

Banting was an orthopedic surgeon, living in London, having a difficult time making a living. He took a part time job as a lecturer at London's Western University. In preparing a lecture on carbohydrate metabolism, he noted that recent research seemed to point to a relationship between diabetes and the islets of the pancreas (islets of Langherhans). Not being able to sleep that night, he pondered both the diabetes question and his personal troubles. The idea came to him in the middle of the night that perhaps if one ligated (or tied off) the ducts of the pancreas (by which the digestive enzymes leave the organ), it may prevent the degeneration of the "internal secretion" (the anti-diabetic substance), enabling its successful extraction. He figured that previous efforts to isolate the "internal secretion" were unsuccessful due to destruction by pancreatic enzymes during extraction. In his notebook that night, he wrote the words:

> "Diabetus Ligate pancreatic ducts of dog. Keep dogs alive till acini degenerate leaving Islets. Try to isolate the internal secretion of these to relieve glycosurea." (Bliss, 1982, p. 50).

Banting went to Dr. J.J.R. Macleod, professor of physiology at the University of Toronto and an expert in carbohydrate metabolism. Here he was given a lab, laboratory animals (dogs) and an assistant, a young medical student with experience in physiology and biochemistry named Charles Best. After many difficulties and setbacks, the team was able to extract the "internal secretion", and on July 30, 1921, they injected the extract into a diabetic dog, which decreased its glycosuria. Similar results were obtained repeatedly, and one dog was kept alive with the extract for 70 days, after which it was sacrificed for medical study.

In late 1921 Professor J.B. Collip joined the research team; he had expertise in the chemistry of hormones. A way of purifying the extract to eliminate its toxic side effects was needed; dogs receiving it often developed fevers or abscesses at the site of injection. In January of 1922, Collip prepared an extract pure enough to be tried on humans.

So, at Toronto General Hospital, in January of 1922, the extract was injected into a very ill 14 year old boy, Leonard Thompson. He entered the hospital on the verge of a coma, weighing 65 pounds. For the first time in a clinical setting, the extract was shown to decrease glycosuria and make a significant transformation in the clinical condition of the person treated. Leonard survived for 15 years on insulin, dying at the age of 29 of pneumonia.

The extract, which was referred to as "Isletin" by Banting and Best, soon became known as "Insulin." This seems to have been the suggestion of Macleod, after the Latin word for "island." Insulin was thereafter injected into several other patients with similar results, and these results were reported at the May 1922 meeting of the Association of American Physicians. However, news of the amazing effects of this new extract reached the press fairly quickly, resulting in people all over the world seeking some of this miracle medicine. Despite the fact that it didn't cure diabetes, it did bring people back from the brink of death, prolonging their lives, and improving the quality of life for those who were able to obtain access to it. At last, the outlook for someone diagnosed with diabetes was more hopeful.

It took several years to make enough insulin to meet the demand, however. An American firm, Eli Lilly and Company in Indianapolis, began commercial production of insulin in 1922, using pork pancreas extracts. The process was patented by the University of Toronto because Banting and Best refused to profit from a patent directly. It would violate a physician's Hippocratic oath to profit from achieving financial gain by preventing a medical discovery from being made available to all. In addition, they wanted to prevent the possible patenting by someone else. The production process would then be published and available to all, and no one company would be able to achieve a financially lucrative monopoly. By 1923, Eli Lilly and Company was producing enough insulin to treat ten thousand people with diabetes.

In 1923, the Nobel Prize in medicine was awarded to Banting and Macleod for the discovery of insulin. Banting shared half his prize with Best, and Macleod shared half of his with Collip. To be fair, there were others who had done similar work on the internal secretion of the pancreas, including Nicolas Paulesco of Romania, Georg Ludwig Zuelzer of Germany, E.L. Scott from Chicago and others. However, Banting, Best, Macleod and Collip were the ones who were able to bring the task to completion. Interestingly, ligating the pancreatic duct of the pancreas to prevent the external secretion from destroying the internal secretion was not necessary. What was necessary was the purification of the extract itself, which was done by the use of an alcohol solution. Even at this early stage, it was recognized that treatment with insulin needed to be ongoing. As Banting accepted the Nobel Prize, he ended his lecture with the statement: “Insulin is not a cure for diabetes, it is a treatment” (Forsham, 1982, p. 3).

Early clinical use of insulin was very cautious by many physicians. It was recognized that too much insulin could cause hypoglycemia, or low blood sugar, which was potentially dangerous. It was also soon realized that use of insulin did not allow the abandonment of diet, but rather required a balance of both. It remained to be learned just how much insulin was necessary. Should all glycosuria be eliminated? During this period, it became understood that sugar levels in the blood (in addition to urine levels) were important, but testing blood sugar levels initially proved difficult, requiring large samples. In 1910, it took 20 cc of blood to do a crude blood sugar test. By 1920 this requirement dropped to 0.2cc.

The first commercially prepared insulins were made from pork and beef sources, and were short acting, with a peak action of about 3 hours and a duration of about 6 hours, resulting in a requirement of 4 injections per day. Allergic reactions, particularly skin reactions at the site of injection, were common due to contaminants in the preparations. With better purification processes over time, however, this became less of a problem. By 1970, it is estimated that insulin preparations were 95% pure, reaching 99.9% by 1982.

A longer acting insulin was developed in 1937 (protamine zinc insulin), followed by NPH insulin becoming available in 1938 and Lente insulin in 1952. These insulins had a peak effect at approximately 8 to 10 hours after the injection, allowing fewer injections per day.

By the 1950’s, the structure of the insulin molecule was better understood, which led to later efforts to create an unlimited supply of insulin, rather than relying on existing supplies of pork and beef sources. Human insulin was introduced by Eli Lilly and Company in 1982, using recombinant DNA technology. This involves genetically engineering *E. coli* or baker’s yeast in the laboratory to create insulin that is identical to that naturally occurring in the body. Another method relies on the modification of pork insulin. During the 1980’s there was a move to switch most patients using pork and beef insulin to human insulin. This was partly due to the potentially unlimited supply of synthetic insulin, as noted above, but also to avoid the body’s production of antibodies against the foreign proteins present in the animal insulin. These antibodies may interfere with insulin action.

Yet another advance in insulin technology became available in 1996, when Eli Lilly and Company marketed a more rapid acting insulin called Lispro insulin, which more closely simulates the body’s natural response to a meal. It has a peak effect at about one hour after injecting, and enables tighter control of blood sugar levels.

Insulin administration was initially cumbersome, using glass syringes with separate needles, both of which needed to be sterilized by boiling for 20 minutes after each use. These needles became dull with time and needed to be sharpened with a pumice stone. In 1961, the first single use syringe was developed, and became more widely used for home insulin administration in the mid to late 1970’s. Insulin “pens” were introduced in 1981, which hold a cartridge of insulin and a disposable needle, allowing more convenient use of insulin for business or travel situations. A unique new insulin delivery system was developed in the late 1970’s, called the insulin pump. This device holds a cartridge of short acting insulin, which is connected to the patient by a catheter, inserted under the skin. The catheter can remain in place for two to three days, eliminating the need for multiple daily injections. Insulin is infused continuously, and the pump can be programmed to deliver varying amounts of insulin as needed. The first pumps were large and bulky, but the newer devices are about the size of a beeper.

The Development of Oral Treatment for Diabetes

A new treatment option for type 2 diabetes was developed during the 1950s. This was an oral class of medications called sulfonylureas (e.g., Diabinese and the newer Micronase and Glucotrol). These medicines work by pushing the pancreas to make more insulin, thereby lowering blood sugar. (This would not be useful in type 1 diabetes, where the body does not have the ability to make insulin). The sulfonylureas became an effective alternative to insulin therapy for many people with type 2 diabetes, and is still a mainstay of its treatment today.

In 1995, two more classes of oral medications became available for the treatment of type 2 diabetes in this country: the biguanides (e.g., metformin), which suppress the liver's production and release of sugar; and the alpha-glucosidase inhibitors (e.g., Acarbose), which slow down the absorption of carbohydrate in the gut. Another new class, marketed in 1997, called thiazolidinediones (e.g., Rezulin), work by increasing the body's sensitivity to insulin. These medicines can be used in several different combinations, often eliminating the need for insulin.

Regardless of what medication is used for type 2 diabetes, it has become understood that diet still plays a major role in its treatment. Up until the 1980s, diet prescriptions were still very low in carbohydrate and higher in protein and fat, which increased the person's risk of cardiovascular disease. Now, rather than a standard diet for everyone, the ideal is an individualized diet with a balance of carbohydrate, protein and fat. People with diabetes are encouraged to meet with a Nutritionist to tailor a diet to their individual needs.

Glucose Monitoring and Testing

Home glucose testing began with urine test strips in the 1960s, which evaluated how much sugar was present in the urine. As blood sugar rises and reaches a certain threshold, it begins to spill over into the urine, and the amount can be measured. However, it was eventually recognized that this threshold is quite high and varies from person to person. One's blood sugar level may become quite elevated before sugar will begin to show in the urine. A negative urine test may therefore still reflect a high blood sugar level. Methods of home testing of blood sugar levels were developed, with the introduction of Chemstrip bG in 1979. This system enabled patients to visually estimate blood sugar levels by placing a drop of blood onto a reagent strip, waiting one minute, wiping away the blood, waiting one more minute and noting the color change.

The first portable blood glucose meter was developed in 1969, but meters were not widely used until the 1980s. Meters eliminated the need to visually estimate blood sugar levels, and allowed more convenient testing that could be done more frequently. As blood sugar levels are constantly changing, frequent testing enables one to understand patterns of blood sugar. The newer devices are quite user friendly, often using a one step process, with no timing or wiping. Today, home blood glucose monitoring is considered to be indispensable in the management of diabetes.

One of the most significant advances since the discovery of insulin has been the use of a test called the hemoglobin A1c, or glycohemoglobin. Developed by Anthony Cerami, PhD and made available in 1979, this test measures the average blood sugar over an approximate two month period of time, which gives one the "big picture" of blood sugar control. A blood sugar test tells one what the blood sugar is at the time it is taken, where the hemoglobin A1c tells one the average blood sugar level over a period of time. It has become the gold standard for assessing blood sugar control.

Conclusion: The Current and Future of Diabetes Care

Our understanding of diabetes has advanced significantly over the past 75 years. In 1935, Roger Hinsworth identified two types of diabetes, one being insulin sensitive (type 1), and the other insensitive (type 2). A landmark study, the Diabetes Control and Complications Trial (reported in June of 1993), conclusively proved that blood sugar control matters. Study subjects with consistently lower blood sugar levels over the course of the study dropped their risk of developing long-term complications of diabetes by an average of 60%. This was confirmed by the United Kingdom Prospective Diabetes Study, the results of which were reported in September of 1998. These studies have led to the increasing push for Diabetes Self-Management Education Programs, where people with diabetes are empowered to take control of their diabetes and attain maximum wellness. There are now National Standards for Diabetes Education Programs (ADA, 2004), with 10 content areas of patient instruction, and official recognition of programs meeting measured criteria established by the American Diabetes Association in early 2004. There is also a nationally recognized certification for professionals who teach diabetes self-management (conveying the title of Certified Diabetes Educator).

Future developments under study include alternate methods of insulin delivery (instead of injection) including eye drops, a nasal spray, an inhaler, a patch and encapsulated tablets, which would bypass gastric juices so as not to be destroyed in the stomach. An artificial pancreas will hopefully one day both measure blood sugar levels and deliver the appropriate dose of insulin automatically. Islet cell transplants may one day offer a readily available alternative to the much more difficult pancreas transplant. Non-invasive meters are currently under development, which would no longer require pricking the finger to obtain a drop of blood. Newer generations of existing classes of anti-diabetic medications are being developed, as are new medications aimed at decreasing the damage to blood vessels that diabetes can cause. There are also trials underway, looking at ways to prevent both type 1 and 2 diabetes in susceptible people.

The number of people with diabetes continues to grow. In 1950, there was an estimated 1.2 million people in this country with diabetes. This number grew to about 5 million by 1975, and today is estimated to be approximately 18 million. As of 2004, it is estimated that 6.3% of the population has diabetes (CDC, 2003). As we continue to live longer, gain weight and lead sedentary lives, this number will certainly increase, affecting even more of the population. It is becoming more common to see type 2 diabetes occurring at a younger age, even in teenagers and children who are overweight and sedentary. Perhaps one of the most important lessons we can learn from looking at diabetes from a historical perspective is the effect of lifestyle choices on blood sugar control and the incidence of type 2 diabetes. As our treatment options continue to multiply, there has been an underscoring of the inescapable need for a healthy diet and regular physical activity.

As the incidence of diabetes continues to grow in epidemic proportions in this country, we will be challenged, not just in terms of scientific advancements, but also in terms of the allocation of research dollars. It is interesting to note that more money is spent on research for diseases which affect smaller portions of the population (such as breast cancer and AIDS) than is spent on diabetes. With the past failure of efforts to develop national health insurance came the development of special interest groups around specific diseases, including diabetes. It will be interesting to see how successful the American Diabetes Association is in fighting for the research dollar over the years to come, as greater and greater percentages of the population are affected by this chronic disease.

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A History of Diabetes
Course Exam

After studying the downloaded course and completing the course exam, you need to enter your answers online. **Answers cannot be graded from this downloadable version of the course.** To enter your answers online, go to e-leaRN's Web site, www.elearnonline.net and click on the Login/My Account button. As a returning student, login using the username and password you created, click on the "Go to Course" link, and proceed to the course exam.

1. While the earliest written account of a disease resembling diabetes was identified by the Egyptians in the Ebers Papyrus in 1500 BC, it wasn't until the 2nd century AD that the Greek physician Arateus first used the term "diabetes"

    A. True.
    B. False.

2. Although early Egyptians, Indians, Chinese and Greeks noted that some people had sugar in their urine, it wasn't until 1775 that Matthew Dobson confirmed that there was:

    A. A sweet smell of sugar on the breath of those with diabetes, indicating that it was also a disorder of the pharynx.
    B. Disorientation associated with the diabetes, indicating that it was also a neurological disorder.
    C. An abnormal amount of sugar in the blood of those afflicted with diabetes, indicating that it was a disease more systemic than merely a problem of the kidneys.
    D. None of the above.

3. Factors contributing to the increase in diabetes near the end of the 1800s include all the following EXCEPT:

    A. A decrease in the number of persons dying from infectious diseases.
    B. A greater emphasis on mental hygiene.
    C. An increase in the consumption of sugar and fats.
    D. A longer life expectancy.

4. Prior to the discovery of Insulin, treatment of diabetes included

    A. Bleeding, blistering and doping.
    B. Dietary restrictions, often with severe caloric restrictions.
    C. Increased exercise.
    D. All of the above.

5. In the late 1800s it was discovered that the surgical removal of the pancreas caused diabetes.

    A. True.
    B. False.

6. The 1923 Nobel Prize for Medicine was awarded to

    A. Nicolas Paulesco for the discovery of insulin.
    B. Eli Lilly and Company for the discovery of the sulfonylureas.
    C. Banting and McLeod (who shared their prizes with Best and Collip) for the discovery of insulin.
    D. Anthony Cerami for the development of the glycohemoglobin blood test.

7. Additional insulin preparations were developed. They include all the following EXCEPT:

    A. NPH insulin in 1938 and Lente insulin in 1952 which had peak effect at approximately 8-10 hours after injecting, allowing fewer injections per day.
    B. Lispro insulin, which has a peak effect in approximately 1 hour after injection, more closely simulating the body's natural response to a meal.
    C. Neither A or B.
    D. Both A and B.

8. Insulin administration methods have progressed from glass syringes with reusable needles to insulin pumps which provide continuously administered insulin with catheters that need replacement only every 2-3 days.

    A. True.
    B. False.

9. The hemoglobin A1s or glycohemoglobin blood test is considered the gold standard for assessing blood sugar control. Its primary value is that it measures

    A. The peak effect of insulin after injection.
    B. The average blood sugar level over an approximately 2 month period.
    C. The serum glucose level at the time the test performed.
    D. None of the above.

10. A landmark study, the Diabetes Control and Complications Trial (reported in June of 1993), conclusively proved that blood sugar control matters. Study subjects with consistently lower blood sugar levels over the course of the study dropped their risk of developing long-term complications of diabetes by an average of 60%.

    A. True.
    B. False.