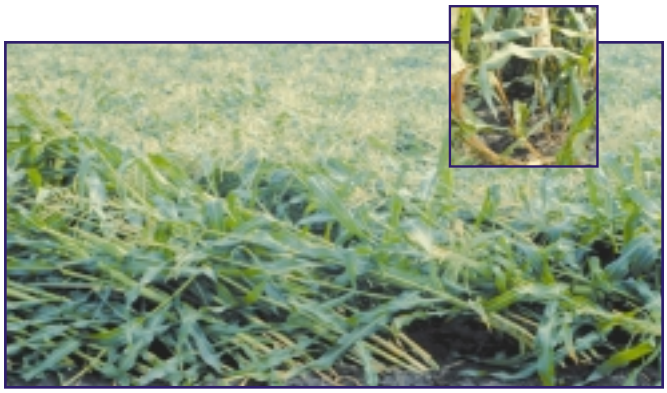
NASA Discovers Plant Growth Genes

Why It Is Important

When astronauts stay in space for long periods of time on the International Space Station or on other planets in the future, they will need to grow plants for sustenance. For NASA, plants represent both a method for recycling air on spacecraft and a source of food for long-duration space missions. NASA is studying how gravity affects plant growth in order to prepare for future needs. Plants respond in a variety of ways to their environments. For example, the stalks in a field of corn that flattened after a strong rain will soon return to growing upright. Phototropism (growth toward light) can explain some of this—but how does a plant know which way is down? Because down is usually where there are soil and water that a plant needs, this is not a trivial question. Since the 1800s, researchers have hypothesized about gravitropism, or growth in response to gravity.

What NASA Is Doing

Two NASA researchers have identified a novel set of genes responsible in part for the gravotropic response (growth "down" in response to gravity) of plants and the identification of important signals in root formation. In addition to studying plant responses to the environment, NASA-sponsored researchers are studying the complex ways in which plant cells communicate with each other—either through membrane proteins or through a hormone-like signal known as auxin.



The phenomena of gravitropism, as illustrated by a corn field. The plants were flattened by a heavy storm (a) but after a few hours, their shoots have curved upward (b). This is due to the plants sensing and responding to the force of gravity.

What the Benefits Are

Both groups use the model plant *Arabidopsis*, and combined with the recent release of its complete genome (genetic blueprint), NASA-sponsored research is contributing to our understanding of the complex ways genes interact with each other and with the environment.

Unexpectedly, research performed on the Shuttle demonstrated that ethylene gas, commonly found on spacecraft, reduced starch production and inhibited growth. Controlling it will be an important component in future space agriculture systems. In addition to fundamental research into how gravity affects plant growth, understanding how plants grow and develop is one way that NASA science can contribute to increasing crop yields on Earth.

NASA Contact: David Liskowski (202) 358-1963

Related Web Sites:

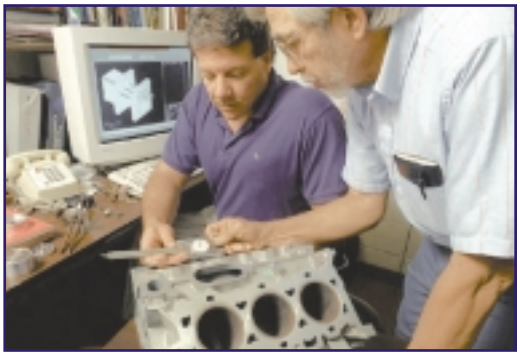
http://spaceresearch.nasa.gov

NF-2001-03-236-HQ

NASA Research Advances Metal Casting Technologies

Why It Is Important

Ninety percent of all durable goods contain metal castings, contributing to a $25 billion/year casting market in the United States. Eighty percent of all U.S. metal casting plants are small companies, having less than 100 employees. The U.S. metal casting industry must also cope with aging infrastructure and processes while competing with low-cost producers in developing nations and high-tech plants in Europe. Profit margins are small and investment capital for research and development is limited. Scrap rates in the casting process are at 10 percent, a costly level of discarded material.



Research for two major U.S. auto makers has helped improve casting parts, including engine blocks.

What NASA Is Doing

NASA's commercial microgravity research* offers great potential for the casting industry. Data that are often impossible to obtain accurately in Earth's gravity—such as the electrical conductivity, viscosity (thickness) measurements, and heat capacity of molten metals and alloys—can be obtained quickly, easily, and precisely in microgravity. Critical data are being obtained to develop new advanced alloys and casting techniques and to improve the yield and efficiency of existing casting processes. The round-the-clock research capability on NASA's International Space Station will be available for future investigations.

Brush Wellman Inc. successfully produced the world's largest aluminum-beryllium casting with NASA data and models.

What the Benefits Are

Industry invested $2.5 million on conducting casting research in collaboration with the Solidification Design Center, a NASA Commercial Space Center, in the late 1990's. Two major auto makers have used this collaboration to improve auto parts, including engine blocks. Brush Wellman Inc. successfully produced the world's largest aluminum-beryllium casting with the assistance of ground-based casting data. The lightness of their casting material makes it useful for a number of aerospace applications. ALCOA and Howmet Corporation are also using the research to cast more reliable, less expensive parts. As a result of the Solidification Design Center casting research and partnership with industry, the quality of cast parts can be improved, even as the casting industry is developing new opportunities for using metal casting.

NASA Contact: John Emond (202) 358-1686

Related Web Sites:

http://spaceresearch.nasa.gov
http://commercial.nasa.gov
http://spd.nasa.gov
http://metalcasting.auburn.edu/

NF-2001-03-237-HQ

**The great reduction in gravity present in the Space Shuttle's freefall orbit around Earth, which NASA calls microgravity, provides a unique laboratory in which scientists can investigate solids, liquids, and gases normally masked by the effects of Earth's gravity. This research will expand exponentially on the International Space Station, where biological and physical scientific research by academia and industry will be conducted 24 hours per day, 365 days a year.*

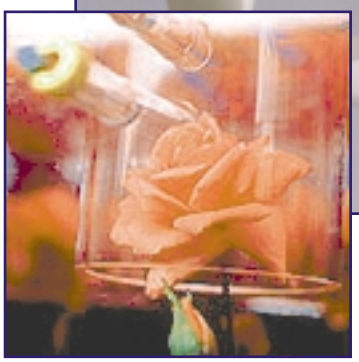
Space Produces New Flavors and Fragrances

Why It Is Important

Manufacturing flavors and fragrances is a multibillion-dollar-a-year industry involving a variety of products, from perfumes to flavors that can make medicines palatable. Companies perform extensive chemical research to create or improve fragrances and flavors that compete favorably in the marketplace.

What NASA Is Doing

Research on NASA's Space Shuttle has shown that microgravity* affects the production of essential oils—the chemical basis of all flavors and fragrances—not with a slight shift in scent but to the point of creating an entirely new fragrance. A new fragrance from space is showcased in a new perfume, ZEN, which was introduced to the market in 2000. The scent may be employed for other uses. In a partnership between NASA's Wisconsin Center for Space Automation and Robotics, a NASA Commercial Space Center, and industry, industry projects the fragrance will produce a profit of $5 million during its first year in the U.S. market place and $20 million worldwide.



This rose produced a scent never produced on Earth during its flight on NASA's Space Shuttle. The resulting commercial product, Zen, is shown above.

What the Benefits Are

This research is helping open new doors for the creation or identification of new flavors and fragrances. It also represents a broadening of the use of space for goods and services, and an expansion of space research beyond the traditional boundaries of aerospace and other established areas of space-based research. When the International Space Station is in operation, it will provide laboratory space available 365 days per year, 24 hours per day, providing a facility for research that will affect a variety of industries and consumer goods.

NASA Contact: John Emond (202) 358-1686

Related Web Sites:
http://spaceresearch.nasa.gov
http://commercial.nasa.gov
http://spd.nasa.gov
http://wcsar.engr.wisc.edu/

NF-2001-03-238-HQ

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NASA Improves Bone Replacement Material

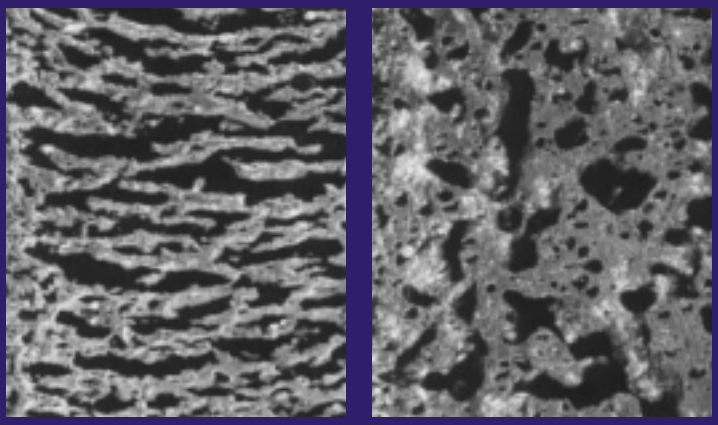
Why It Is Important

Bone loss from accident, illness, or aging is a serious problem worldwide. Approximately $3 billion is spent annually on bone replacement in America alone. Because of the limited durability of today's bone replacement materials, often the initial physical trauma is compounded by the necessity of replacing an implanted prosthesis several times during a lifetime. The Center for Commercial Applications of Combustion in Space, a NASA Commercial Space Center, is working with industry to develop a ceramic-metal composite unlike current conventional replacement materials. It is highly porous, allowing blood vessels, nerves, and even bone to grow through and around it, limiting the amount of replacement surgery necessary for implant replacement throughout the patient's lifetime.

What NASA Is Doing

Using microgravity research aboard NASA's KC-135 aircraft, industry has already successfully synthesized a ceramic-metal composite. As a result of this NASA commercial partnership, industry is planning to invest over $2 million to continue microgravity* research aboard the International Space Station. Industry hopes to optimize pore size, distribution, and strength of porous ceramics to perfect materials for more durable bone replacements.

POROUS CERAMICS for BONE REPLACEMENT



Normal Gravity **Microgravity**

The difference in internal structure of porous ceramics produced in gravity and microgravity is clearly visible in this photograph. The microgravity-produced sample has a porosity similar to that of natural human bone.

What the Benefits Are

Stronger replacements that more closely match natural human bone will decrease the number of implant operations, resulting in less surgery, hospitalization, and stress for the patient. Advanced future research by NASA, its Commercial Space Centers, and industry could even lead to replacement products that dissolve into the body as natural bone cells grow into the implant.

NASA Contact: John Emond (202) 358-1686

Related Web Sites:

http://spaceresearch.nasa.gov
http://commercial.nasa.gov or http://spd.nasa.gov
http://www.mines.edu/research/ccacs/

NF-2001-03-239-HQ

**The great reduction in gravity present in the Space Shuttle's freefall orbit around Earth, which NASA calls microgravity, provides a unique laboratory in which scientists can investigate solids, liquids, and gases normally masked by the effects of Earth's gravity. This research will expand exponentially on the International Space Station, where biological and physical scientific research by academia and industry will be conducted 24 hours per day, 365 days a year.*

NASA Research Improves Antibiotic Production Efficiency

Why It Is Important

Antibiotics used internationally by medical communities to combat disease represent a $23 billion market. The pharmaceutical industry uses a production process called microbial fermentation in the formation of antibiotics. BioServe Space Technologies, a NASA Commercial Space Center, and its commercial partners are using the microgravity* environment of space to improve antibiotic production processes that can be replicated on Earth.

What NASA Is Doing

Preliminary research conducted in microgravity on two NASA Shuttle flights demonstrated up to a 200-percent increase in the fermentation process in space over process performance on Earth. NASA, BioServe, and industry are exploring ways to reproduce the increase in metabolic efficiency observed in space to improve operation efficiencies of commercial fermentors on Earth. Examples of antibiotics being tested are Monorden and Actinomycin D. Long-term adaptation research is planned to be conducted on the International Space Station. NASA, BioServe, and Bristol-Myers Squibb will continue research collaboration, possibly making a cumulative investment of $1 million.

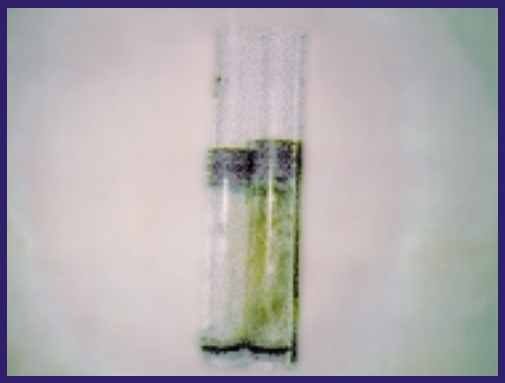
What the Benefits Are

A 1-percent efficiency increase alone will result in an estimated $6 million annual antibiotic production cost savings for Bristol-Myers Squibb. Therefore, if even a small increase in the operational efficiency of Earth-based antibiotic production is made possible as a result of the knowledge gained from space, the economic gain could be substantial.

NASA Contact: John Emond (202) 358-1686

Related Web Sites:
http://spaceresearch.nasa.gov
http://commercial.nasa.gov or http://spd.nasa.gov
http://www.colorado.edu/engineering/BioServe/
http://www.ksu.edu/bioserve/

Monorden Production in Space



Ground Sample **Flight Sample**

A 200-percent increase in rate of production of Monorden was seen on NASA's flight STS-77 (right) in comparison with ground-based production (left).

Monorden Production in Space

Ground Sample **Flight Sample**

A 75-percent increase in production of Actinomycin D was seen on NASA's flight STS-95 (right) compared with ground-based production (left).

NF-2001-03-240-HQ

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Space Combustion Science Spawns New Technologies and Protects Earth's Environment

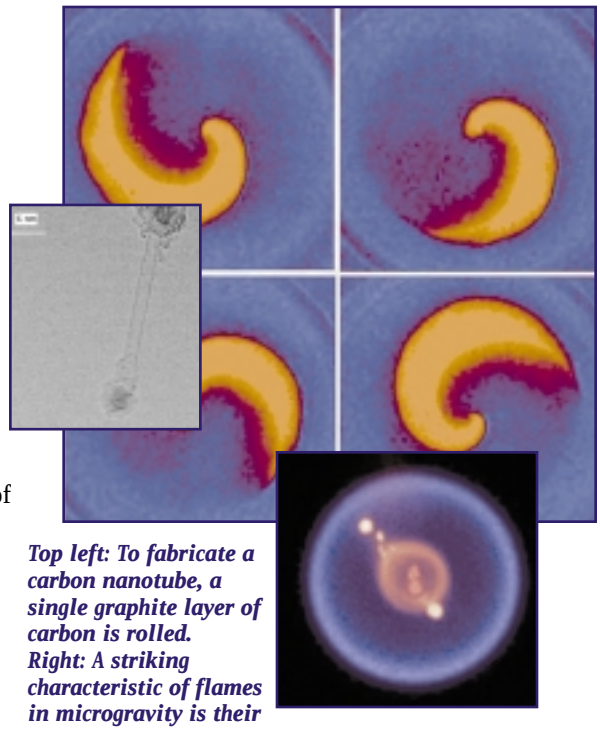
Why It Is Important

Combustion is a key element of many of modern society's critical technologies. Electric power production, home heating, ground transportation, spacecraft and aircraft propulsion, and materials processing all use combustion to convert chemical energy to thermal energy or propulsive force. Although combustion, which accounts for approximately 85 percent of the world's energy usage, is vital to our current life style, it poses great challenges to maintaining a healthy environment. An improved understanding of combustion will not only help us create new technologies but will help us deal better with the problems of pollutants, atmospheric change and global warming, unwanted fires and explosions, and the incineration of hazardous wastes.

Recently discovered rotating spiral flames exhibit many similarities to spiral waves in biological systems.

What NASA Is Doing

Flames behave differently in space than on Earth. Without gravity, buoyant convection and sedimentation are virtually eliminated. Scientists can observe the properties of flames and determine the lowest limits of temperature and fuel that can sustain flames. Recent rotating spiral flames observed in space experiments have provided controllable, steady configurations to study pattern formation and transition for understanding turbulent combustion—of vital importance to engine combustion. Combustion processes can also be tailored to actually manufacture tiny miniaturized materials such as carbon nanotubes. A single graphite layer of carbon can be rolled up to form a seamless tube. These tubes are significantly stronger than currently commercially available carbon fibers (10 times as strong as steel but possessing 1/6 of the weight). This property makes them highly desirable for strengthening polymer and ceramic composite materials.



Top left: To fabricate a carbon nanotube, a single graphite layer of carbon is rolled. Right: A striking characteristic of flames in microgravity is their spherical shape.

What the Benefits Are

Numerous technological innovations in addition to nanotubes have resulted from NASA's space program. These include (1) a spectroscopy system to measure and monitor the composition of gas from factory smoke stacks, (2) an ammonia monitoring system for industry, (3) a fuel-lean stabilizer device that allows natural gas appliances to operate more efficiently while simultaneously reducing air pollution, (4) advanced optical diagnostics and lasers to better define and control the soot formation process, and (5) devices to measure soot in exhausts from all types of automobile and airplane engines.

NASA Contact: Dr. Merrill King (202) 358-0817

Related Web Sites:

http://spaceresearch.nasa.gov

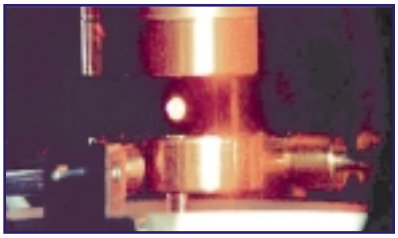
NF-2001-03-241-HQ

Space Improves Tomorrow's Material Processing

Why It Is Important

To improve the manufacturing methods for advanced electronic and structural components, as well as optical and other sensing devices, industry needs to know the values of a wide variety of scientific properties of materials. A significant number of these properties cannot be measured on Earth because of the effects of gravity. Measurements need to be made in liquid form and under highly controlled environments to preserve purity and to access regions of the liquids not reachable on Earth, or in the solid crystalline form with a minimum number of imperfections so that sophisticated Earth-based techniques (such as x-ray crystallography) can be used to extract the valuable information.

What NASA Is Doing



High-temperature levitation technology has been implemented in Earth-based laboratories.

Using the low-gravity environment of space and new technology to carry out materials property measurement has advanced our understanding of numerous manufacturing processes. (1) **Glasses** and **ceramics** crack under great force or stress. By controlling the minute flaws that govern how the crack occurs, scientists hope to be able to control the process and prevent the formation of imperfections that lead to catastrophic failure. (2) Certain **metals** and **alloys** transform from a single-phase liquid through several phases before they solidify. The molecules group together in gravity but are evenly dispersed through the multiphase structure in space and can be observed. (3) **Polymers** are large molecules made up of numerous repeating molecules called monomers. Their bonding, seen clearly in their crystalline form in space, affects surface tension, miscibility, and solubility. (4) A few impurities in some **electronic materials** can drastically affect their ability to conduct electricity, but by examining their impurities in space, better electronic devices with wider applications can be manufactured. (5) An added benefit of space in testing materials is the capability to not use **containers**. Acoustic, electromagnetic, or electrostatic forces position or levitate an experiment sample. Therefore, products are not contaminated by their containers and can withstand extremely high temperatures and/or corrosive environments.

What the Benefits Are

Conducting scientific research in space, where gravity is one-millionth that of Earth, allows researchers to observe properties of solids, liquids, and gases that could potentially change industrial practices and products in ways that are unimaginable today. NASA scientists can apply the knowledge gained from glass and ceramic experiments to improve glass fibers used in telecommunications and high-strength, abrasion-resistant crystalline ceramics used for gas turbines, fuel-efficient internal combustion engines, and bioceramic artificial bones, joints, and teeth. Metals and alloys with space-induced multiphase structures are useful for specialized applications such as superconductors, high-performance magnets, bearing materials for engines, catalysts, and electrical contacts. Polymers appear naturally in wool, silk, and rubber and are manufactured in the form of acrylic, nylon, polyester, and plastic. Better electronic components can improve computers, medical instruments, power systems, and communications systems. Semiconductor research can create crystals for use in lasers, computer chips, solar cells, and x-ray, gamma-ray, and infrared detectors.

NASA Contact: Dr. Mike Wargo (202) 358-0822

Related Web Sites:

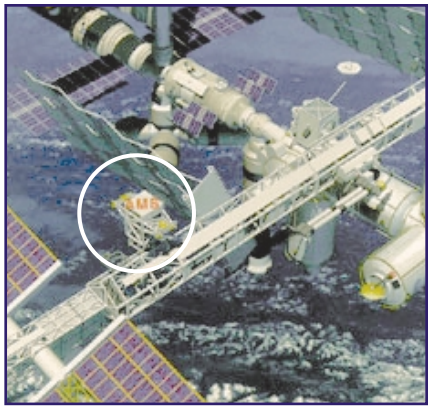
http://spaceresearch.nasa.gov

NF-2001-03-242-HQ

NASA Explores Anti-matter and Atom Lasers

Why It Is Important

Astronomy and physics have long theorized the existence of anti-stars and anti-galaxies. Small "anti-matter" particles such as the positron and anti-proton have been detected in nature and can be generated in human-built accelerators, but larger particles of anti-matter such as anti-carbon and heavier anti-nuclei have yet to be detected in nature. Although recent advances in experimental techniques have allowed us to visualize the world of atoms, which has led to significant advances in our understanding of particles in nature, we still need to gain insight into the detailed interactions of large numbers of atoms, which will lead to improvements in your knowledge of nature, in space transportation, and in commerce.



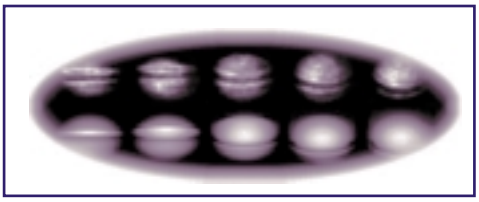
View of the Alpha Magnetic Spectrometer experiment (which will probe for dark matter and cosmic particle composition) which will be located on the International Space Station.

What NASA Is Doing

A NASA physicist first demonstrated that it is possible to amplify a beam of atoms the way a beam of light can be amplified. He increased the number of atoms in an initial atom beam by using light and a Bose-Einstein condensate to create an "atom laser."

An atom laser does for atoms what an optical laser does for light. It generates an intense beam of atoms. The step from ordinary atomic beams to atom lasers is analagous to the step from the light bulb to the optical laser. The atom laser might replace conventional atom beams where ultimate precision is required in items such as atomic clocks. Now NASA is collaborating with the Department of Energy and 13 countries in a 3-year International Space Station physics experiment that will investigate the complex behavior of atoms, dark matter, anti-stars, and anti-galaxies. The effort will probe for the presence of theoretically predicted dark matter and determine the composition of high-energy cosmic particles found in space.

What the Benefits Are



This photo shows atomic waves generated with a Bose-Einstein condensate at the National Institute of Science and Technology.

The resolution of scientific issues associated with anti-matter, dark matter, and the composition of the high-energy cosmic particles background in the universe will have a tremendous impact on our scientific understanding of the physical world and of the origin of the universe. Planned investigations on Bose-Einstein condensates, dubbed "The Coolest Gas in the Universe" by the December 2000 issue of the *Scientific American*, are believed to yield technology that will allow 100-fold improvement in the accuracy of atomic clocks, leading to ultra-precise deep space navigation and more definitive tests of Einstein's fundamental theory of gravitation. The potential application of atom lasers to the field of nanoscale integrated circuits has far-reaching consequences.

NASA Contact: Dr. Mark Lee (202) 358-0816

Related Web Sites:

http://spaceresearch.nasa.gov

NF-2001-03-243-HQ

NASA Research on Muscle Restoration Provides Earth Benefits

Why It Is Important

Muscles weaken and lose mass in space, as happens with inactivity, disease, and aging on Earth. Studying (1) how muscles work at the cellular level above Earth's gravity level in space, (2) how muscle composition changes, (3) how muscles interact with the brain and nerves, and (4) how muscles adapt or remodel will enable researchers to explore ways to protect astronauts from muscle loss when in space for long periods of time. These same techniques can be used to aid individuals suffering from muscle deterioration on Earth.

Crew member gait and posture instability is measured on a treadmill pre- and postflight.

What NASA Is Doing

NASA researchers are exploring what changes occur in the muscles, brain, and spinal cord when using muscles in different ways or in different levels of gravity, and they are trying to define the role of gravity in locomotion. NASA-sponsored research offers evidence that:

- Contrary to conventional scientific wisdom, the spinal cord—even when completely severed from the brain—can relearn to step and to stand.
- Specific muscle proteins have a role in the loss of muscle mass observed in astronauts. Myosin, one of the two proteins that contracts muscles, is lost in individuals participating in space and bed rest studies on Earth. The loss of this protein leads to a decrease in the large muscles often responsible for posture, walking, and support of the body.
- Thyroid hormone levels (regulating muscle growth) relate to myosin content in muscles. Scientists found that newborn rats with thyroid deficiency developed normal soleus muscles in microgravity, while their normal counterparts did not.
- Growth hormone release, which normally occurs following exercise, is totally depressed for the first few days of both bed rest on Earth and space flight. Minimal continuing neuromuscular activity is necessary to maintain normal release of the growth hormone when exercising. Hormone replacement may be a potential therapy.

What the Benefits Are

Muscle research can benefit individuals suffering from muscle loss due to disease and aging on Earth. More than half of individuals over 70 years of age who experience major bone fracture die of complications that could often be prevented by preserving muscle strength and coordination. Sensor implants, other electronic devices, and computer software developed by NASA to monitor and analyze muscle activity can also be useful in finding ways to recover locomotion after spinal cord injury. NASA research could benefit more than 10,000 patients with spinal cord injuries and more than 500,000 stroke patients admitted to U.S. hospitals each year.

NASA Contact: David Tomko (202) 358-2211

Related Web Sites:

http://spaceresearch.nasa.gov
http://www.fundamentalbiology.arc.nasa.gov
http://www.spacebio.net

NF-2001-03-244-HQ

NASA Astronaut Fainting Antidotes Find Earth Applications

Why It Is Important

Head-down tilt bed rests simulate space flight cardiovascular activity.

When astronauts are orbiting Earth on the Space Shuttle, they experience one-millionth of the gravity on Earth. The lack of gravity causes fluid shifts of the blood to the head and rapid changes in blood pressure. Astronauts who have just returned to Earth have a tendency to faint when they stand up, because changes that their cardiovascular systems underwent to adapt to space flight have impaired their bodies' ability to maintain adequate blood flow to the brain on Earth. This rapid shift in fluid is similar to the fluid shift adjustments necessary when an individual stands after a prolonged bed rest on Earth and faints. Research being done to ensure the health and safety of astronauts to understand the mechanisms of this "orthostatic intolerance" will also have diverse applications on Earth. It can benefit patients trying to stand after prolonged bed rest, the elderly trying to stand quickly after awakening, as well as fighter pilot equilibrium when making tight turns in the air to avoid objects.

What NASA Is Doing

Many changes must occur simultaneously in the body for the cardiovascular system to function properly. To understand how space flight affects this tightly regulated system, NASA researchers closely monitor fluctuations in physiological signals. NASA investigators on Earth have placed subjects on tilted bed rests to simulate the cardiovascular activity that occurs in astronauts during space flight. They are testing the effectiveness of a newly (1996) FDA-approved drug, antiorthostatic alpha-agonist midodrine, to make cardiovascular adjustments. An oral dose of Midodrine administered at the end of a bed rest period has shown subjects had fewer cardiovascular changes and showed less tendency to faint than subjects not given the drug. NASA will next test the drug in space flight.

Recent evidence in another NASA study suggests that fainting, caused by blood vessels contracting in their legs when astronauts stand after space flight, can be caused by a loss of tone in the leg blood vessels. Adjusting levels of nitric oxide, a naturally occurring substance that increases blood vessel diameter in Nitroglycerine and Viagra, is consequently another method of preventing fainting that is being studied.

What the Benefits Are

NASA plans to use Midodrine to protect astronauts from orthostatic intolerance while studying the effects of gender and age on fainting. Space research experiments with Midodrine and nitric oxide have the potential for aiding over one-half million Americans suffering from blood pressure control disorders resulting in dizziness and fainting.

NASA Contact: David Tomko (202) 358-2211

Related Web Sites:

http://spaceresearch.nasa.gov
http://www.fundamentalbiology.arc.nasa.gov
http://www.spacebio.net

NASA Research Explores Insulin Dosage Improvement

Why It Is Important

Many diabetics require insulin injections to regulate their blood sugar levels. In the United States alone, $3.2 billion a year is spent on insulin. The amount of insulin and the frequency of those injections depend on a number of factors, including the formulation of the insulin being injected. If a longer-lasting insulin formula can be developed, diabetics could decrease the number of their injections.

What NASA Is Doing

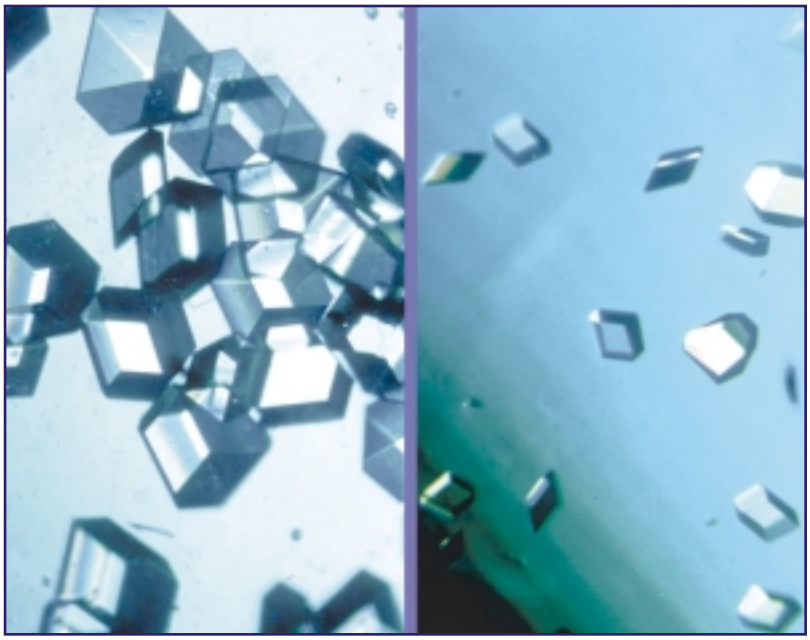
The Center for Biophysical Sciences and Engineering, a NASA Commercial Space Center, and its industry partners have joined forces to conduct microgravity research* with human insulin crystals on several Space Shuttle missions. The research has revealed surprising and uniquely valuable data that have the potential of being used to develop an insulin formulation that can be taken less frequently.

What the Benefits Are

A longer-lasting insulin formula will provide diabetics better control of their condition, as well as a greater sense of freedom resulting from fewer injections per day. Controlling their condition can have secondary health benefits.

NASA Contact: John Emond
(202) 358-1686

Related Web Sites:
http://spaceresearch.nasa.gov
http://commercial.nasa.gov
http://spd.nasa.gov
http://www.cmc.uab.edu



The difference in size between space-grown human insulin crystals (left) and Earth-grown crystals (right) is readily apparent in this photograph.

NF-2001-03-246-HQ

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NASA Investigates Ways to Protect Astronauts and Patients from Radiation

Why It Is Important

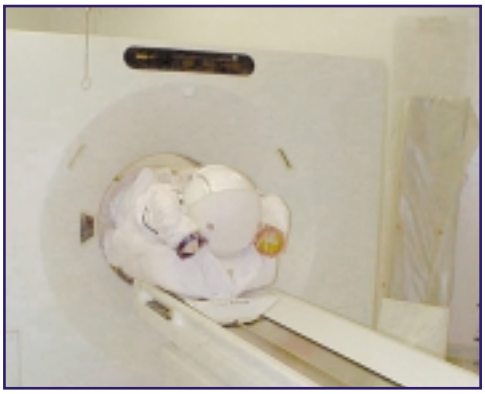
Astronauts in space need protection from space radiation. This radiation consists of high-energy charged particles (nuclei of atoms stripped of their electrons by passage through space). The consequences of excessive exposure to space radiation are not clear. Medical treatments on earth in which patients are subjected to radiation for cancer can ultimately benefit from NASA researching this problem for astronauts.

What NASA Is Doing

The most cost-effective way of investigating the danger of space radiation is at ground-based laboratories capable of simulating the particles in action. The lightest and most abundant particles in space are protons (the nuclei of hydrogen). Only one U.S. facility is equipped to handle the sophisticated biological research required for radiobiological studies simulating protons in space, the Loma Linda University Therapy Proton Synchrotron facility.

Nuclei of atoms heavier than hydrogen are accelerated into high-energy beams at the Alternating Gradient Synchrotron (AGS) at Brookhaven National Laboratory in Long Island, New York, and in the Booster Synchrotron, used as an injector in the accelerator chain leading to the AGS. The AGS only covers the high-energy part of the full-energy range. Currently, an irradiation facility is under construction to take advantage of the Booster Synchrotron. This Booster Applications Facility will provide access for biological and physical research using the full range of particle energies available at Brookhaven.

This experimental setup for cell biology at Brookhaven AGS is used for radiation investigations.



A U.S. spacewalk spacesuit filled with radiation detection instruments is being prepared for irridation at Loma Linda University.

What the Benefits Are

NASA ground-based studies have shown that lightweight materials, such a polyethylene, have superior shielding properties against space radiation. This material is being used to add panels to the International Space Station to improve shielding. The research, performed in cooperation with other Federal agencies and our international partners, will also contribute to breakthroughs in radiation biology, and to an improved understanding of cancer biology on Earth.

NASA Contact: Walter Schimmerling (202) 358-2205

Related Web Sites:

http://spaceresearch.nasa.gov
http://www.hq.nasa.gov/office/olmsa/lifesci/spacerad.htm
http://www.hq.nasa.gov/office/olmsa/lifesci/Strategic_Plan.pdf

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