



Winter 2001  
Vol. 1, No. 1

## *In this Issue*

Diabetes - A Serious  
Health Problem  
page 2

Definition, Categories and  
Complications of Diabetes  
page 3

Technologies for Control-  
ling and Monitoring and  
Accommodating Secondary  
Complications of Diabetes  
pages 4-6

Carmen Schacht's Story  
page 7

Resources and References  
page 8

*The National  
Grant Program  
of the  
AgrAbility Project  
is a joint effort of*

The USDA Cooperative,  
State, Research, Education  
and Extension Service

University of  
Wisconsin-Extension  
Cooperative Extension

Easter Seals

## Farming with Diabetes

In 1999 the staff at Vanderbilt Rehabilitation Center called the Kentucky AgrAbility staff and asked them to visit Mr. Gerald Craighead, a farmer who had just had his right leg amputated below the knee as a result of diabetes.

Craighead developed a fungus on the back of his right big toe near its base. Neither he nor his doctor recognized that it was a fungus at that time. As he got on and off the bulldozer he used to do custom farming construction projects, he kept hitting the toe and aggravating it. Although it was sore and uncomfortable, he did not realize how badly the fungus had affected the toe. He finally discovered the extent of the damage one day while showering. He sought medical help immediately but the infection was so severe that it resulted in an amputation of the leg below the knee.

Craighead developed type 2 diabetes when he was 40 years old. At first he was able to control it with just a special diet and exercise. As time went on, his condition required him to take insulin pills. Today, in addition to watching his diet and getting enough exercise, his treatment includes a combination of insulin pills and insulin injections. He uses the common type of monitoring device and injection system.

### *AgrAbility Staff Visit*

Shortly after he returned home from the hospital, AgrAbility staff visited him at home. Together they discussed his plans for running the operation with his now limited mobility.

Prior to the surgery Craighead had a full time position as the maintenance supervisor at a nearby university. He worked his 120-acre farm part-time. Seven years ago he left his maintenance position and "retired" to fulltime farming. In addition to raising 40-45 head of beef cattle and putting up hay for them, he also raises and sells 100 acres of hay for other farmers in the area. He spends a good deal of time using his bulldozer to do custom construction (e.g., putting in fence posts and ponds) for other farmers.

AgrAbility staff left a resource manual with Craighead for him to review and determine if the manual included ideas for modifications that he would like to try.

*"The AgrAbility staff were very helpful and easy to talk with. The resources they showed me and helped me get through vocational rehabilitation made a big difference in my life!"*  
-- Gerald Craighead

## Diabetes - A Serious Health Problem

Diabetes is a serious public health problem in the United States. According to statistics from the Center for Disease Control (CDC)<sup>1</sup>, diabetes is the seventh leading cause of death listed on U.S death certificates. In 1996 alone, it contributed to more than 193,000 deaths.

Currently, an estimated 10.3 million people in the United States have been diagnosed with diabetes—a six-fold increase over the past 40 years—and another 5.4 million people have undiagnosed diabetes. About 2,200 new cases are diagnosed every day in the United States. The prevalence of diabetes among adults increased 33 percent between 1990 and 1998.<sup>2</sup> These people are all at increased risk for serious health complications.

Diabetes is the leading cause of end-stage (chronic, irreversible) kidney disease, lower extremity amputations not related to injury, and new cases of blindness among adults 20–74 years old. It increases the risk of heart attack and strokes two to four times. And although people with diabetes are about three times more likely to die of complications from influenza (flu) and pneumonia than are people without diabetes, only 50% get an annual flu shot.

### *Populations at increased risk*

Diabetes occurs among Americans of all ages and racial and ethnic groups. CDC data indicate, however, that a larger percentage of Americans over age 65 (18+%) have the disease than those younger. Although AgrAbility data on type of disability was not collected by age category, the data does indicate 220 clients, which is about 3% of all those who received direct on-site assistance, reported having some form of diabetes.

In addition to older Americans, certain racial and ethnic populations, including African Americans, Hispanics/Latinos, American Indians, and Alaska Natives are more prone to develop diabetes than their non-Hispanic white counterparts of similar age. Several studies have also shown increased rates of diabetes among certain Asian and Pacific Islander populations.

### *Cost to society*

The American Diabetes Association<sup>3</sup> estimates that the nation spends more than \$98 billion annually on the direct and indirect costs of diabetes. Medicare costs for treatment of kidney failure alone average \$51,000 per person. The full economic impact of diabetes is, however, difficult to measure, because death records frequently do not indicate whether diabetes was a contributing factor in the deaths.

The costs related to undiagnosed diabetes are unknown. In addition, we have no way to measure the costs to families and communities when their members' lives and abilities are lost.

### *Farming with Diabetes (continued from Pg. 1)*

AgrAbility staff made a second visit to conduct a worksite assessment and talk with him about how assistive technology could make his tasks a little easier and his farm more accessible. Together they determined that automatic drive-through gates in the pastures, a new remotely controlled door on his workshop (the old door was too heavy for him to raise by hand without putting undue pressure on his prosthesis), and hand-controls for four of his vehicles were the three most pressing needs.

### *Contacting DVR*

The staff put Craighead in touch with a counselor at the Department of Vocational Rehabilitation so he could request assistance from the department in making the modifications necessary for him to work fulltime on the farm. Craighead then worked directly with DVR to get the modifications purchased and installed. He says he is slowing down the farming a bit now but has purchased a new fully automatic bulldozer and is continuing to do the construction work. The modifications remain important to his mobility whether he is farming or doing custom farm construction.

**Definition**

The term *diabetes mellitus* (*diabetes*) describes either a deficiency of insulin or a decreased ability of the body to use insulin, a hormone manufactured by cells in the pancreas. Insulin allows glucose (sugar) to enter cells and be converted to energy. Insulin is also needed to synthesize protein and store fats. In uncontrolled diabetes, glucose and lipids (fats) remain in the bloodstream and, with time, damage vital organs and contribute to heart disease.<sup>1</sup>

**Categories of Diabetes**

**Type 1** (previously called juvenile-onset) diabetes is an auto-immune disease in which the body does not produce any insulin because of damage to the pancreas. Between 5% and 10% of people with diabetes have type 1, which most often appears in childhood or the teenage years. People with type 1 diabetes must take daily insulin injections to stay alive. Symptoms include weight loss, frequent urination, hunger, thirst, blurred vision, fatigue, and/or coma. The goal of treatment is to lower glucose levels with insulin shots plus good diet and/or exercise.

**Type 2** (formerly called adult on-set) diabetes is a metabolic disorder resulting from the body's inability to make enough or properly use insulin. In either case, glucose builds up in the blood. Type 2 is the most common form of the disease, which affects 90%–95% of people with diabetes, and usually appears after age 40. It is nearing epidemic proportions due to an increased number of older Americans and a greater prevalence of obesity and sedentary lifestyles. The goal of treatment is to lower blood sugar and improve the body's use of insulin with effective meal planning, exercise, and weight loss. Sometimes, however, healthful habits like eating well, losing weight, and exercising are not enough. In that case, a doctor may prescribe insulin pills or injections.

**Gestational** diabetes develops in 2–5% of all pregnant women who have never had diabetes before but it disappears when a pregnancy is over. The exact cause is unknown. Women who have had gestational diabetes are at increased risk for developing type 2 diabetes later in life.

**“Other specific types”** of diabetes are less common and together may account for 1%–2% of all diagnosed cases. These types result from specific genetic syndromes, surgery, drugs, malnutrition, infections, and other illnesses. Treatment varies depending on the type.

**Complications of Diabetes**

Many of the complications resulting from diabetes can be prevented with early detection, improved delivery of care, and better education on diabetes self-management. Four of the most serious diabetes-related complications that could be prevented or reduced are listed below.

**Eye Disease and Blindness**—Diabetes is the leading cause of new cases of blindness among adults 20–74 years old. Twenty-five percent of adults with diabetes, or about 1.6 million people, report that they are visually impaired. Each year, an estimated 12,000–24,000 people become blind because of diabetic eye disease.<sup>3</sup> Early detection and treatment could prevent up to 90% of diabetes-related blindness. Only 60% of people with diabetes are receiving annual dilated eye examinations—a key strategy for preventing diabetes-related blindness.

**Kidney Failure**—Each year, about 33,000 people with diabetes develop kidney failure, and more than 100,000 people with diabetes receive treatment for this condition. One half of the new cases of diabetes-related kidney failure could be prevented.

**Nerve Disease and Amputations**—About 60–70% of people with diabetes have mild to severe forms of diabetic nerve damage, which, in severe forms, can lead to lower limb amputations.<sup>3</sup> In fact, diabetes is the most frequent cause of non-traumatic lower limb amputations. The risk of a leg amputation is 15–40 times greater for a person with diabetes than for one without. Each year, more than 86,000 amputations are performed among people with diabetes.<sup>1</sup> Over half of these amputations could be prevented.

## Assistive Technology Notes

## Diabetes

### Technologies for Controlling and Monitoring, and Accommodating Secondary Complications of Diabetes

A variety of assistive technology solutions can be used to help with the control of diabetes and secondary complications that may result from the disease. Diet, medications, and physical activity are important in controlling the disease and preventing potential complications. \* The following assistive technology solutions may be useful in helping individuals achieve their treatment goals and remain as independent as possible on their farms or ranches.

#### Dietary Planning and Diabetes Monitoring

##### Meal Planning Sheets

The American Diabetic Association and the American Dietetic Association have developed six food exchange lists for individuals with diabetes. Meal planning sheets can be used when shopping for and preparing foods. For individuals who are always on the go, meals can be prepared ahead of time and stored in the freezer or refrigerator.

##### Electronic Prompting Aids

Eating meals or a snack at the right time can be challenging for individuals who do not have the same work routine each day. Working long hours, over lunch, or into the night can result in missed snacks or meals, which can result in extreme variations in the blood-glucose levels.

Electronic prompting aids can be very useful in reminding someone when and what to eat. Several of these prompting devices are on the market.

(1) The *Timex Data Link Watch* or *electronic Voice Organizer* allows an individual to record, in his or her own voice, reminders of snacks or meals to be eaten, medications to be taken, or insulin levels to be checked. Commands can be programmed to reoccur daily at the same time. The device is the size of a pager and can be worn on a belt or placed in a pocket. When the device goes off, the individual simply pushes the play button and listens to the reminder.

(2) *Personal Digital Assistants (PDAs)*, such as the Palm Pilot or Visor Handspring, can also be programmed with auditory prompts that can reoccur at the same time each day. These devices require the individual to read the prompt on an LCD screen.



##### Electronic Prompting Aids (con't.)

(3) "Day-Timer" has developed another simple prompting aid that makes a series of auditory beeps that can be programmed for up to 22 reminders per day by simply turning a tiny switch on over the hour or half-hour. The device measures 1" x 5" x 1/4" and can be purchased at many office supply stores. The limitation of this simple prompting device is that when the alarm goes off, the user must remember what the alarm is about.

(4) *Electronic watches* can also be programmed with beeping prompts throughout the day.

#### Insulin Monitoring

Several glucose-monitoring devices are currently on the market. Although each device requires checking the glucose content of a small drop of blood, there are variations in the way this sample is obtained. The majority of the glucose monitoring systems requires the use of lancets, test strips, and a monitor that reads the blood-glucose level. Another type of system, the "AT LAST" Blood Glucose System, creates a small break in the skin of the arm or thigh, capillary action delivers a tiny blood sample to the test strip, and a which can then provide an automatic reading in 15 seconds. Glucose monitors can be purchased at most pharmacies. Medicare and other health insurance usually pay for these monitors.



#### Insulin Treatment

Insulin can be taken in pill form; however, many individuals with diabetes require insulin injections. Newer technologies available to inject insulin include insulin pens that allow the user to dial a selected dosage, insulin jet injectors, and external insulin pumps. Additional technologies under development include an implantable insulin pump and the insulin patch to give continuous insulin.

## Assistive Technology Notes

## Diabetes

### Low Vision or Blindness

Thousands of assistive technology solutions are available to help individuals accommodate low vision or blindness. Technologies include voice/talking output devices, magnification devices or systems, mobility canes, tactile overlays or materials, large print items, lighting solutions, and handwriting guides.

#### *Auditory Outputs*

In addition, there are devices with auditory outputs like talking watches, color identifiers, calculators, scales, clocks, note takers, pagers, organizational aids, text-to-speech computer software (e.g., JAWS or Kurzweil), books on tape, and 4-track recorders/players.

An updated version of *The PARROT Voice Mate* is now available. This is a small hand-held electronic talking organizer that uses voice recognition technology with the following features: a phone book, a voice note pad, an appointment book, a talking alarm clock, and a calculator.

*I.D. Mate*, manufactured by En-Vision AMERICA, incorporates bar-code scanning technology and digital voice-recording technology. Bar code identifiers can be generated and placed on virtually any object or material. With a small portable scanner and digitized voice output device, the user can quickly identify objects in the workplace. This technology could, for example, be used to identify a cow that is being milked in a milking parlor. This same manufacturer also sells *Script Talk*, a portable hand-held electronic device used to identify prescription information that is stored on a microchip imbedded in the paper label of a pill bottle.

#### *Magnification Aids*

Magnification aids include magnifying mirrors, monoculars, video magnification systems for closed circuit TVs, and computer magnification software programs that magnify whatever is on the computer screen (e.g., Zoom Text and Kurzweil).

#### *Mobility Canes*

Mobility canes for individuals with visual impairments may be either folding or ridged and are usually made of aluminum, fiberglass, or graphite. Graphite canes are lighter and more resistant to bending than the others. Less commonly used are laser canes, which emit laser beams that bounce off obstacles.

### Solutions Made at Home (Low-Tech)

Many individuals who have lost their eyesight as a result of diabetes have developed their own low-cost, low-tech solutions to help accommodate their condition.

#### *Protective Clothing*

Protective clothing, such as a wide-brimmed hat, can prevent potential bumps or cuts to one's head. Usually, the brim of the hat will hit a protruding or overhanging object, which will alert the individual to stop before his/her head hits the object.

#### *Apply Padding*

Padding applied to protruding objects can be a simple solution to preventing a potential cut or bruise. If the protruding object cannot be adequately padded, applying padding to the individual might be the next best solution. Padding can include bump hats, construction hats, kneepads, shin guards, or elbow pads. When working in cluttered environments or around wagon tongues, a person can use hockey shin guards to help prevent injuries to his or her ankles and shins.

#### *Contrasting Colors*

Use of contrasting colors on the edges of objects, doorways, and steps make edges easier to see. Glass doors can be marked with black and yellow tape. Areas around the farm site can be identified more easily with tactile ground markers like rocks, fencing, pavers, and paths of #2 crushed-rock with fines. "Puffy paint" and "High Mark" can be used to place markings on dials or scales to identify various measurement increments. Colors or textures of tags, ropes with knots, and chains around the calves' necks will make it easy to identify them quickly.

#### *Adding Sounds*

Wind chimes or radios set to different music stations and in various farm buildings can help an individual orient him or herself when performing work tasks.

Motion detectors with prerecorded messages can be placed in hazardous areas to alert a person to a potential danger or hazard.



**Trained Dogs**

Dogs can also be trained to alert the worker of a potential hazard in the area. Farmers who experienced blindness as a result of diabetes have reported that trained farm dogs can help keep livestock and other animals at a safer distance.

**Organized Shop**

Tool caddies and shop organizers can be useful. Organizing the farm site and workshop so that there is a specific place for everything is an invaluable practice for a farmer with blindness or low vision.

**Proper Foot Care**

Custom shoes are often required to avoid sores or risk of infections. If comfortable, well-fitting shoes cannot be commercially purchased, a podiatrist should be consulted for assistance in obtaining customized footwear. A pedicurist or podiatrist can assist with proper foot care for a person with diabetic neuropathy by, for example, preventing nicks or cuts when trimming toenails.



**Foot or Leg Amputations**

Advances are continually being made to improve comfort, energy storing capacity, and function of lower extremity prosthetic devices. Specific lower extremity prosthetic devices are recommended to individuals according to their level of activity.

**Prosthetic Feet**

Today, manufacturers sell single-axis and multi-axis prosthetic feet. “Multi-axis” feet allow the ankle to twist for uneven terrain. This feature can be useful for farmers and ranchers with well-healed amputations who work on uneven surfaces and constantly climb up and down tractors.

The two primary types of prosthetic feet are energy-storing and energy-saving. The heavier and more active people are more likely to benefit from an energy-storing foot. These feet act like a spring in the toe. The spring compresses (storing energy) and springs back (releasing energy) at toe-off, thus conserving energy that otherwise would be wasted. Examples of energy-storing prosthetic feet include The FlexFoot, The STEN (STored

ENERgy) foot, The Otto Bock Dynamic Foot, The S.A.F.E. (Stationary Attachment, Flexible Endoskeletal) foot, and The Carbon Copy II.

On an energy-saving foot the toe (lever) of the prosthesis is soft rubber and the wood keel is not too long so that little energy will be required to go over the toe of the prosthesis. The lighter and less active people are the more likely they are to benefit from an energy-saving foot. Examples of energy-saving prosthetic feet include the SACH (Solid Action Cushion Heel) and the Seattle Foot.

**Mobility Aids**

Individuals with foot or leg amputations should consider the benefits of using a mobility aid to save energy and prevent potential risks of slip or fall injuries. Mobility aids can be used both indoors and outdoors. These aids include power scooters, utility vehicles, powered wheelchairs, golf carts, or even modified lawn mowers with the blades removed.

**Non-slip Materials**

Non-slip materials, such as grip strut, non-slip ladder rung material, and strips of non-slip material with self-adhesive can be used to prevent slips and falls. Ice grippers can be applied to the bottom of shoes to prevent potential slips or falls on the ice. Special ice gripping cane and crutch tips are also available.

**Crutches**

The latest comfort technology available for those who use crutches is *The Absorber Crutch Enhancer*. This device absorbs up to 90% of the shock transferred to the wrist, elbow, and shoulder each time the crutch strikes the ground. It can be retrofitted into existing metal forearm and axillary crutches.

**For more information:**

Please see the National AgrAbility Project web site at [www.agrabilityproject.org](http://www.agrabilityproject.org) for information on all of the technologies mentioned above and much more.

*\*NOTE: Mention or display of a trademark, proprietary product, or firm in text or figures does not constitute an endorsement by the U.S. Department of Agriculture, Easter Seals, the University of Wisconsin, or the AgrAbility Project, and does not imply approval to the exclusion of other suitable products or firms.*

## Carmen Schacht's Story

Mrs. Carmen Schacht helped her husband run their 267-acre Iowa farm, where they raised field crops, 30 head of beef cattle, and 400-500 hogs. In 1988, she developed necrotizing fasciitis (a condition in which a bacteria attacks and kills the connective tissue within the body). Treatment for the fasciitis required a two month hospital stay, during which time she developed diabetes.

Because of the high doses of antibiotics she received she also developed acute neuropathy. Although she was able to walk with a walker following her first hospitalization, about five years ago she had another severe bout of illness and lost a substantial amount of muscle tone in her legs. At that time Schacht began using a wheelchair and/or a scooter.

### ***FaRM Program Involvement***

In 1989, staff from the Easter Seals Iowa Farm Family Rehabilitation Management Program (FaRM) (which became the nonprofit disability partner in the Iowa AgrAbility Project in 1991) visited Schacht on the farm. Staff completed an accessibility assessment and identified a need for a ramp into the house, a lowered sink in the kitchen, and a bathroom with an accessible tub and shower.

Following the visit, staff helped Schacht get in touch with the Iowa Department of Vocational Rehabilitation (DVR) to explore with a VR counselor if and how the department might be able to assist the Schachts with the needed modifications. DVR did help pay for the modifications. Although the modifications made it possible for her to function more independently in the house, within a year her limited mobility made it necessary for her to give up working with the hogs. And in 1990, she stopped doing outdoor farm work altogether. She remains involved in the book and record keeping of the farm business.

*"AgrAbility is the best program I've ever heard of that helps people deal with disabilities. It helps us help each other."  
-- Carmen Schacht*

### ***Controlling Her Diabetes***

Schacht's diabetes falls under the "other specific types" and "insulin-dependent" categories because it was triggered by an infection; and that combined with the other results of the fasciitis and neuropathy means that she must stay vigilant about her health in order to maintain it. She is very careful about her diet, monitors her blood sugar, and gives herself daily insulin injections. She follows a special Eli Lilly Diabetic diet. To date she has not had any problems with her feet, eyes, or kidneys; and her upper body strength remains adequate. She says she is certain that this is because she follows the health regimen prescribed for her.

### ***Involved in Peer Support Network***

In 1990, Schacht began as a volunteer with the seasonal Community Action Program, where she assisted Low-income Home Energy Assistance Program (LIHEAP). In 1991, she became an employee with the Program and continues to work with the LIHEAP.

At the same time she began this work, she began attending the FaRM/AgrAbility Project peer support network meetings. Since 1990, Schacht has not missed a meeting because, she says, "I always get good ideas from the other people who attend."

Now she works 25-30 hours per month for the AgrAbility Project as a Peer Network Coordinator. The job entails assisting with newsletter preparation, helping with training for those who would like to become peer support group leaders in the remote and smaller agricultural areas in the state, matching peer support volunteers with new clients; and participating in all of the volunteer training offered by the AgrAbility staff.

## Resources and References

### Resources

**American Diabetes Association (ADA)**

<http://www.diabetes.org>

**Center for Disease Control**

<http://www.cdc.gov/diabetes/>

**National Diabetes Education Program** - a joint program of the Center for Disease Control and the National Institute for Health

<http://www.cdc.gov/diabetes/projects/ndeps.htm>

**National Institute of Diabetes & Digestive & Kidney Diseases**

<http://www.niddk.nih.gov/index.htm>

### References

<sup>1</sup>Center for Disease Control and Prevention. "Diabetes: A Serious Public Health Problem", *AT-A-GLANCE 2000*.

<sup>2</sup>American Diabetes Association. "Diabetes Trends in the U.S.: 1990-1998," *Diabetes Care*, 2000, 23:1278-1283.

<sup>3</sup> American Diabetes Association. *Diabetes Facts and Figures*. 2000.

The **AgrAbility Project** promotes success in agriculture for individuals with disabilities and their families through on-site assistance and educational resources. For additional information on the **National AgrAbility Project** or for a current list of state project sites, addresses and telephone numbers contact:

**University of Wisconsin- Cooperative Extension**

460 Henry Mall

Madison, WI 53706

866-259-6280 or 608-262-5166

<http://www/agrabilityproject.org>

**Easter Seals**

700 Thirteenth St., NW-Suite200

Washington, DC 20005

800-914-4424 or 202-347-3066

### States AgrAbility Projects

**Colorado** - Colorado State University Extension Service  
Easter Seals Colorado

**Delaware** - University of Delaware Extension Service  
Easter Seals Delaware

**Illinois** - University of Illinois Extension Service  
Easter Seals Illinois

**Indiana**- Purdue University Extension Service  
Southern Indiana Center for Independent Living

**Iowa** - Iowa State University Extension  
Easter Seals Iowa

**Kentucky** - University of Kentucky Extension Service  
Cardinal Hill Rehabilitation Hospital

**Minnesota** - University of Minnesota Extension Service  
Goodwill/Easter Seals Minnesota

**Mississippi** - Mississippi State University Extension Service  
Mississippi Society for the Disabilities

**Missouri** - University of Missouri Extension Service  
Services for Independent Living

**Nebraska** - University of Nebraska Extension Service  
Easter Seals Nebraska

**North Carolina** - North Carolina State University  
Partnership in Assistive Technology

**North Dakota** - North Dakota State University Extension Service  
Easter Seals North Dakota

**Pennsylvania** - Pennsylvania State University Extension Service  
Easter Seals Central Pennsylvania

**South Dakota** - South Dakota State University Extension Service  
Easter Seals South Dakota  
Avera McKennan Hospital

**Tennessee** - University of Tennessee Extension Service  
Easter Seals Tennessee

**Texas** -Texas Agricultural Extension Service  
Warm Springs Resource Center

**Utah** - Utah State University Extension Service  
Options for Independent Living

**Wisconsin** - University of Wisconsin Cooperative Extension  
Easter Seals Wisconsin

States with affiliate projects are Louisiana, Michigan, Idaho, New Hampshire, New Jersey, New York and Vermont.

The AgrAbility Project is administered by the U.S. Department of Agriculture CSREES. Funding for this document was provided under project number 00-41590-0932.