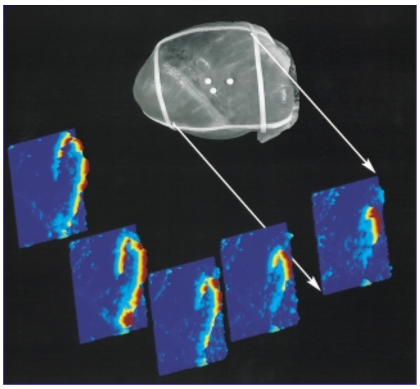
Research Update • Le point sur la recherche

Visualizing ventricular fibrillation

An international team headed by a University of Alberta cardiologist has developed a way to watch the molecular action of ventricular fibrillation (*Nature* 1998;392[6671]). The development allows researchers to see what actually happens when a heart attack triggers this type of arrhythmia.



Dog heart and fluorescent images from within it. On the heart, the white tape indicates the area shown in the images and the 3 dots indicate the pacing sites. The 5 images below span approximately 20 milliseconds. The brighter areas show an increase in voltage. (Arrows indicate the orientation of the images.) A QuickTime movie of these images is available (www.physics.gatech.edu/research/acl).

By applying a voltage-sensitive dye to the membrane of isolated and perfused dog hearts and then illuminating it with fluorescent light, cardiologist and electrical engineer Dr. Frank Witkowski has transformed the electrical activity of ventricular fibrillation into light levels almost intense enough to be seen with the naked eye. Adding more dye or increasing illumination to bring the action within visual range would have interfered with the process he and his colleagues hoped to watch. Instead, they "souped up" the imaging system.

The team's fluorescent imaging camera sees the lower light levels, delivering new information on the out-of-control electrical impulses washing over the heart during fibrillation. But even if the light levels were bright enough for the unaided eye, the action is too fast to observe.

The newly developed camera is incredibly fast. "It allows you to visualize [fibrillation], grabbing a frame almost every millisecond," Witkowski says. "In one second our camera system accumulates 838 frames of data, and each frame has 16 384 sites [pixel resolution]."

He compares fibrillation to ripples or waves in water. If a single, normal heart beat can be represented by the ripples sent out by dropping a pebble into water, ventricular fibrillation can be represented by someone throwing a handful of stones into the water. The waves collide and interfere with one another. And, in the case of the heart in fibrillation, "the wave is completely disorganized with respect to creating the mechanical action."

When the researchers finally looked at fibrillation "there were some things that surprised us," he says. The electrical waves' behaviour "changes in morphology. We thought it would just sit there . . . but it actually changes its morphology."

The new challenge is to begin modelling the action in 3 dimensions — the new imaging abilities simply allow researchers to see the tip of the iceberg. "It probably becomes more 3-dimensional," Witkowski says of the behaviour of the electrical waves. "But I can't see it in 3-D. We are only looking at the outside of the heart." — © *Richard Cairney*.

In the news . . .

The salt of life

In a huge epidemiologic study, US researchers have analysed the relation between salt intake and the risk of death from all causes and from cardiovascular disease (*Lancet* 1998;351:781). And they have found that salt intake and energy intake are *inversely* related to the risk of death: salt and energy intake decrease the risk of death slightly but significantly. The data were obtained from the National Health and Nutrition Examination Survey, which followed 20 729 US adults from 1971–75 to 1992. Many other factors that could account for the risk of death were included in the analysis. While the authors do not advocate any dietary changes based on these findings, the study raises questions about the impact of low-sodium and low-energy diets.

Get off my wheel!

US scientists have raised golden hamsters to become bullies — attacking younger and weaker intruders and leaving animals of similar size and age alone (*J Neurosci* 1998;18[7]:2667-72). The bullying hamsters were exposed to aggressive adults every day during their adolescence. The stress of threat and attack caused a 50% lower-than-normal level of vasopressin in the animals' anterior hypothalamus, a site involved in the regulation of aggression.