Heart Drug Prevents Muscle Loss After Burns

Life after a severe burn injury can be extremely difficult. Burn patients—many of them young children—are often left with severe scarring and other physical impairments. Significant muscle and bone loss is one of the most frustrating consequences slowing recovery from a severe burn injury. Researchers have long known that a badly burned body breaks down its own muscle and bone, presumably in an effort to heal itself. This breakdown process, called “catabolism,” can significantly impact time to recovery. NIGMS-supported burn surgeon David N. Herndon of the University of Texas Medical Branch in Galveston has come up with a promising medical treatment to thwart this devastating muscle and bone loss. Herndon and his colleagues performed a small clinical study on 25 badly burned children, who had experienced burns covering more than 40 percent of their bodies. Half of the burn patients received a 2-week course of a standard heart rate-lowering drug called a “beta-blocker.” After the study was complete, Herndon discovered that the children who received the beta-blocker (which lowers the body’s heart rate and overall metabolism) gained muscle and protein mass, as measured by levels of hormones and electrolytes in body fluids and X-ray analysis of muscle and bone mass. In contrast, the control subjects (who received no beta-blocker treatment) lost muscle and protein mass.

Fruit Flies for Health

To many people, fruit flies are the annoying consequence of buying too many on-sale bananas. Yet these tiny red-eyed creatures—known to scientists as the insect species Drosophila melanogaster—hold a secret key to curing human diseases. Fruit flies first jumped into the research fray 100 years ago, when a biologist named T.H. Morgan noticed a fly on the wall of his lab that had white eyes instead of the usual red ones. Years later, scientists discovered that this particular strain of fruit fly had white eyes because one of the fly’s genes hadn’t worked properly. Today, Drosophila is one of the most valuable research tools available to scientists who study the relationship between genes and health. For example, one recent study performed by NIGMS-supported scientist Ethan Bier of the University of California, San Diego unearthed 548 fly genes that are so similar to genes involved in 714 different human genetic disorders that the likelihood of the similarity occurring by chance alone is 1 in 10 billion. What this means is that scientists can look for causes and treatments for blindness, cancer, Parkinson’s disease, diabetes, and other disorders using lab fruit flies that are inexpensive and can be bred very quickly. Bier predicts that a few hundred fly “disease” genes will make proteins that are indistinguishable from their human counterparts. Ultimately, Bier says, fly genes can play an important role in the study of at least 1,000 known genetic diseases in people. Pretty impressive for an insect!

Sour Orange Juice Gives Medicines An Extra Punch

Swallowing certain medicines with a glass of grapefruit juice can provide an unwanted surprise. For 10 years now, scientists have known that a natural chemical in grapefruit juice can boost the blood levels of a variety of medicines in some people. Researchers figured out that grapefruits do this by releasing a chemical that disables an enzyme called cytochrome P4503A4 (CYP3A4). Doctors have observed this “grapefruit juice effect” with more than 20 different medicines, including drugs used to treat allergies, heart disease, and infections. NIGMS-supported researcher Paul B. Watkins has now discovered that Seville (sour) orange juice—but not regular orange juice—has the same effect on the body’s handling of these medicines. Watkins and his coworkers at the University of North Carolina at Chapel Hill assembled 10 people who volunteered to participate in the juice-medicine study. Each person took a standard dose of felodipine (a drug commonly used to treat high blood pressure) diluted in grapefruit juice, sour orange juice, or plain orange juice. The researchers measured blood levels of the medicine at various times afterward. The team observed that grapefruit juice and sour orange juice led to the same increase in felodipine levels in the blood while regular orange juice had no effect. Since both juices contain a chemical called dihydropyridine, the scientists suspect that this chemical may be the molecular culprit accounting for the grapefruit juice effect, although further lab tests are needed to confirm this suspicion. Who drinks sour orange juice? While not a typical breakfast choice, Seville oranges are often ingredients in food products such as marmalade. However, further studies will need to confirm whether the amount of dihydropyridine in such food products is enough to affect the body’s processing of medicines.

Fingerprinting Anthrax

Biologists play a key role in deterring bioterrorism cases. Last fall, when potentially deadly anthrax bacteria showed up in letters addressed to Senate Majority Leader Thomas A. Daschle (D-S.D.) and NBC News anchor Tom Brokaw, biologists went to work to identify the source of the bacteria, which also infected and killed photographer Bob Stevens of American Media, Inc. in southern Florida and four others. Just as a criminal can be identified by a unique fingerprint pattern, a bacterial strain can be pinpointed through analysis of its genetic fingerprint (DNA). Samples of DNA from bacteria that evolved from the same microbial ancestor have DNA with a nearly identical sequence of genetic “letters”—building blocks called nucleotides. NIGMS-supported evolutionary biologist Paul Keim of Northern Arizona University developed the molecular technique used by authorities to identify the anthrax strains used in bioterrorist attacks in the fall of 2001. Keim has also used his DNA fingerprinting technique recently to analyze the strain of anthrax bacteria released in 1993 by the Japanese cult Aum Shinrikyo. His analysis showed that the attack failed because the cult members used a veterinary vaccine strain of anthrax that is not dangerous to humans.

How Feverfew Works

The use of herbal therapies is on the rise in the United States. While millions of people take herbs routinely to treat various health problems, many herbal concoctions can be harmful and some have proven to be deadly. Unlike many prescription (or even over-the-counter) medicines, herbs contain many, many different ingredients—sometimes thousands of them—and researchers do not know in the majority of cases how herbs work inside the human body. Because herbs are natural products, they are not regulated by the U.S. Food and Drug Administration. Scientists have not performed careful studies to evaluate the usefulness and safety of most herbs. Certain herbs, however, are showing medical promise. For example, a handful of controlled scientific studies in people have hinted that the herb feverfew is effective in combating migraine headaches. Scientists have suspected that this herb, which is also known by its plant name “bachelor’s button,” exerts its effects by halting inflammation, a standard immune system response that is one of the body’s most basic defense mechanisms. Recently, NIGMS-supported chemist Craig Crews of Yale University discovered how an inflammation-fighting ingredient in feverfew may work inside the cells of the body. Crews used chemistry and biology experiments to show that the ingredient, called parthenolide, disables a key cellular process involved in kickstarting inflammation.