Bat breath adds fuel to evolutionary flap

Flying consumes a lot of an animal's energy. Sending out ultrasonic pulses and analyzing their echoes can also burn up plenty of fuel. So blind bats that use sonar systems to "see" must be real energy guzzlers when they fly.

Wrong.

Echolocating bats are surprisingly energy efficient in flight, report two zoologists, who believe their finding supports a controversial theory that some bats evolved from primates.

Jonathan R. Speakman and P.A. Racey of the University of Aberdeen in Scotland studied two species from the suborder Microchiroptera – small bats that navigate by sonar instead of sight. Armed with previous data on the energy these fist-sized "microbats" use to echolate while at rest, they calculated the energy cost of sonar-navigated flight by comparing pre- and post-flight levels of oxygen in the bats' breath and carbon dioxide in the bats' blood. Surprisingly, the energy needed to fly by sonar was only slightly more than the energy of echolocating at rest, they report in the April 4 NATURE.

In a companion article, zoologist Jeremy M.V. Rayner of the University of Bristol in England suggests that a flying microbat saves energy by pumping out each ultrasonic pulse "on the back of" a wingbeat and a simultaneous exhalation of breath from the lungs.

Even so, a good pair of eyes would seem to save a bat some bother. But when Speakman and Racey went on to compare the energy costs of flight in microbats and in larger, sighted bats of the suborder Megachiroptera, controlling for the difference in body size, they discovered that microbats and megabats use approximately the same amount of energy.

Echolocation's negligible energy cost during flight, combined with its superiority over vision as a means of detecting insects, raises the question of why so few megabats have sonar rather than visual systems, Speakman and Racey assert. They say their results fit with the theory that microbats and megabats evolved separately, with microbats emerging first and megabats appearing about 30 million years later. According to this controversial scenario, megabats probably descended from a primitive flying lemur – which, like all primates, had made an early evolutionary commitment to a highly developed visual system.

In contrast, the standard theory – based mostly on wing similarities – holds that microbats and megabats evolved from nocturnal mammals of the order Insectivora, and that most megabats later lost their echolocating abilities.

Those who argue for the bats' separate evolution cite several lines of evidence. In 1986, for instance, studies of the megabat visual system turned up "about 30 very striking features which were thought to be unique to primates," says John D. Pettigrew of the University of Queensland in Australia, who directed the work. In addition, fossil records suggest that well-developed, echolocating microbats existed more than 50 million years ago, while the oldest megabat fossils are only 20 million years old and show very primitive wing formation, he says.

Pettigrew cautions, however, that the fossil records for both microbats and megabats are very sparse and that any conclusions based on these records remain "very speculative." *– T. Walker*

Later-in-life babies may cut cancer risk

Women who bear their last child after age 34 face a significantly lower risk of endometrial cancer – the fourth most common malignancy in U.S. women – than do mothers who end their childbearing much earlier, according to an epidemiologic study. For instance, the data reveal a risk reduction of as much as 60 percent for women who give birth after age 40 compared with those who bear no children after age 25.

The new findings support the prevailing view among cancer researchers that hormonal and reproductive factors play a role in the development of this malignancy, which begins in the endometrium, a membrane lining the muscular walls of the uterus. Endometrial cancer kills an estimated 4,000 U.S. women each year. Though its cause remains unknown, studies have indicated that obesity, hypertension, infertility, diabetes and late menopause appear to increase the risk of developing the cancer, whereas bearing many children reduces the risk.

Samuel M. Lesko and his colleagues at the Boston University School of Medicine in Brookline compared the reproductive histories of 483 women hospitalized for endometrial cancer and an age-matched group of 693 women hospitalized for conditions considered unrelated to reproductive factors (such as lung cancer and trauma). The analysis uncovered no indication that women who had never given birth faced an increased risk, or that a woman's age when she first gave birth affected her risk. However, as a woman's age at last childbirth increased beyond 25 years, her chance of developing the disease decreased steadily, the team reports in the March 15 AMERICAN JOURNAL OF EPIDEMIOLOGY.

The new data also support previous indications that endometrial cancer risk decreases as the number of childbirths rises. However, Lesko says the apparent protective effect of having multiple children appears independent of that conferred by late childbearing.

Early and late in a woman's reproductive years, her chances of failing to release an egg during the monthly ovarian cycle are much greater than in the intervening years. Oncologists generally believe that these anovulatory cycles increase endometrial cancer risk by exposing the endometrium to estrogen in the absence of progesterone, Lesko and his coauthors note. What remains unclear, Lesko says, is whether the apparent protective effect charted in the new study results from bearing children later in life, or just from maintaining the capacity to ovulate during each cycle. *– J. Raloff*

Ozone decreasing over U.S.

The protective ozone layer over the United States and other populated regions in the Northern Hemisphere is thinning at twice the previously reported rate, according to a scientific assessment announced last week by EPA Administrator William K. Reilly.

In 1988, researchers who analyzed satellite and ground-based measurements for the period 1969 to 1986 concluded that winter ozone levels had dropped by 1.7 to 3 percent during that time in the latitude band between New Orleans and the Arctic Circle. But the new analysis, which includes the last several years, shows wintertime ozone values decreasing even faster, at a rate of 6 to 8 percent per decade over the latitude range including the United States.

Scientists believe that chemical pollutants – principally chlorofluorocarbons and halons – are causing the ozone depletions over the United States, although they have yet to gather enough data to establish a cause-and-effect relationship. These same compounds generate the Antarctic ozone hole each year.

The new research, conducted by NASA, indicates that the Northern Hemisphere ozone thinning extends into springtime, when most people are exposed to more sunlight. In the region north of Memphis, Tenn., ozone levels for April and May have dropped by 3 to 5 percent over the last decade.

As ozone levels decrease, increasing amounts of the harmful ultraviolet radiation in sunlight penetrate the atmosphere to reach Earth's surface. The EPA estimates that the ozone trends detected in the new study will cause 12 million new cases of skin cancer in the United States over the next 50 years, resulting in 200,000 deaths during that period. □