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In This Issue...

Client Feature

John Baird
pages 1-2

Focus

Lower Extremity
Amputations
page 3

AT Notes

Lower Extremity
Prosthetic Devices
pages 4-5

Project Feature

Breaking New Ground
(Indiana)
pages 6-7

References page 8

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Tractor hand clutches and positive attitude keep Indiana farmer going

It's not often when someone can recall the exact moment when his/her life changes forever, but John Baird of Rockville, Ind. can tell you his exact moment was at 5:32 p.m. on June 5, 1977. The 24 year old farmer was riding his motorcycle home from the fields during a severe summer storm, when suddenly a tree was blown over onto his motorcycle. The impact knocked him unconscious and ignited the motorcycle's gas tank.

"When I came to, everything was on fire," remembers John. His left foot was tangled in the wreckage and he could not free himself. "I burned my hand trying to free my leg and that's when my watch stopped – 5:32 p.m. Luckily, my brother who was following on a different bike found me."

John sustained burns over 60 percent of his body, which required extensive skin grafts, and his left leg was amputated 5 inches below the left knee. Initially, doctors did not expect him to survive the accident, much less resume farming, but John wasn't willing to stop working on his family's farm.

"When I was in the burn unit and recovering, I just kept repeating what my mother always said – 'Everything will work out.' I know it sounds silly, but if you're bitter, nothing is going to work. The best thing is to keep your sense of humor."

John's positive attitude and determination to get back to farming helped him through the long recovery. "It was a year before I could work," recalls John. "I went to work for Moorman Manufacturing Co., a livestock feed and equipment company, as a salesman but kept farming part-time too." For the next 14 years, John worked both on and off the farm. In 1998, he decided to return to farming full-time and quickly settled back into running the 70-head



John Baird on his ATV overseeing his farm operation

Client Story

John Baird

brood cow and 450-acre row crop and hay operation that has been in his family for more than 60 years.

Dealing with an old problem

While John enjoyed farming full-time again, a persistent problem with his thigh-corset prosthetic was becoming more than an annoyance. It was affecting his ability to walk around the farm. The grafted skin on John’s amputated leg is extremely sensitive and more fragile than normal skin. This makes using prosthetics quite difficult and painful. John explains, “I only have so many steps in me before my leg hurts, so I need to save steps whenever I can.”

One way John saves steps is through the use of an ATV to assist him in performing everyday chores around the farm. Unfortunately, this was not enough as John was having difficulty operating the foot pedals in his tractors. The pressure applied to the prosthetic while pushing the tractor’s foot clutch aggravated his sensitive stump and left John in agonizing pain at the end of the day.

In 1999, a friend told John about Purdue University’s Breaking New Ground (BNG) program, Indiana’s AgrAbility project. John contacted BNG and arranged an on-site work assessment of his farm operation. BNG identified two initial methods of reducing stress to his leg; installing hand-clutches in his tractors and modifying the farm’s fences and gates.

After much consideration, John decided to install the hand clutches first. Using the information and literature

from BNG, John worked with a local welder to put in new hand clutches on all of his tractors. They have been a huge success and greatly reduce the stress applied to his leg each day. “I can run that stuff all day without pain now,” says John.

As for BNG’s other recommendations, John hasn’t ruled out installing cattle guards or ATV ramps to his gates and fencing. Those modifications would reduce John’s needs to dismount his vehicles to operate the gates, which in turn would further decrease the stress applied to his leg. “If I was having problems right now, I’d do it,” explains John. “It’s possible I’ll put in additional modifications in the future. But they [BNG] helped me with my major

problem. Plus, this way I get some exercise.” If John eventually finds a need to conserve a few more steps throughout his day, he’s looking forward to working with BNG again and anticipates enlisting the help of Indiana’s vocational rehabilitation system to assist with the modifications to the fences and gates.

Today, John is content with his hand clutches and ATV. He’s also having fun diversifying his farm operation. For the past five years, John and two friends have operated a maple syrup camp that produces about 40 gallons of maple syrup. Last year,

in addition to his regular crops (soybean, corn, wheat and hay), John planted an acre of pumpkins that he sold through a local auction house and an acre of sorghum that yielded almost 55 gallons of molasses. “I’m just trying to get people together and keep a little bit of the old stuff alive,” notes John. ❖



John Baird demonstrating his tractor’s hand controls

Lower Extremity Amputations

Each year, more than 150,000 people join the ranks of over 4 million existing amputees in the U.S. ¹ Currently there are over 380,000 individuals in the U.S. who have had a lower limb amputation. ² The types of lower extremity amputations include: foot amputations, ankle amputations, below-knee amputations, above knee amputations, and hip disarticulation (meaning the entire leg bone has been amputated).

Amputations are primarily caused by injuries, cancer, diabetes, and other diseases. Peripheral vascular disease, resulting in poor blood circulation, account for 74 percent of all amputations. While John Baird experienced his leg amputation as a result of a motorcycle injury, traffic, industrial, and farm-related injuries account for approximately 23 percent of leg amputations. The remaining 3 percent of leg amputations are a result of birth defects. ²

Each year the National AgrAbility Project receives demographic information on clients working with the state AgrAbility projects. Results from 2001-2004 data show that 120 AgrAbility clients reported a lower limb amputation as their primary disability and 26 clients reported lower limb amputations as an additional disability. Of the 146 clients reporting lower limb amputations, 55 percent were amputations below the knee, 35 percent were leg amputations above the knee, 7 percent were foot amputations and 3 percent were toe amputations. ³

Over one third of AgrAbility clients reporting lower extremity amputations as a primary disability report a tractor or farm machinery incident as the cause of their amputation.

The four major types of agricultural operations that AgrAbility clients with leg amputations were involved in were: livestock (37 percent), field grain crops (37 percent), dairy (15 percent), and hay (16 percent). This breakdown is similar to reported farming operations among *all* AgrAbility clients, suggesting that there is no association between type of farming and number of amputations (see Chart 1).

Rehabilitation

Following an amputation, the individual usually waits six to eight weeks before being fitted with a prosthetic device. ⁴ The selection of the most appropriate device depends on several factors including the level and severity of the amputation and the level and type of activities. Individuals who are less active and live a more sedentary lifestyle may choose a basic prosthetic system. Conversely, athletes and active farmers frequently require a more robust system to accommodate the variety of strenuous activities.

The rehabilitation process involves: skin care training and exercises to maintain full mobility of the residual limb; residual limb shrinkage to ensure that the limb is properly shaped; and the fitting process. Rehabilitation goals are established during this process to achieve maximum independence and function in all life activities. This entire rehabilitation process can take up to six months. ⁵ Delays in wound healing, phantom pain, residual limb pain, and infections can all have an impact on the fitting process. ⁶

Farmers who have had a leg amputation are at risk of acquiring secondary injuries due to a slip, fall or an injury to the residual limb (the stump). Exploring preventative measures with a physician, prosthetist, or an AgrAbility staff person can be helpful in developing a plan to reduce these risks. ❖

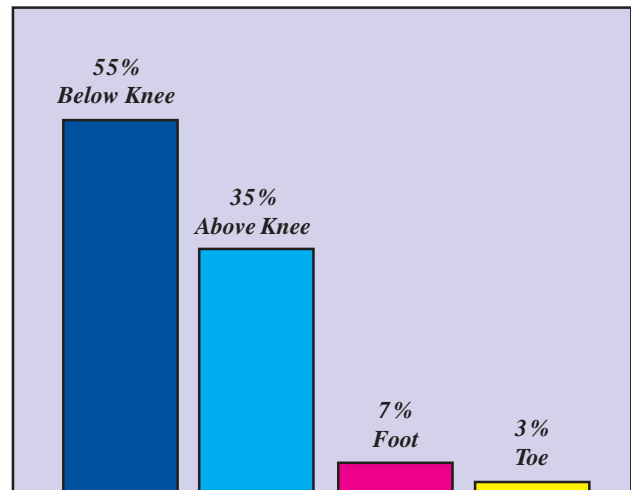


Chart 1: 2001-2004 NAP Demographic Data

Continuing to Farm with Lower Extremity Amputations

Technological advances in the development of new prosthetic devices have produced devices that are more comfortable and stable, provide a more natural gate, save energy, reduce fatigue, increase function, and withstand the forces that farmers experience when performing day-to-day farm tasks.

There are three categories for lower limb prosthetics: above knee, below knee, and partial foot. The basic components of a lower extremity prosthesis include: the socket, a sock or gel liner, a suspension system, a knee joint (articulating joint), the shank (a pylon), and a foot (terminal device)⁷ (Fig. 1).

The *socket* enables the prosthesis to connect and fit to the stump (residual limb). This is the most important prosthetic component. A good fit is critical. A socket that is uncomfortable is a common reason why a prosthesis is rejected. Contoured sockets fit closer to the remaining bones, muscles, and soft tissues providing better support, and provide relief where it's needed for comfort.⁸

Examples of contoured sockets include the Hanger ComfortFlex™ Socket System, Quadrilateral Socket, CAT/CAM Socket, ML socket, Acrylic socket, Total Contact Socket, Pump It Up system, the Otto Bock Air Cushion Socket system and more. *Liners* are sometimes used inside the socket to obtain a better fit and for comfort. A gel liner helps in pressure distribution, comfort, and skin smoothing.

The *suspension system* keeps the prosthesis from sliding off the residual limb. A suspension system may consist of a variety of belts, wedges, straps, suction, or any combination of these.

Individuals who have an above-the-knee amputation often use a *prosthetic knee joint*, a mechanical joint that replaces the knee joint and provides support and control when walking. Advances in prosthetic knees include a hydraulic, pneumatic, a single axis constant friction knee, or an electronic knee. The electronic microprocessor controlled knees, such as the Ottobock C-Leg System

(Fig. 2, see page 5) or the Endolite Adaptive Prosthesis, electronically sample the way a person walks and make immediate adjustments to pneumatic and hydraulic mechanisms in the knee joint. The electronic knee system provides better stability and can assist with stumble recovery to reduce falls and prevent the knee from buckling.⁹ This is particularly important when farmers are walking up or down hilly surfaces or in fields with weeds, plants, or corn stalks that can increase potential stumbles.

The *shank*, also called a *pylon*, can be a hard shell, a tube, or even something that looks like a “leaf spring” and attaches the socket to the foot. Advances in the design of pylons include the ability to allow for axial

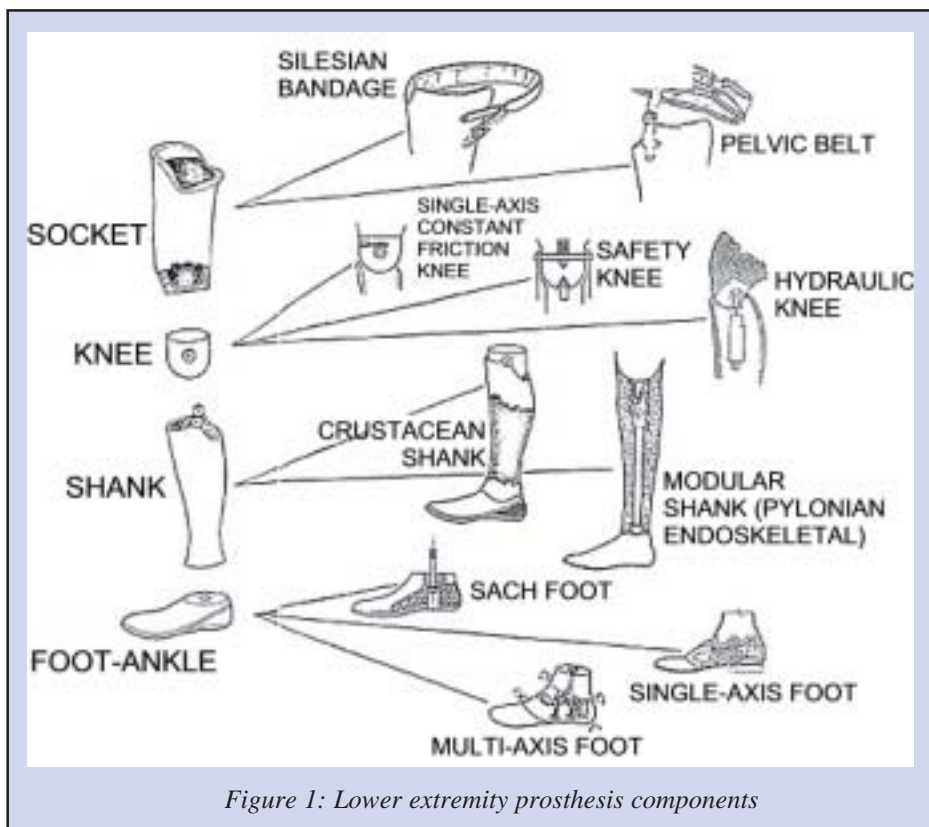


Figure 1: Lower extremity prosthesis components

Continued on page 5

rotation, shock absorption, and energy storage and release. For a farmer, these features may be particularly useful when getting on and off the tractor and walking around rough terrain. The pylon can be covered with a soft or hard covering for cosmetic purposes.

The *foot*, also called the *terminal device* is the part of the prosthesis that comes in contact with the ground, provides movement and a stable weight-bearing surface, and absorbs shock while walking. It may allow movement at the ankle or the foot itself may be flexible to allow movement. Figure 3 shows a wide variety of terminal devices that are available.

Active farmers may find the energy-storing multi-axis foot well suited to their work needs. This type of foot not only helps to absorb shock and save energy, it can also accommodate walking on uneven surfaces or dismounting a tractor. This foot “gives a little” in side to side motion and also adjusts to rotational forces that can occur when walking on rough terrain. Energy-storing feet can also be called a flex foot system, an energy storing foot, multi-axial ankle/foot, dynamic response foot, or flex-walk system.¹⁰

Farmers who use prosthetic devices may also benefit from accommodations to their worksite and equipment. Adaptations or changes may reduce fatigue and stress to the prosthetic device



Fig 2: Ottobock C-Leg System

and other parts of the body. Depending on the farmer’s needs and situation, modifications could be made to equipment or to how the work is performed; such as, additional steps and hand controls in tractors, automatic hitching systems, back saving solutions, outdoor mobility aids, and modifications to buildings, gates, and livestock handling facilities. To learn more about these worksite modifications and assistive technology solutions, go to <http://www.agrabilityproject.org/assistivetech/>. ❖



Figure 3: Various Foot and Terminal Devices

Resources

1. The Global Resource for Orthotics and Prosthetics Information <http://www.oandp.com>
2. Northwestern University: <http://www.repoc.nwu.edu>
3. Health Cyclopedia: <http://www.healthcyclopedia.com/musculoskeletal-disorders/amputee.html>
4. Amputee Treatment Center: <http://www.amputee-center.com/pump.htm>
5. Information about fence and gate modifications is available in the Focus/Assistive Technology section of *AgrAbility Quarterly's* Livestock Management issue (Vol. 3, No. 2) <http://www.agrabilityproject.org/newsletter/index.cfm>.

Figure Credits

1. The Global Resource for Orthotics and Prosthetics Information: <http://www.oandp.com/resources/patientinfo/manuals/ak6.htm>
2. Otto Bock HealthCare: http://www.ottobockus.com/products/lower_limb_prosthetics/c-legproduct.asp
3. Fremantle Orthotic Services (FOS Pty Ltd.): <http://www.fos.com.au/prosthetics/flexfoot.htm>

Breaking New Ground (Indiana)

Breaking New Ground (BNG) began in 1979 when a farmer with paraplegia called Purdue University looking for assistance in getting back onto his tractor. The call was routed to Bill Field, the Extension safety specialist, who took a team of student engineers to visit the farmer and eventually developed a tractor lift, which enabled him to mount the tractor and return to his livelihood.

At the time of BNG's inception, few other programs had attempted to address the challenges of farming with a disability. There was not a federal funding structure for such projects, so during the 1980s BNG operated through a variety of grants and donations, including start-up funding from Deere & Company and continued for several years through funding from the U.S. Department of Education's NIDRR program.

The BNG Outreach Program, which provides technical assistance to Indiana farmers, served as a prime model for the AgrAbility Program and became one of the initial state projects funded in 1991. In addition to technical assistance to individuals, program staff members have also provided direct services to hundreds of rural businesses, churches, county fairgrounds, and Extension offices. The BNG Resource Center was established to develop technical resources, conduct research on rural disability issues, and respond to informational needs outside Indiana. The BNG Resource Center, partnered with National Easter Seals, functioned as the National AgrAbility Project lead from 1991-2000.

In 1996, the BNG Resource Center established a nationwide, toll-free helpline; thereby providing another valuable service resource to consumers and professionals. More than 16,000 calls have been received on the helpline from nearly every state in the U.S. and even from several foreign countries.

The BNG Resource Center has produced more than 50 print, audiovisual, and electronic resources covering a wide range of topics related to disability in agriculture and

rural life. The BNG newsletter, published between 1982 and 2000, included 28 technical reports that targeted specific disability-related issues. *Agricultural Tools, Equipment, Machinery, and Buildings for Farmers and Ranchers with Disabilities (The Toolbox)*, 4th edition, have been some of the program's most highly acclaimed resources. The award-winning *To Everything There is a Season* kit for rural caregivers has spawned numerous caregiving workshops in several states. The *Perfect Fit* and *Bridging Horizons* educational resources were designed and introduced to encourage full inclusion of rural youth with disabilities in traditional 4-H and FFA programs. The most recent publication from BNG is *Arthritis and Agriculture* released in 2004 with more than 6500 copies distributed to date.

Since the early 1980's, BNG has also invested significant time and energy in conducting conferences and workshops related to disability in agriculture, including 10 National AgrAbility Training Workshops, 2 national assistive technology conferences, 14 Caregiving in the Heartland workshops, and over 30 consumer workshops in more than 20 states and 4 Canadian provinces.

The quality of BNG's services has been validated by national awards from a variety of organizations, including the National Safety Council's 2001 First Place Award for the Improvement in the Quality of Life for People with Disabilities and the 2002 RESNA Leadership Award. BNG has also received more than 10 Blue Ribbon Awards from the American Society of Agricultural Engineers for papers, Extension methods, and Extension publications.

Some of the projects most recently initiated by BNG include the Bridging Horizons FFA Contest and self-employment workshops/counseling for people with disabilities. The Bridging Horizons Contest challenges Indiana FFA chapters to complete service projects related to accommodating disability within their communities. The self-employment initiative, begun as a pilot project through

Continued on page 7

Spring 2005

the National AgrAbility Project, has already assisted approximately 10 consumers in developing business plans and several have been approved by Vocational Rehabilitation.

Through the years, BNG programs have provided no-cost, on-site assessments to thousands of farmers and ranchers in Indiana and other states. In many cases, these visits have been pivotal in the future of the particular farm and farm family. As the needs of rural and farm families impacted by disability have changed, BNG has responded by adapting some of its services. What has not changed, however, is the mission of the program to cultivate greater independence for all people with disabilities, especially those involved in the production of our food and fiber. ❖

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William Field, Ed. D. serves as Professor and Extension Safety Specialist at Purdue University. Bill initiated the Breaking New Ground project over 25 years ago and is the project's Principle Investigator. He has 27 years at Purdue.



Al Tolbert is the Executive Director of the Southern Indiana Center for Independent Living (CIL) where his duties include program management and advocacy. He has worked at the CIL for 9 years and BNG for 15 years.



Paul Jones is the Manager of the BNG Resource Center. His duties include overseeing project management and resource development. He has worked with BNG six of his seven years at Purdue University.



Denise Heath is an Administrative Assistant at Purdue University. She provides general administration support and has worked with BNG since it started over 25 years ago. She has worked at Purdue for 26 years.



Stephen Swain is the Rural Rehabilitation Specialist. His duties include conducting site assessments and generating public awareness. He has worked for BNG since starting at Purdue four years ago.



Ed Kirkpatrick is an Editor at Purdue University. His duties include editing, proofreading and shipping BNG materials. Ed has been with BNG 15 of his 34 years at Purdue.



Sharyl Border is Vice President of Health Promotion for the Indiana Chapter of Arthritis Foundation. She works on health education and public awareness. She has worked for the Arthritis Foundation for four years and with BNG for three.



Randy Martin is a Consumer Consultant for the Southern Indiana Center for Independent Living. His duties include conducting site assessments and generating public awareness. He has worked with BNG for two years. ❖

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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

Easter Seals, Inc.
700 Thirteenth St., NW, Suite 200
Washington, DC 20005
800-914-4424 or 202-347-3066

<http://www.agrabilityproject.org>

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