Labs explore health effects of Ramadan

By Emily Anthes, Globe Correspondent | August 20, 2007

Next month, observers of the Muslim holiday of Ramadan will fast daily between sunrise and sunset, and feast thereafter, while scientists in a handful of labs around the world will examine what's happening inside their bodies.

Ramadan, it turns out, has become a useful phenomenon for researchers studying circadian rhythms -- and what happens to the body when they are disrupted.

During Ramadan, Muslims eat and get more active just when their bodies are used to winding down, creating sleep disruptions, hormonal changes, and sometimes mood impacts.

"Their biological clocks are no longer in harmony with their watches," said Yvan Touitou, a chronobiologist at Pierre and Marie Curie University in Paris. "Ramadan is capable of desynchronizing people."

Touitou's research has illustrated that Ramadan can alter the usual circadian patterns of cortisol, a stress hormone, and testosterone, with sharper decreases of these hormones in the morning and later rises at night -- though the impact of these rhythm disruptions is unclear.

The holiday also changes the schedule of the release of leptin, a hormone that regulates appetite and weight, and decreases the peak levels of melatonin, a hormone released at night to induce sleep. Interestingly, despite the disruption in leptin and in daily eating patterns, Ramadan rarely causes significant changes in body weight. Investigating why this is the case could yield useful insights into human energy metabolism, said Tom Reilly, a sports scientist at Liverpool John Moores University in England who has studied circadian rhythms and Ramadan.

"Normally, your body clock is affected by the alternation of light and darkness -- light is the signal to become alert. With Ramadan, fasting is obligatory at exactly the time the body is gearing up for activity," Reilly said. "It's an exact reversal of the usual pattern."

Florian Chapotot, a neuroscientist at the University of Chicago, found that subjects showed an overall decrease in the amount of sleep they got during the holiday -- not surprising given that typically, Ramadan adherents often fit in two or three meals between sunset and sunrise.

What was most interesting, Chapotot said, was the finding that subjects also spent a smaller proportion of their sleep time in slow-wave and REM sleep, both of which "are important because they have restorative functions."

It's still not clear, however, whether sleep disruptions are a result of changes in melatonin secretion, other physiological rhythms or behavioral patterns during the holiday.

The effects of all these physiological changes are unknown. Research has shown that motor skills, such as reaction times, muscle, and learning performance decrease significantly during the holiday and that sleepiness and traffic accidents increase. But scientists are investigating whether these changes are direct results of circadian rhythm disruption.

And despite its usefulness, Ramadan is difficult to study, partly because of the sheer number of variables. The month, part of the lunar Islamic calendar, moves forward by about 11 days every year, and the length of daily fasting can range from 12 hours upward, depending on location and time of year.

Additionally, those who observe the holiday have wildly different ways of coping with the altered hours -- some take naps during the day and stay up most of the night, while others only slightly alter their usual sleeping patterns.

"The use of Ramadan as a chronobiological model is a little bit messy. We cannot get control of all of the variables," Reilly said. But, "it's a beautiful field experimental condition."