

LIGHTNING DATA CENTER  
SEPTEMBER 5, 2003  
MINUTES  
ST. ANTHONY HOSPITAL, DENVER

Quote of the Month:

"Under ordinary circumstances, the process of rain production depletes clouds. The 'sink rate,' or the rate at which water leaves a cloud, exceeds the supply of moisture arriving from the air and sea below, causing clouds to dissipate like ghosts returning to the afterworld. But hurricanes defeat this cycle. They use wind to harvest moisture and deliver it to the centers...The result can be rainfall more akin to the flow from a faucet than from a cloud."

Erik Larson in Isaac's Storm, 2000

1. Meeting began at 11:30 am and adjourned at 1:20 pm.
2. Members present: Arendt, Burrows, Cherington, Collier, Foley, Gift, Glancy, Hodanish, Kozak, Lee, Lines, Mayes, McDonough, Meinert, Mouchantat, Nibbe, Olsen, Olson, Russon, Schoesson, Stewart, Wallin, Wachtel, Wells, Yarnell.
3. I brought the following articles (abstracted in part here):
  - a. Garry DJ, Mammen PPD. Neuroprotection and the role of neuroglobin. Lancet 2003;362:342-3.

"The adult human brain contains more than 100 billion neurons...and requires more than 10% of the cardiac output to maintain function and consciousness. Prolonged interruption of blood flow results in a cerebrovascular accident (ie. Stroke). Tissue haemoglobins reversibly bind oxygen and may facilitate oxygen transport. Neuroglobin is a small protein that is expressed in human brain. The discovery of neuroglobin suggests that the brain, like the heart, contains a tissue haemoglobin that functions in the delivery and storage of oxygen and prevents hypoxic insults. Neuroglobin might function during the acute phases of hypoxic insult to preserve neuronal viability, and may have implications for the treatment of cerebrovascular accidents."

b. AMS Statement: Lightning safety awareness. Updated recommendations for lightning safety - 2002. BAMS (Bull Am Meteorol Soc) 2003;84:260-5.

c. Dmitriev MT, Lakshin AM, Morozov SS. Specifics of ball lightning injuries.

M. Shmatov sent this article to us via mail. We recently had it translated from Russian to English.

4. We received an inquiry from John Kennedy of the New Jersey Library Network. He was seeking help in finding a book on the biography of a man who was struck by lightning while on the phone. The

title was something like: "Behind the Door or Window." The author's first name might be Robert or Bob. Members suggested we ask Steve Marshburn of LSESSI if he can help. Karen Wells, Librarian at Lutheran Hospital will also try to find this book. If any or our members can help, please let us know.

5. Several of our members were highlighted in the media recently.

Rick Russon and other Angel Flight pilots were quoted in a Denver Post article (September 2, 2003 by Greg Griffin). The article dealt with volunteer pilots who fly these "missions of mercy."

Phil Yarnell was quoted in the Rocky Mountain News (August 26, 2003, article by Tillie Fong) about a lightning strike patient that he cared for at St. Anthony Hospital. Phil said the patient "is making excellent progress, but will need to be monitored for the next year for" any long term effects. Phil first saw the patient shortly after he was flown by Flight for Life helicopter to St. Anthony Hospital. He will discuss his observations and thoughts at the October meeting.

6. Our guest speaker, Dr. Raphael C. Lee, of the University of Chicago gave a superb and scholarly presentation. The title of his talk: Tissue injury by electrical force. I shall copy here from my notes taken during his talk (with apologies to Raphael and all speakers where my notes are incomplete and incorrect).

- a. Electrical injuries are complicated: direct, mechanical and thermal effects. One common theme of cell injury - plasma membrane damage.
- b. Plasma membrane is a lipid bilayer that normally is a good transport barrier.
- c. Nerve and muscle cells (as compared to other cells in the body) are especially sensitive to electrical signals.
- d. Electric field = spatial gradient.
- e. Plasma membrane is important to cell viability. It does not well tolerate changes in voltage. Electric current can cause structural damage to plasma membranes.
- f. Direct electrical effects: Electroporation and protein denaturation.
- g. Same physics applies to intracellular "membranes" of mitochondria, Golgi apparatus. Lightning can cause electroporation of inner structures without damaging plasma membranes.
- h. Electric current of short duration (e.g. lightning) - damage to inner organelles. Electric current flowing for longer time - damage to outer cell membrane.
- i. Electric shock damage to membrane: electroporation and ion channel (especially potassium) effects.
- j. Thermal effects (burns). Cell membrane destroyed if temperature is raised from 37o C to 42o C.
- k. Disrupted cell membrane results in cell death. Agents of membrane damage: electrical, thermal, chemical, mechanical, free radicals.
- l. Natural mechanism of sealing (permealize) cell membrane.
- m. Approaches to therapy for membrane injury: repair membrane; replenish ATP requiring enzymes.
- n. Polymers in solution can cause membranes to fuse (polyethylene glycol fuses membranes).

7. These minutes do not represent official positions of LDC members. They simply reflect the comments of members present at the meeting.

8. Our next meeting will be divided into two. There will be two presentations:

A. Brief discussion of HIPPA rules and regulations. Ms. Anissa Smith of St. Anthony Hospital

B. Case reports of Colorado lightning casualties during the Summer of 2003:  
Mike Foley, Steve Hodanish, Sheryl Olson, Phil Yarnell.

Meeting will be held in the Main Auditorium of St. Anthony Central Hospital at 11:30 am on Friday, October 10, 2003.

Respectfully submitted,

Michael Cherington, MD

<<September Dr. Lee.jpg>>