California AgrAbility

Finding Solutions for Californians Farming with Injuries and Disabilities

California AgrAbility Program

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CalAgrAbility is a partnership between the University of California Farm Safety Program (Cooperative Extension) and the California Arthritis Foundation Pacific Region Sacramento/ Central Valley Office.

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Gripping News for Farm Hands

When CalAgrAbility staff mention farm hands, we are usually talking about workers who plant and harvest our produce …. rather than the actual digits used to do the planting and harvesting.

The hand may be one of our most under-appreciated tools. CalAgr-Ability has seen many work-related injuries to hands suffered by farmers and employees.

According to CalAgrAbility staff, studies show that in one year the greatest number of *occupational* injuries treated in US hospital emergency departments were acute hand injuries (e.g. lacerations, crushed or fractured hands). These constituted about one-third of the 3.3 million work-related injuries treated that year.[1]

Our hands are our main tools for physically interacting with our farm environment. They are capable of gross motor skills (i.e., grasping a large wrench) and fine motor skills (i.e., picking up a small screw). Because our fingertips have dense nerve endings, our digits give us valuable tactile feedback. Our sense of touch is intricately involved with our hands. And, the right and left hands are controlled by opposite brain hemispheres. This determines handedness.[2]

In dangerous jobs like farming, our digits are the most exposed organs in our bodies. Our fingers are special, because *there are no muscles inside the fingers*. The muscles that bend finger joints are in the palms and forearms. Similar to string puppets, muscles are connected to finger bones by tendons, which pull on and move the fingers. *(Fig. 2)*

Figure 1: The hand has 29+ bones (Image: http://visual.merriam-webster.com/terms-of-use.php)

Everyone is different, but generally *each hand* has

- 29 bones *(Fig. 1)*
- 29 joints.
- 123 named ligaments
- 34 muscles that move the fingers and thumb:
  - 17 muscles in the palm of the hand
  - 18 muscles in the forearm
- 48 named nerves:
  - 3 major nerves
  - 24 named sensory branches
  - 21 named muscular branches
- 30 named arteries
- 30+ smaller named branches [3]

[1] Safety Science, V. 38, Issue 3, Aug. 2001, 241-256
[2] *http://emedicine.medscape.com*
[3] *Electronic Textbook on Hand Surgery (http://www.eatonhand.com/index.htm)*

Resources

Simple Solutions: Ergonomics for Farm Workers
National Institute for Occupational Safety and Health
NIOSH Publication No. 2001-111
http://www.cdc.gov/niosh/docs/2001-111/

A Guide to Selecting Non-Powered Hand Tools
National Institute for Occupational Safety and Health
Publication No. 2004-164
www.cdc.gov/**niosh**/docs/2004-164/pdfs/2004-164.pdf

Cal/OSHA
California Department of Industrial Relations
(510) 286-7000
http://www.dir.ca.gov/dosh/contactus.html

American Society of Hand Therapists
15000 Commerce Parkway
Ste C
Mount Laurel, NJ 08054
856.380.6856
Fax 856.439.0525
asht@asht.org
http://www.asht.org/

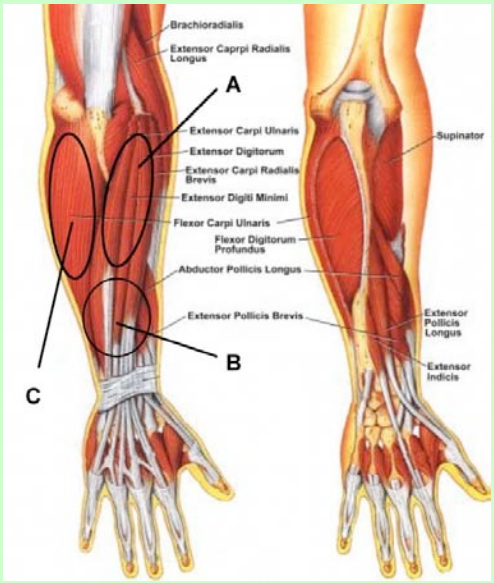

Figure 2: Muscles that move fingers are in the palms and forearms (Image: health.com)

Didn't Your Mom Ever Tell You to Stand Up Straight?

Awkward postures place more stress on your wrists, hands, shoulders, elbows and back. To reduce pain and fatigue choose tools that require the least continuous force and do not put you in an awkward position. *(Fig. 3)* The ***right tool*** will help keep your neck, shoulders, and back relaxed and your arms at your sides.

The best tool is one that:

- Fits the job you are doing
- Fits the work space available
- Reduces the force you need to apply
- Fits your hand

The origin of the common term, ***Rule of Thumb,*** is not clear. Some say it originated with wood workers who used the width of their thumbs rather than rulers to measure inches.

Others swear it started with ***farmers*** when planting in their fields. Plants need a fairly precise depth to seed properly, whether planted from seed or being replanted, and the depth has historically been estimated using the thumb. (Safire, William, *Uncertain Terms*)

CalAgrAbility spoke with Dr. Carla Wilhite, OTR/L, Assistant Professor, Dept of Occupational Therapy, U. of North Dakota-School of Medicine & Health Sciences, who says there are many factors causing hand injuries on farms. For instance, the farmer's state of mind, attention toward the task and attitude toward safety play roles in injuries. Removal of power safety guards can result in death, amputations, and severe lacerations. Careless handling of toxic chemicals cause severe burns, and lack of concentration near animals could mean deep bites and crushed, broken hands.

Wilhite, a former AgrAbility OTR/L, emphasizes that hands and wrists are often the first injured in falls, since we use them instinctively to reduce impact during falling. Fingers are injured during routine work on farms, i.e., hitching and unhitching implements cause digits to be crushed or amputated.

Dr. Wilhite also says that stresses on the musculoskeletal system, especially repetitive motions, cause wear and tear and cumulative trauma to our hands and wrists. This results in chronic illnesses and strains, i.e., tendonitis, carpal tunnel, bursitis, and arthritis.

There is no debate among medical professionals that using ergonomics principles on farms will reduce injury and chronic strains to hand and wrist muscles and joints.

Figure 3: Wrong and Right Postures when working with hand tools (Images: NIOSH Pub. No. 2004-164)

RESOURCES

Protect Hands!

Use rubber (not cotton) gloves for handling **hazardous liquids** because rubber repels liquids, while cotton absorbs them.

Chilblains is a nonfreezing cold injury caused by prolonged skin exposure to cold & wet temperatures (above freezing). Skin is red, tender, and hot to the touch, itchy with a pins & needles sensation & numbness. Fingers are frequent victims of chilblains that can be prevented with insulated cold-wet gloves.

Ambidexterity is a specialized skill where there is no dominance between body symmetries (handedness). So tasks requiring fine motor skills can be performed with the left or right extremities. The most common example of ambidexterity is the ability to write with the left or right hand, rather than one dominant side. Only 1 out of one 100 people are naturally ambidextrous *(http://www.sciencedaily.com/)*

Gripping News …. *Continued*

Get A Grip! Choose Tools with Right Handle

CalAgrAbility ergonomics experts say that tool design (weight, shape, fit) and work station design go "hand-in-hand." Ideally, a worker should be able to operate a tool with one hand. Therefore, the weight of the tool, especially for repetitive use, should not exceed 2 lbs. Adjust your work area. Awkward postures require using more force, leading to strained hands and wrists. Test tool handles for proper fit to reduce stress on fingers and arms. *(Figs. 4,5,6)*

*Figure 4: Best **handle diameter** for power tasks is 1-1/4 in. to 2 in. (Images: NIOSH Pub. No. 2004-164)*

*Figures 5 & 6: **Open grip span** for power tasks not more than 3-1/2 in. and **closed grip span** not less than 2 in. (Images: NIOSH Pub. No. 2004-164)*

Tool Tips ……

- Avoid handles with finger grooves since finger size & placement differ from person to person
- Use tools with handles covered in a soft material
- Use handles with no sharp edges and seams
- Choose spring-loaded double-handled tools [4]

[4] *Occupational Health & Safety, Nov. 2008*

Tool Tips ……

- Palms are full of pressure-sensitive nerves and blood vessels and high-force tasks can damage them
- Choose handles long enough that the ends won't press into the palms [5]

[5] *NIOSH Pub. No. 2004-164*

About CalAgrAbility …

The California AgrAbility Program's primary goal is to help farmers, agricultural workers, ranchers and their families to continue working in agriculture regardless of physical limitations, impairments and disabilities. Staff will help conduct on-site assessments and identify appropriate assistive technologies to make the job safer and easier. This is supported by the NIFA (USDA) under special project number 2010-415090-20751.

1-800-477-6129