Farm Labor Contractor Education Institute
July 12, 2005

Why and How to Help Workers Control Heat Stress

Howard Rosenberg
University of California at Berkeley

Why worry?

(COURTESY KMSP)

(AP PHOTO)

bakersfield.com
The Bakersfield Californian

Tuesday, August 10 2004

Farmworker's death spurs UFW plea

Employers urged to raise standards; grower says safety always first

By MISTY WILLIAMS, Californian staff writer
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Posted: Monday August 2nd, 2004, 11:05 PM
Last Updated: Monday August 2nd, 2004, 11:15 PM

The son of a farmworker who may have died of heatstroke last week was joined by UFW officials Monday in calling for better emergency procedures and standards for the region's growers.

Jose Asuncion Valdivia, 53, died Wednesday after becoming ill while finishing up a 10-hour day picking grapes for Giumarra Vineyards in the Wheeler Ridge area.

Valdivia's son, Luis Angel, who also worked at the vineyard, said his father began complaining of dizziness and nausea in the late afternoon heat.

“Unfortunately, we only hear about it when it becomes a tragedy”

FresnoBee.com

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Intense heat is tied to deaths

Tomato picker dies after collapsing, and transient succumbs.

By Matt Leedy and Michael Baker
The Fresno Bee

(Updated Sunday, July 14, 2002, 4:47 AM)

CHOWCHILLA -- A 60-year-old farm laborer died Friday morning, a day after collapsing with a 107-degree body temperature while picking tomatoes in triple-digit heat.

Edwardo Jimenez Chavez sought shelter in a barn on Happy Boy Farms before he succumbed to the heat. Chavez was taken to the Chowchilla Hospital Clinic and transferred to Madera Community Hospital, where he died.

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Friday evening, authorities reported a second death possibly related to the intense Valley heat.

An unidentified man described as a transient in his 60s died as he sat on a downtown Fresno bench, p

Autopsies on the men could begin today.

When Risk Factors are Present

Relevant Legal Guidance

The General Duty: ". . . provide a safe and healthful workplace . . ."

GISO, Group 1, §3203. IIPP

The Program shall . . . at a minimum:

(2) Include a system for ensuring that employees comply with safe and healthy work practices.

(3) Include a system for communicating with employees . . . on matters relating to occupational safety and health.

(4) Include procedures for identifying and evaluating work place hazards

(7) Provide training and instruction . . . .

From the Model IIPP

LIST OF TRAINING SUBJECTS

We train our workers about the following checked training subjects:

AGRICULTURE PRODUCTION AND FARM LABOR AND MANAGEMENT SERVICES
(SIC Codes: 0111-0119, 0131-0139, 0161, 0171-0179, 0191, 0721-0724, 0761-0762)

- ☐ Safe practices for operating any agricultural equipment, including procedures for cleaning, repairing, servicing and adjusting.
- ☐ Electrical hazards.
- ☐ Heat stress.
- ☐ Ergonomic hazards, including proper lifting techniques and working on ladders or in a stooped posture for prolonged periods at one time.
- ☐ Hazardous chemical exposures.
- ☐ Other job-specific hazards, such as_____
  _____
  _____

CCR Title 8, §3457. Field Sanitation

Agricultural operations shall meet the following requirements:

(1) Potable drinking water.

(A) Potable water shall be provided during working hours and placed in locations readily accessible to all employees. Access to such drinking water shall be permitted at all times.

(B) The water shall be fresh and pure, suitably cool, and in sufficient amounts, taking into account the air temperature, humidity, and the nature of the work performed, to meet the needs of all employees.

(C) The water shall be dispensed in single-use drinking cups or by fountains. The use of “common use” drinking cups or dippers is prohibited.

(D) Drinking water containers shall be constructed of materials that maintain water quality, and shall be provided with a faucet, fountain, or other suitable device for drawing the water.

§3457. Field Sanitation (more)

(4) Reasonable use: The employer shall notify each employee of the location of the sanitation facilities and potable water and shall allow each employee reasonable opportunities during the workday to use these facilities. The employer shall ensure that employees use the sanitation facilities provided and shall inform each employee of the importance of each of the following good hygiene practices to minimize exposure to the hazards in the field of heat, communicable diseases, retention of urine, and agrichemical residues:

(A) Use the water and facilities provided for drinking, handwashing, and elimination;

(B) Drink water frequently, especially on hot days;

. . . . . .

ASHIP: Heat Stress Hazards

- “Agricultural workers during the hot summer months are at risk of heat stress.”
- “Employers must provide plenty of cool, potable water and ensure that all workers drink [it] throughout the workday.”
- “Employers should schedule frequent cool-down breaks and time the heaviest workload during the coolest part of the day.”
- “Employers should provide a working environment that encourages workers to break for water and cool-down periods.”

Basic Terms

Heat stress: An accumulation of heat in the body that raises core temperature and threatens normal functioning.

Heat illness: A breakdown of normal physical or mental functioning that is caused by heat stress directly or by the body's response to it.

Heat Illnesses

- *Pre-illness*
- *"Minor"*
  - Heat rash, other skin ailments
  - Heat syncope
  - Heat cramps
  - Heat exhaustion
- *Major*
  - Heat stroke

Heat Rash - Prickly Heat

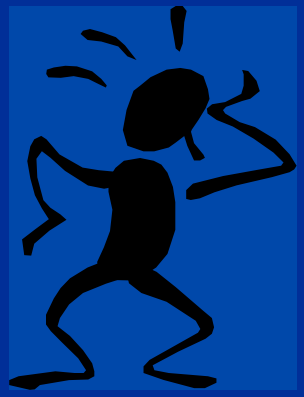
- Inflammation of skin and ducts
- Secondary bacterial infection is common; can block pores
- May progress to chronic dermatitis with prolonged exposure
- Rx: cleanse and dry skin; apply soothing lotion or 1% topical salicylic acid to inflamed area

Heat Syncope

- Loss of consciousness
- Blood collection at extremities; slow flow
- Occurs most in unacclimatized individuals in early stages of exposure to high heat
- Greatest danger is injury from fall
- Rx: drink fluids; rest; ventilation

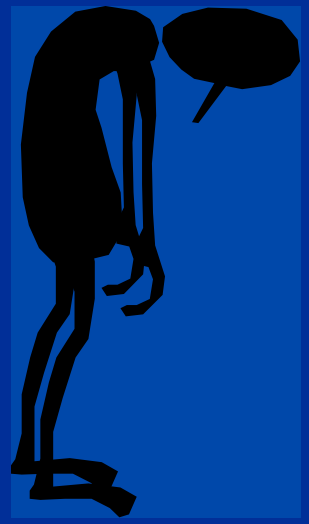
Heat Cramps

- Painful, involuntary muscle contractions
- Most common in legs, arms, abdomen
- Induced by loss of fluid and electrolytes
- Rx: rest in cool environment; replace water and salts; use 0.1 to 0.2% saline fluid, not tablets



Heat Exhaustion

- May develop over a few days
- Consciousness usually maintained
- Non-specific symptoms
  - Dizziness/ weakness/ fatigue/ malaise
  - Lightheadedness/ nausea/ vomiting
  - Headache/ blurred vision
  - Heavy sweating, paleness
  - Fast, weak pulse/ shallow breathing
- Depletion of water and salts from body
- Core temperature rises, up to 104 F
- Rx: drink fluids, rest, go to cooler environment



Heat Stroke

- Ultimate failure of coping mechanisms
- Profound dehydration
- Classic triad
  - Very high body temperature (> 104 F)
  - Hot, dry, reddish skin; dry mucosa
  - CNS out to lunch; confusion, headache
- Rapid, stong pulse
- Denial of oxygen to brain
- Rx: Cool using any method. Get help !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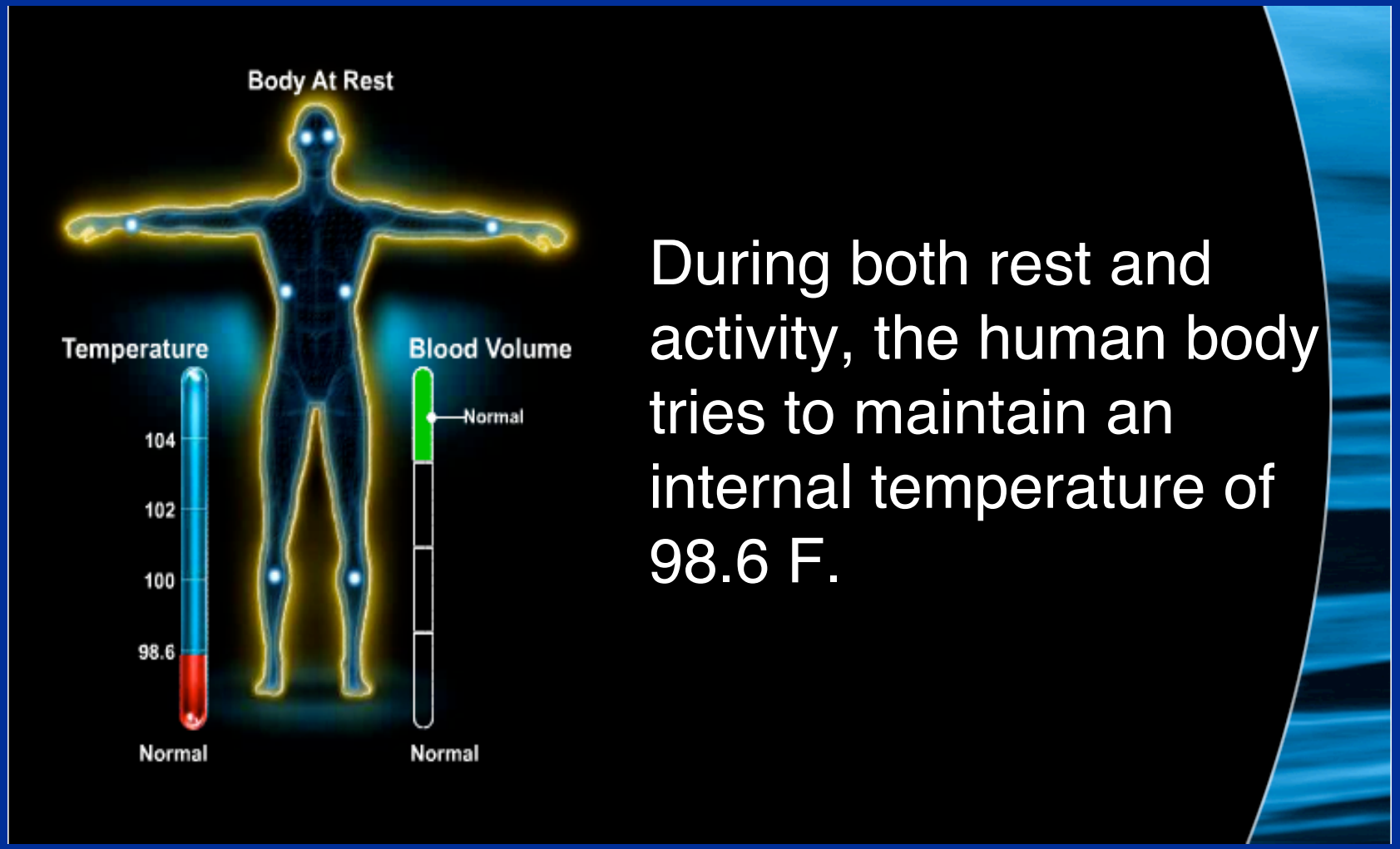
Physiology of Heat Stress



During both rest and activity, the human body tries to maintain an internal temperature of 98.6 F.

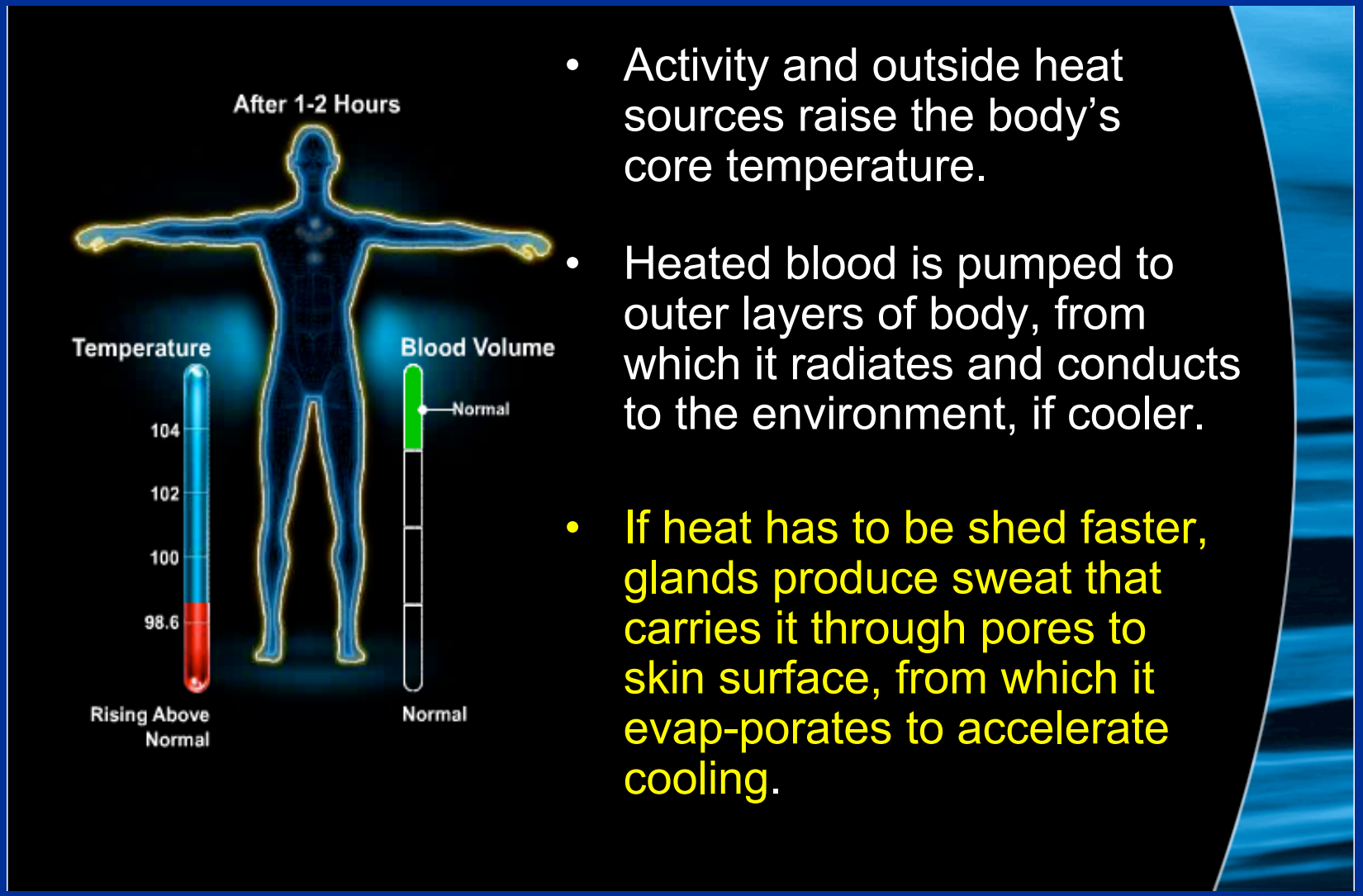
High Temperatures in CA & AZ

	May	Jun	Jul	Aug	Sep	Oct
Cloverdale	77.5	84.9	90.7	90.0	86.2	77.9
Modesto	81.5	88.9	94.1	92.3	87.4	78.3
Watsonville	66.2	67.8	70.2	71.2	73.2	71.8
Yuma	94.2	103.3	106.6	105.3	100.5	90.3
Phoenix	93.6	103.5	105.9	103.7	98.3	88.1
Bakersfield	84.6	92.3	98.4	96.4	90.0	80.6
El Centro	94.1	104.0	108.0	106.2	101.3	90.0

Activities Generate Heat

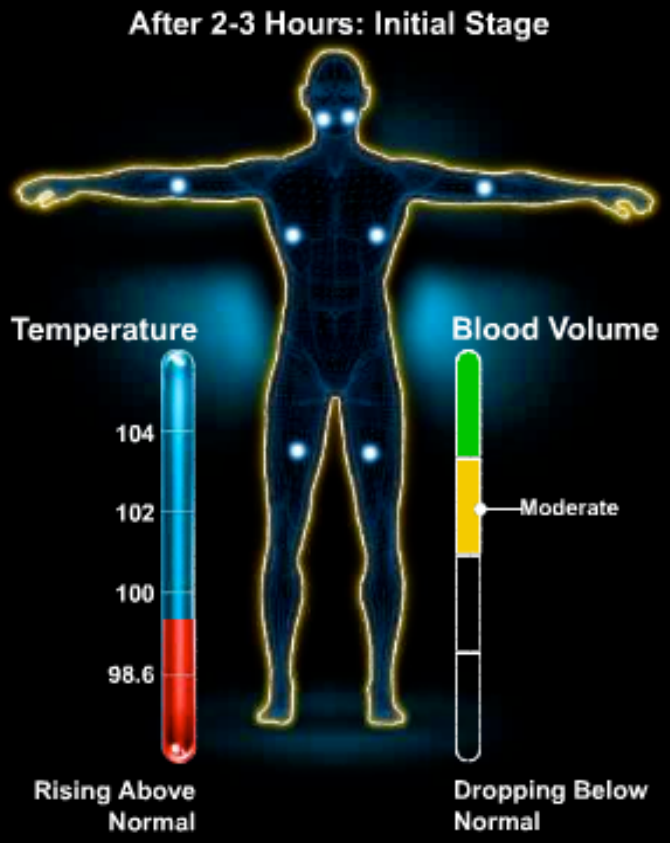
activity	kcal/hour
Resting	60-90
Standing	90-120
Driving	120-180
Factory work	210-400
Walking, flat surface	300-400
Construction tasks	300-600
Swimming	300-880

Physiology of Heat Stress



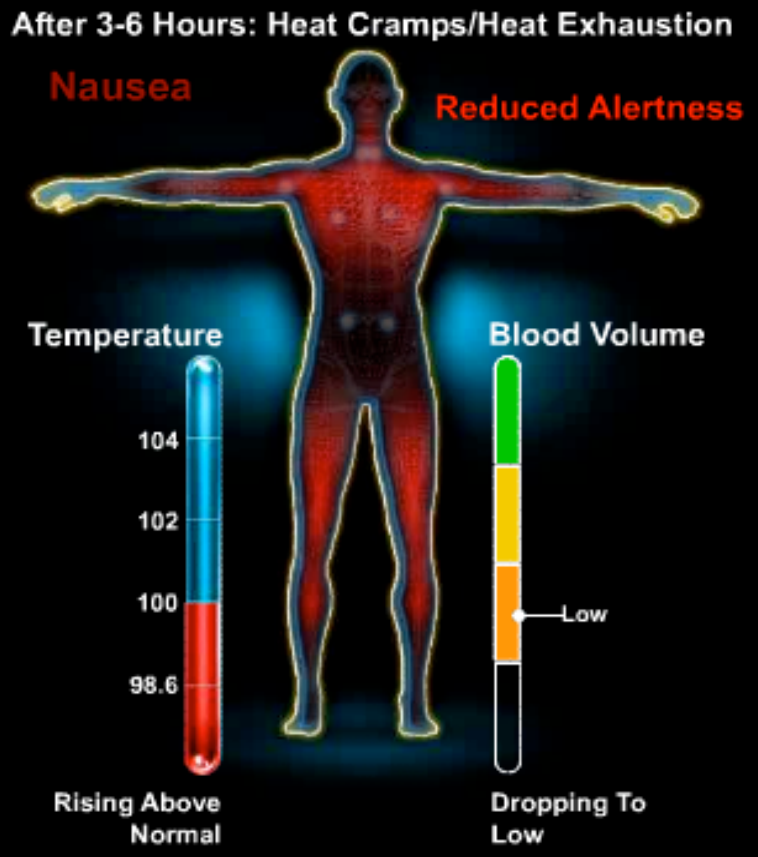
- Activity and outside heat sources raise the body's core temperature.
- Heated blood is pumped to outer layers of body, from which it radiates and conducts to the environment, if cooler.
- If heat has to be shed faster, glands produce sweat that carries it through pores to skin surface, from which it evap-porates to accelerate cooling.

Physiology of Heat Stress



- During heavy work, a body can lose 1-2 liters of water per hour.
- After 2-3 hours of fluid loss, a person is likely to:
  - Lose endurance
  - Become uncomfortable
  - Feel hot
  - Sense thirst

Physiology of Heat Stress



- The longer a body sweats, the less blood there is to carry excess heat to skin or oxygen and nutrients to muscles.
- After 3 hours, a dehydrated worker may experience:
  - Headaches
  - Muscle fatigue
  - Loss of strength
  - Loss of accuracy and dexterity
  - Heat cramps
  - Reduced alertness
  - Nausea

Heat Stress Effects if Fluid not Replaced

Level	Cum. fluid loss	% Body wt.	Time till*	Symptoms and effects
Minor dehydration	1.5 lb. (.75 L)	1%	1 hr.	Generally not perceived.
Incipient stress	3.0 lb. (1.5 L)	2%	2 hrs.	Begin thirsty, hot, minor discomfort.
Moderate stress	4.0 lb. (2.25 L)	3%	3 hrs.	Loss of energy, muscle endurance.
High stress	6-9 lb. (3-4 L)	4-6%	4-5 hrs.	Impaired coordination, endurance. Low energy, strength. Fatigue, cramps.
Very high (exhaustion)	9-12 lb. (4-5.5 L)	6-8%	6-7 hrs.	Headache, dizziness, nausea, Serious fatigue.
Emergency (stroke)	11+ lb. (5+ L)	7+%	7+ hrs.	High temperature. Confusion. Loss of consciousness.

* based on a 150 lb. male doing moderately active work in hot weather and not replacing fluids

More Hazards of Heat Stress

Besides the medical hazards of illness or injury, heat stress raises risks of accidents.

- Direct causes of accidents:
  - Sweat in the eyes
  - Slippery hands
  - Fogged glasses
  - Dizziness or fainting
- Indirect causes of accidents:
  - Physical discomfort
  - Slower mental and physical job reactions
  - Diverted attention, loss of concentration
  - Lapse in judgment
  - Irritability and anger

Environmental Factors that Affect Body Heat Gain and Loss

- Air Temperature
- Air Movement
- Humidity
- Radiant Heat
- Altitude

Personal Factors Affect Heat Stress

- Activity level (metabolic heat)
- Fluid intake and electrolyte replenishment
- Alcohol and drug use

- Diet
- Acclimatization
- Physical fitness
- Body fat
- Age

Recommended Measures

- Monitor environment and provide alerts
- Evaluate and modify work assignments
- Adjust rest period frequency and length
- Schedule heavier jobs for cooler hours
- Allow a few days for acclimatization
- Wear light clothing and lightweight protective gear
- Consider cooling garments
- Climate-control machine operator cabs
- Educate about recognition, treatment, physiology
- Increase fluid consumption

Fluid Replenishment Guidelines

U.S. Military & NIOSH Research:

- 25 oz./hr. during moderate work at 82-90 deg.
- 33 oz./hr. during heavy work at 90+ deg.
- Drinks small amounts frequently (drip, not flood)
- Don’t wait for thirst
- Rest every hour, a lot

Real World of Agriculture

- Have to get work done on time and budget
- Physically demanding jobs
- Unconditioned environments
- High temperatures and humidity
- PPE burden -- may cover face, scalp, torso
- Opportunities to drink water vary

Field Observations

- Water generally available
- State of the art is "igloo"
- Infrequent visits to it
- Large quantities drunk each visit
- Much less consumption than advisable
- Hypo-hydration likely
- Less access taken while on piece-rate

On the pickup

At the truck

On the toilet trailer

At the end of the row

In a product truck

On the gondola

On the harvest machine

On a dedicated tractor

Why not replenish enough?

- Impetus to drink
  - Thirst-driven
  - Some fears
  - Understanding of need and function
- Costs to access the water
  - Physical effort
  - Supervisory disapproval
  - Co-worker respect
  - Earnings opportunity

What more can managers do?

- Reduce various costs of access
- Help workers understand the physiology and recognize symptoms
- Support through foremen and culture

Personal "hydration system"?

Personal container

Training Choices

- What form
- Who delivers
- Where to hold meetings
- When to provide
- How deep to explain
- What materials to draw on

Problem and Prevention
Practicalities of Access
Employer Obligations
Field Studies
DANR Workgroup
References

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Recap

- Heat stress risk common in agriculture
- Harmful effects for people and business
- Sports physiology provides guidance
- Lessons not widely known or applied
- Workplace conditions present barriers
- Can do better anyhow
  - Reduce "costs" of access to water
  - Educate foremen’s and workers’ decisions

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