Comet mission hits a snag

Scarcely a month ago, the National Aeronautics and Space Administration formally asked scientists to propose experiments for a spacecraft that would sweep past Halley's comet, eject a probe toward the comet's nucleus and then head off to spend a year cruising side by side with another comet, known as Tempel 2 (SN: 11/17/79, p. 343). For the past two weeks, however, both NASA and the scientists have been in a tizzy at the prospect that the envisioned mission — in the planning stages for years — may have to be scrapped, a victim of close-cut budgets.

The key to the current problem is a special motor, called the Solar Electric Propulsion System, or SEPS, that would have to be developed for the flight. It would produce a small but continuous acceleration from a tiny amount of fuel, enabling the craft to reach high speeds and maneuver extensively without the handicap of the large, heavy propellant supply that would be required by a conventional rocket motor. Although NASA has not planned to request initial funding for the spacecraft until fiscal 1982, the SEPS would be a major new technology, requiring funding to begin with the fiscal 1981 budget that is now in the Office of Management and Budget awaiting January transmittal to Congress.

The administration's budget request contains substantial extra funding for the space agency, but it is for helping with the various problems facing the space shuttle. The OMB is said to have left those funds intact, in light of heavy administration backing related to "national security considerations" (the Defense Department is counting on the shuttle's launch services), but several other cuts were made, including the start-up money for the SEPS, about $15 million.

As a result, NASA administrator Robert Frosch met with President Jimmy Carter on or about Nov. 30 to appeal for a restoration, with results reported to have been noncommittal. A number of scientists have written to White House science advisor Frank Press, further urging administration support, but as of Dec. 11, neither NASA sources nor scientists involved with the mission's planning appeared to know which way the wind was blowing.

The space agency had originally hoped to conduct a months-long velocity-matching rendezvous with Halley, but delays due to budget limitations caused the mission to be redesigned, with Halley receiving only a quick flyby (plus the nucleus probe) and the rendezvous taking place with Tempel 2 three years later in the flight. NASA's Comet Science Working Group has called Halley "by far the best choice" for a first comet mission of the rendezvous type, since it is "the only bright comet which displays the full range of cometary phenomena and has a sufficiently predictable orbit." But in the revised mission, many scientists feel that it is the long look at the "lesser comet" rather than the quick glance at Halley that would be the more productive.

The reason is the belief that comets are among the most primitive objects in the solar system, possibly formed in the early proto-solar nebula and "preserved" at great distances from the sun until their orbits are perturbed to send them inward. Thus the composition and structure of comets may carry clues to the way in which planets and other objects formed. Almost nothing is known, for example, about how planets coalesced from the dust and gas of the nebula; a long look at a comet's nucleus, says Cornell's Joseph Veverka, head of the comet working group, might reveal the size of the intermediate "lumps" that formed it, with valuable insights into accretion mechanics. The comet could also be studied both near the sun, while it was releasing abundant gas and dust for study, and far from the sun, when the spacecraft could safely approach the more quiescent nucleus to examine it from close up.

Yet the Halley flyby is also deemed important, partly because Halley's vast output of dust and volatiles while near the sun would enable sensors to detect measurable amounts of key trace elements and molecules. In addition, says Veverka, Halley has made far fewer trips through the near-solar region than have the shorter-period comets, so it is "fresher," giving scientists a chance to study interactions of dust, gas and charged particles that may apply to objects as seemingly removed from planetary studies as interstellar clouds. The probe that the passing spacecraft would send into the nucleus would further allow the sampling not only of the ionized molecules in the comet's outer "atmosphere," but also of the closer-in "parent molecules" from which they came.

NASA's problems with the mission are more complex, however, than simply dealing with a "yes or no." The European Space Agency would be building the little Halley probe, and the current uncertainty about the nominal mission's future has prompted NASA officials to reassure ESA that even if the SEPS is delayed (by either funding or development problems), a similar program could be conducted with two separate launchings — one for the Halley flyby and probe, the other for the rendezvous. This, however, opens up worries about whether the second flight might be scuttled in a later budget. Also, even with the SEPS, NASA will still have to get the spacecraft's funding started in FY 1982. Other candidate comet missions have been proposed, but some researchers feel that those suffer variously from reduced instrument-carrying capacity, less desirable target comets, or expensive, less energy-efficient trajectories. □

Exercise works against diabetes

Exercise has long been recognized as beneficial to persons with maturity-onset diabetes, a condition characterized by decreased insulin sensitivity (decreased ability of insulin to metabolize glucose) and an abnormally low number of insulin cell receptors. An explanation for why this is the case was reported by Philip Felig of Yale University School of Medicine at a recent symposium in New York on Nutrition and the Killer Diseases and is also reported by Felig and his colleagues in the Nov. 29 NEW ENGLAND JOURNAL OF MEDICINE. According to the researchers exercise increases both insulin sensitivity *and* insulin cell receptors.

Six healthy but unathletic young men participated in the Yale researchers' study. The men were measured for insulin levels, insulin sensitivity and insulin cell receptors. They were put on a constant carbohydrate diet and subjected to cycle exercise for one hour four times a week for six weeks. At that time their insulin levels, insulin sensitivity and insulin cell receptors were again measured and compared with base-line measurements.

As the investigators report, the exercise did not increase the subjects' insulin levels, but did result in 30 percent greater insulin sensitivity and a 50 percent increase in insulin cell receptors, suggesting that the binding of insulin to the increased number of receptors probably contributed to greater insulin sensitivity.

If exercise can increase insulin sensitivity and insulin cell receptors in healthy subjects, the researchers conclude, it probably also does so in maturity-onset diabetics and explains why exercise can help correct the disorder. □

Better insulin use through chemistry

While insensitivity to insulin is the problem in maturity-onset diabetes, it is a shortage of insulin itself that characterizes the less common, but more serious, juvenile-onset disease. For more than 50 years diabetics have been treated with insulin injections, a therapy that is not completely successful in mimicking normal insulin release. When insulin is supplied through injections the amount is not regulated by blood glucose levels, so there is often not enough insulin to stimulate sufficiently the biochemical reactions that remove glucose from the blood. Inability to regulate insulin can lead to significant tissue damage, causing blindness, heart attacks, strokes and other diseases.

To make insulin release responsive to the metabolic requirements of the body,

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