

UCSD research scientist Edward Dennis heads the Lipid MAPS project. The pharmacology and biochemistry professor said, "This grant is aimed at laying the groundwork and infrastructure to explore and expand a new field." *K.C. Alfred / U-T*

## Fat study focus of grant

By Keith Darcé, STAFF WRITER  
October 11, 2008

When most people think of fat, they imagine expanding waistlines and clogged arteries. But work by a national team of researchers led by scientists at UCSD is shedding new light on the active role that these molecules, known as lipids, play in diabetes, stroke, cancer, arthritis, Alzheimer's disease and many other ailments.

The study – called Lipid Metabolites And Pathways Strategy, or Lipid MAPS – recently received a major vote of confidence when the National Institutes of Health awarded a \$38 million grant to continue the project for five more years.

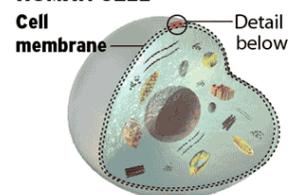
The University of California San Diego's medical school launched the lipids program in 2003 with \$35 million from the agency, the federal government's largest supporter of medical and scientific research.

Lipids are the latest chapter in a decades-long, global effort to map the basic components of cells. Just as gene- and protein-mapping projects have done, the lipids research could open more doors to understanding how diseases work and thereby help scientists create more effective, personalized treatments for patients.

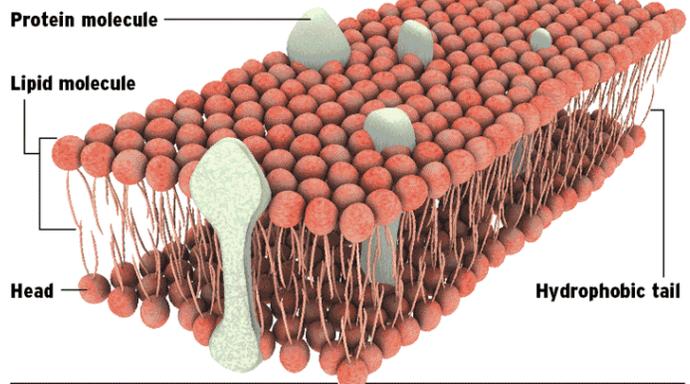
### Multipurpose fat

Lipids, another name for fat molecules, do more than store energy. Each cell in the body can contain tens of thousands of lipids, whose heads and hydrophobic tails link with proteins to form the protective membrane. The molecules also act as messengers within and between cells.

### HUMAN CELL



### CELL MEMBRANE



SOURCES: UCSD; Union-Tribune research

DANIEL WIEGAND / Union-Tribune

“This grant is aimed at laying the groundwork and infrastructure to explore and expand a new field,” said Edward Dennis, director of Lipid MAPS and a professor of pharmacology and biochemistry at UCSD.

“Historically, it was thought that genes had all of the information content of cells and that proteins carried out the work,” Dennis said. “It was thought that lipids were passive.”

More recently, scientists have learned that lipids also influence the way cells function. Identifying the tens of thousands of lipids that can exist in a single cell is a crucial step in understanding this process.

“The idea here is to take a very systematic approach and to use very powerful technologies to identify all of the major lipid species and many of the minor species,” said Dr. Christopher Glass, another lead scientist for Lipid MAPS and a professor of cellular and molecular medicine at UCSD.

The size of the two lipid grants – unusually large for basic health research – speaks to the difficulty of the work and its potential importance, said Jean Chin at the National Institutes of Health, who has overall oversight of Lipid MAPS.

Working on the project with UCSD are researchers from 15 universities, medical institutes and biotechnology companies.

“It would have taken forever, if ever, for any individual to do this sort of thing,” Chin said.

Lipids are fats and oils that exist in nearly every kind of tissue. They're best known for storing energy, but they also are a main component of a cell's membrane, and some lipids act as messengers within and between cells. Examples of these messenger lipids include prostaglandins, which trigger inflammation and pain, and steroid hormones such as estrogen and testosterone.

The Lipid MAPS researchers have focused on identifying all of the lipids – or the lipidome – in a macrophage, a white blood cell that destroys harmful invaders such as bacteria and tumor cells.

The macrophages they are studying come from mice instead of humans because the mouse cells are easier to reproduce and harvest, Dennis said.

About \$5 million of the initial grant was used to purchase 14 mass spectrometers, instruments that can measure the size and concentration of molecules and atoms.

A supercomputer at the UCSD Jacobs School of Engineering compiles and analyzes the massive volume of data being produced by the Lipid MAPS team.

An elaborate Web site containing all information collected by the project is open to the international scientific community. It receives

several hundred thousand hits each month, Dennis said.

Discoveries made by the Lipid MAPS team could reverberate through the medical science world for decades to come, said Dennis Vance, a member of an advisory committee that reviews the team's work for the National Institutes of Health.

“The expectation from previous experience is that this fundamental research provides the basis for new treatments for diseases that may not benefit me or you, but it may benefit our children and grandchildren,” said Vance, a professor of biochemistry at the University of Alberta, Canada. “The payoff is often many years down the road.”

## LIPID MAPS

- Lipid Metabolites And Pathways Strategy, or Lipid MAPS, is a national study led by the University of California San Diego.
- The main goal is to map a typical cell's tens of thousands of lipids, or fat molecules.
- Lipids affect everything from inflammation and chronic diseases to pain and hormonal levels.
- The 10-year study is being funded by two grants totaling \$73 million from the National Institutes of Health.
- Online: [lipidmaps.org](http://lipidmaps.org).