

Fat and Fiction

Calorie for calorie,
the thin gain more — and other weighty findings

By PETER L. WEISS

That skinny friend who pigs out but never gains weight might be a rarer bird than you thought. Contrary to widespread belief, thin people typically gain weight with fewer calories than the obese, a recent nutritional study suggests. The likely reason for the difference lies in the type of new tissue added.

These and other recent findings challenge some popular notions about weight gain and dieting. New research also raises questions about hunger in the obese and offers evidence that high-protein diets may aid in weight loss.

Thin people gain primarily lean tissue, whereas people already overweight add mainly fat, notes endocrinologist Gilbert B. Forbes in the August *AMERICAN JOURNAL OF CLINICAL NUTRITION*. But it takes six times as many calories to add a pound of fat as to add a pound of lean, he says. Thus, for the same calorie intake, thin people will gain more.

Forbes, of the University of Rochester (N.Y.) School of Medicine and Dentistry, reanalyzed data from six previous weight-gain experiments conducted by his team and others between 1975 and 1989. The studies included a total of 34 men and 29 women ranging from adolescence to middle age. Eight of the women had recently "stabilized" from severe malnutrition due to anorexia nervosa, an eating disorder involving self-imposed starvation.

In all six experiments, researchers fed people more food than needed to maintain their initial body weight. From the collective results, Forbes plotted excess calories per gram of weight gain against initial body weight and against percentage of body fat. He found that people with greater weight or body fat required more calories to add each gram.

Thin people with obesity in the family should take note, says obesity specialist Theodore B. VanItallie, a professor emeritus with Columbia University College of Physicians and Surgeons in New York City. "If you were physically active and for some reason you changed [to a more sedentary life style], you might begin gaining weight and gaining it quite rapidly," he warns. However, barring those

hereditary pitfalls, people who maintain a steady weight into their 30s "haven't got much to worry about," he says.

Although VanItallie calls Forbes' work "a very valuable insight," he and others question certain aspects of the analysis — in particular, the inclusion of anorexics. "The dice are somewhat loaded when you use people who are undernourished," he says.

Ethan A. H. Sims, a professor emeritus with the University of Vermont College of Medicine in Burlington, thinks Forbes also biased his analysis by leaving out studies of "lean, hungry" people. In his report, Forbes says he excluded data from any studies in which people consumed more than 12 excess calories per gram of weight gain. He told *SCIENCE NEWS* he chose that figure as a cutoff because it is the "energy cost" of gaining pure fat, the body's most energy-rich tissue. Thus, 12 calories would represent the maximum surplus a person needs to add a gram of weight. "If people report more than that, there's an error somewhere," Forbes says.

Sims, on the other hand, contends that for some "lean, hungry" types the ratio of calorie intake to weight gain can exceed this theoretical maximum. In his own nutrition experiments, Sims studied prisoners and medical students whom he fed excess calories. Some gained little weight despite overeating by large amounts, he says. In those cases, the body's known energy-wasting mechanisms dissipated the excess calories, Sims suspects. New research to explore whether "lean, hungry" people make more use than others of energy-wasting, or "futile," metabolic cycles has begun in several labs, Sims says.

Another popular but questionable scenario depicts dieters inevitably regaining lost weight as they fight a losing battle against built-in survival mechanisms. Indeed, numerous studies have shown that metabolic rate falls precipitously during a diet — out of proportion to the amount of weight lost. The metabolic slowdown apparently represents the body's attempt to counteract

the reduced intake — which it mistakes for impending starvation — by using food more efficiently.

But can the dieter's metabolism rise again?

A report in the Aug. 8 *JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION* indicates that after weight loss ends, metabolism rebounds to a level normal for the new weight. In a 48-week experiment at the University of Pennsylvania School of Medicine in Philadelphia, researchers divided 18 obese women into two groups. One group ate a weight-loss diet of 1,200 calories per day throughout the study. Women in the other group ate 1,200 calories per day except during weeks 2 through 17, when they followed an extremely low-calorie regimen of 420 calories per day. Ultimately, women in the two groups lost comparable amounts of weight.

During the first five weeks, both groups showed steep declines in metabolic rates, report Thomas A. Wadden and his co-workers. But by the end of the study, those rates had risen to within 10 percent of their original levels. Other studies have revealed a similar effect, but the Philadelphia researchers tracked metabolism more closely and over an unusually long time period, Wadden says.

The final metabolic rates, although reduced from original rates, simply reflected the smaller body size of the dieters, he explains. Just as "a smaller house will burn less fuel to heat it," Wadden says, from now on these women will have to eat less than they once did if they wish to maintain the new, lighter weight.

All of the women in the study increased their physical activity while dieting, mainly by walking more. The researchers suggest that the return to a metabolic level consistent with body weight may depend in some way on exercise.

One new report focuses specifically on the relationship between exercise and obesity. Aware that rats show appetite suppression for a short time after strenuous exercise, Harry R. Kissileff, F. Xavier Pi-Sunyer and their colleagues wondered whether the same pattern exists in humans. To find out, they compared the food intake of nine obese and nine nonobese women who ate after moderate and strenuous workouts.

In the August *AMERICAN JOURNAL OF CLINICAL NUTRITION*, they report that non-obese women ate more after moderate workouts than after strenuous exercise, but obese women consumed the same amount in each instance. The researchers suggest that this lack of appetite suppression reflects a peculiar unresponsiveness of the obese. Earlier studies have indicated that eating habits of obese people do not always follow the changing energy demands of their

bodies, note Kissileff and his colleagues at the Columbia University College of Physicians and Surgeons.

According to another paper in the same journal, high-protein diets can suppress appetite—at least in monkeys. By a feat of surreptitious plumbing, a Baltimore research team bypassed finicky monkey noses and taste buds to feed four monkeys a dietary supplement containing 50 percent protein. Anticipating that the animals might change their eating habits when presented with the modified diet—and thus throw a primate-wrench into the experiment—the scientists implanted tubes into the monkeys' stomachs and connected them to food-delivery pumps. The monkeys, trained to feed at nozzles connected to other suction-activated pumps, unknowingly triggered both pumps with each oral feeding, thus getting a measured double-dose of food.

The protein-boosted diet caused the monkeys to eat less overall, dropping their total calorie intake by 25 percent, report Judy S. Hannah, Anil K. Dubey and Barbara C. Hansen of the University of Maryland School of Medicine. The finding, they say, adds to the body of evidence suggesting that high-protein diets can aid in weight reduction.

"A high-protein diet does appear to have an appetite-suppressing effect, and of course, if you want to lose weight, that could be beneficial," Hannah says. She warns, however, that people with kidney problems, high blood pressure or diabetes should not undertake a high-protein diet on their own. "In fact, anyone should always consult a physician before making major dietary changes." □

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nary gift for poetic improvisation, which he demonstrated by producing immediate English versions of French, Italian or Latin verse and rhyming, scanning verses on such trivia as children's hats. A world-class procrastinator, he produced some of his best-known essays at the last moment at great speed and apparently never revised his work. Although functioning at a high artistic and intellectual level, Samuel Johnson recalls Dr. Oliver Sacks' "Witty Ticky Ray" in his ability to adapt his disability to creative ends.

Thinking of Johnson as a Tourette rather than a gross eccentric enhances our appreciation for his achievements and for the 18th-century ability to appreciate talent while overlooking what we today would call pathology.

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Many researchers indeed cite Dr. Johnson as an early documented case of Tourette's syndrome.

— B. Bower

Solar vs. sidereal days

Earth rotates on its axis every 23 hours and 56 minutes, yet an Earth day is 24 hours. Likewise, Earth rotates 366.26 times per year, yet an Earth year has only 365.26 days. The reason for these differences is that, as commonly defined, days are measured relative to the sun ("solar days") while rotations are measured relative to the stars. Consistent with this, if Earth did not rotate at all, it would still experience a day, actually an "inverse" day, for each orbit around the sun ("inverse" meaning the sun would rise in the west and set in the east). This accounts for Earth's "missing" day after 366.26 rotations each year and also for the "extra" 4 minutes (1/366.26 day) required beyond a rotation period in order to complete a day.

For other planets the magnitude of this effect can be fairly astounding—an interesting and

important fact that was not included in your discussion of Mercury's cyclic solar exposure ("Cold message from Mercury's hot poles," SN: 6/16/90, p.375). You state that "a Mercury year lasts but 1½ Mercury days" and that "Mercury [turns] three times on its axis for every two trips it makes around the sun." Clearly, you are referring to "sidereal days" (synonymous with rotations) instead of solar days, despite the discussion's solar context. While sidereal and solar days differ by only 0.27 percent on Earth, they differ by 200 percent on Mercury.

The "inverse" day resulting from Mercury's orbit leaves that planet with a net of only ½ solar day per year. In other words, a stationary observer on Mercury would experience alternating years of daylight and darkness. Thus, each longitude directly faces the sun at only one point (and always at the same point) during each two treks along Mercury's highly elliptical orbit. This results in only two longitudes (180° apart) ever directly facing the sun at the orbit's perihelion, and consequently results in the occurrence of the equatorial "hot poles."

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CORRECTION

In "Sweet tooth, rotten kid: A theory gone sour" (SN: 8/11/90, p.84), the name of the California State University scientist who commented on the sugar study was misspelled. The correct spelling is Stephen Schoenthaler.

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burrow D-17 came up speckled with tell-tale white fragments. Sometime late in the '88 season, unbeknownst to the observers, a dark-rumped petrel had laid an egg.

The team repeated the experiment in '89 and '90, adding a total of 140 artificial burrows. Each year, the number of night visitors increased, and more of them lingered through the day. Podolsky and crew found birds sitting in burrows during morning checks in 1989, with burrow D-17 again housing incubating petrels. This summer, the number of nesting petrels tentatively stands at one pair. With the verdict still out on some suspiciously busy burrows, Podolsky is optimistic that the count will rise before the birds head out to sea in a few months for the winter.

At the suggestion that a handful of petrel nests seems a modest return for 220 hand-dug burrows and three seasons of avian advertising blitzes, Podolsky smiles like a salesman

about to close a million-dollar deal. For he knows the nature of his customers.

The dark-rumped petrel often lives into its 30s and takes eight years to mature—an unusually long time for a bird of its size. "When we play our recordings, we don't appear to lure in breeders, we appear to only lure in young prospectors," Podolsky says. "We think they start returning to the island at 2 years old and continue to prospect until they're 8 years old." That leaves a comforting window of time before the return on his investment comes due. And in light of the finding that young petrels have already perused more than 70 percent of the 220 artificial burrows, the prospect of a petrel boomtown becomes easier to envision.

Podolsky and Kress see an expanding global need for their services, and they may be the world's only salesmen to view a rising demand as sad news. Dark-rumped petrels of the Galápagos and Hawaiian islands face a continuing threat from expanding agriculture and introduced predators, they say. And seabird situations around the world look sim-

ilarly grim. Of the approximate 270 species of seabirds worldwide, 30 are listed as endangered or threatened.

"Ultimately, our responsibility as biologists is to maintain the biological richness, the natural heritage of this planet," says Podolsky. "It's like the rivet puller analogy by [ecologist] Paul Ehrlich: You start pulling rivets from an airplane and nothing seems to happen. But there comes a point. . . ."

For now, most of the ornithologists' efforts are mere stopgaps, helping to settle and protect new colonies of endangered seabirds until less predator-infested island homes can be found. For some birds, however, the menaces aren't limited to rats, gulls, pigs and people.

Consider the short-tailed albatross. All but seven of the last 100 or so breeding pairs nest on Tori Shima Island off Japan. "The idea is to lure them to the other side of the island," says Podolsky. In the meantime, the heart of the short-tailed albatross population innocently gathers each fall to lay its precious eggs in the shadow of an active volcano. □