Lagging Behind

Texas A&M researchers identify bacterial gene that regulates internal clocks

By Arun Arjunan
The Battalion

An overnight flight for a business trip or vacation can have unpleasant side effects, to which junior French major Christie Clapp can attest. Clapp visited Belgium last semester to participate in a study abroad program.

The travel itself was not strenuous, but Clapp most likely experienced jet lag, which is the disorientation and insomnia caused by traveling through different time zones.

"The trip was really tiring; I had to sleep the whole day after we arrived in Belgium. It took me about a week to get back to normal," Clapp said.

This type of exhaustion is not unusual among overseas travelers and other people who maintain irregular sleeping schedules. Usually those who work nights and other odd shifts suffer from jet-lag symptoms like disorientation and tiredness. It would seem that one with an atypical sleep pattern is subject to jet lag and its associated effects on behavior.

The problem is caused by disrupting the body's natural timing system.

Dr. Susan Golden, a biology professor at Texas A&M said jet lag is the most obvious evidence that people have an internal timer that operates without receiving any information from their immediate surroundings.

"Only when this biological clock resets itself do people completely adjust to the schedule of their environment. This internal clock is known as circadian rhythms," she said.

In humans, its biological basis is the suprachiasmatic nucleus (SCN), a part of the hypothalamus gland in the brain. Light receptors in the eye transmit light-induced signals to the SCN and switch off production of a hormone called melatonin. The body's level of melatonin increases after darkness falls, making people feel drowsy. Circadian rhythms are not specific to human beings. Animals and plants also have these internal timing devices.

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>
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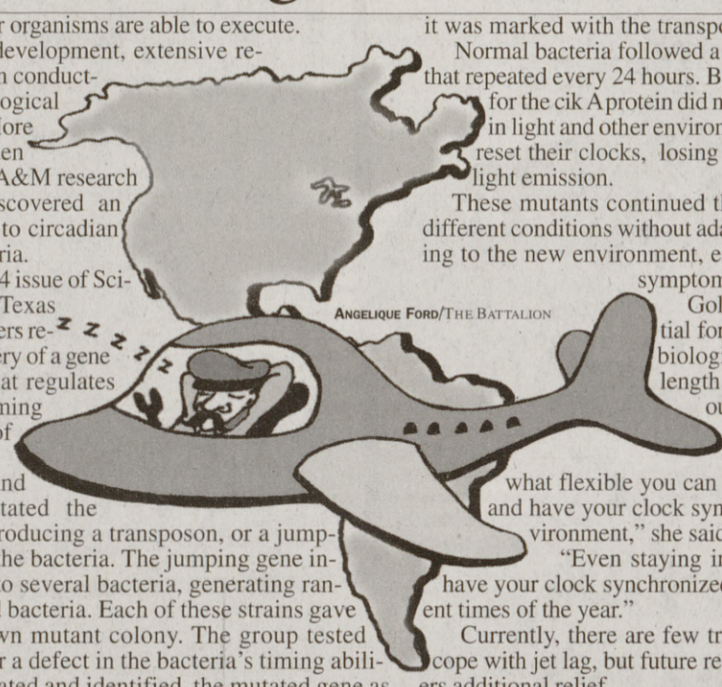
In 1990, scientists discovered that single-celled bacteria contain similar biological timers. The bacterial clocks are capable of carrying out the same function that clocks in larger organisms are able to execute.

Since this development, extensive research has been conducted on this biological mechanism. More recently, Golden and her Texas A&M research team have discovered an important key to circadian clocks in bacteria.



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In the Aug. 4 issue of Science, the Texas A&M researchers report the discovery of a gene called cik A that regulates the internal timing device clock of cyanobacteria.

Golden and her team mutated the bacteria by introducing a transposon, or a jumping gene, into the bacteria. The jumping gene inserted itself into several bacteria, generating randomly mutated bacteria. Each of these strains gave rise to their own mutant colony. The group tested each colony for a defect in the bacteria's timing ability and then located and identified the mutated gene as it was marked with the transposon.

Normal bacteria followed a pattern of light emission that repeated every 24 hours. Bacteria with the mutation for the cik A protein did not respond to the changes in light and other environmental cues an could not reset their clocks, losing two hours in its cycle of light emission.

These mutants continued their usual schedule in a different conditions without adapting to the new environment, experiencing jet lag like-symptoms.

Golden said that it is essential for organisms to reset their biological clocks because the length of days change throughout the year.

"By having an internal clock that is somewhat flexible you can go to different locations and have your clock synchronized with your environment," she said.

"Even staying in one location, you can have your clock synchronized appropriately at different times of the year."

Currently, there are few treatments or methods to cope with jet lag, but future research may bring travelers additional relief.

Science in Brief

Researchers find rare cholesterol, heart-attack link

DALLAS (AP) — People with high levels of a little-known form of "bad" cholesterol are 70 percent more likely to have a heart attack than those with lower concentrations of this lipoprotein in their blood, according to a study released Monday.

The obscure cholesterol particle — called lipoprotein(a) — is especially insidious because it is difficult for doctors to measure reliably and because its levels have little to do with the better-known form of "bad" cholesterol, called LDL.

The elevated Lp(a) levels also had little to do with more conventional heart disease risk factors: smoking, high blood pressure and poor diet. It also cannot be directly linked to high cholesterol, or the kind whose levels can be altered through diet or drugs, said lead researcher Dr. John Danesh, of Oxford University, in England.

"This study suggests there is a clear association between Lp(a) and an increased risk of heart disease," said Danesh, who pointed out that more than a decade worth of research failed to link Lp(a) to increased risk of heart disease in the general population.

The findings are published in Circulation Magazine.

Labs investigated for discrimination

LIVERMORE, Calif. (AP) — Physicist Edward Teller isn't sure whether the nuclear weapons labs he helped found have a spy problem.

But the man known as the "Father of the H-Bomb" is sure that any problems aren't going to be fixed by ousting the University of California manager of the Los Alamos National Laboratory and Lawrence Livermore National Laboratory.

He is reminded of the crisis of 1949 when scientists working on the weapons program at Los Alamos, N.M., learned that secrets of the atomic bomb had been leaked to the Soviets.

Today's troubles in the weapons program began last year with allegations that nuclear secrets had leaked to China. Los Alamos scientist Wen Ho Lee was fired and later charged with mishandling classified information. Both Los Alamos and Livermore are being investigated for possible discrimination against Asians,.

"Losing UC would be "a horrible thing," said Los Alamos scientist Manvendra Dubey.