

Long Term Cyclic Changes in the Temperature of Man

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Rhythmicities of various frequencies (solar-day, lunar-day, lunar-month and annual) have been reported for a great number of organisms ranging from single-celled plants and animals to the most highly developed organisms. Many of these rhythms have been shown to persist in constant conditions in regards to light, temperature, pressure and humidity. An excellent review of the work in this area was done by Webb and Brown (8). More recent work has demonstrated the effects of cosmic radiation, magnetic fields and electrostatic fields on responses in living organisms. (3, 5, 9).

Some work has been done with cycles in the human organism; but, with rare exceptions, most of this work has been concerned with cycles of 24 hours or less duration. The main exception is the well known reproductive or menstrual cycle in the human female. Lunar month cycles have been pointed out in another mammal, the rat (2). And although many M.D.'s and concerned persons have kept close records on individual daily temperature changes for one or several months, there has, to the author's knowledge, been little if any work done to determine the nature of the temperature cycle as it applies to the species. There has been no effort made to uncover any correlation of this cycle with one of the cosmic frequencies. The research described here was conducted to that end.

Methods and Results

Volunteers were asked to take their temperature twice daily for a minimum of 30 days. The two times selected were: (1) in the morning just before rising; and (2) at noon just before eating. In this report only the early morning records were analyzed. Each individual was provided with the same type of thermometer which had been checked for accuracy. Each volunteer kept a daily record to indicate any illness or other unusual occurrence which might disrupt the normal temperature pattern. Any temperature record determined as abnormal for these reasons was discarded. Records were kept for February and March of 1959 and May, June and July of 1960.

Ninety monthly records were obtained and analyzed. Of these, fifty-nine were female and thirty-one male. The temperature range for different subjects varied from a minimum of .7° F. to a maximum range of 2.8° F. In order to prevent one individual's record from contributing more to the total picture than any other's, each individual's daily temperature was expressed as a percent of his deviation range from his daily mean temperature and plotted as a plus or minus percentage value.

A mean value was obtained for each day of the lunar month for all the female records and for all the male records. Figure 1A depicts the average value for the females for each day of the lunar month. Two main temperature drops can be observed. The first occurring on the 13th day after new moon is the minor one; and the second one occurring from the 16th through 19th day after new moon is the major one. It will be noticed that the temperature maximum occurs on the day before full moon and the temperature drop starts on the day of new moon. Menaker

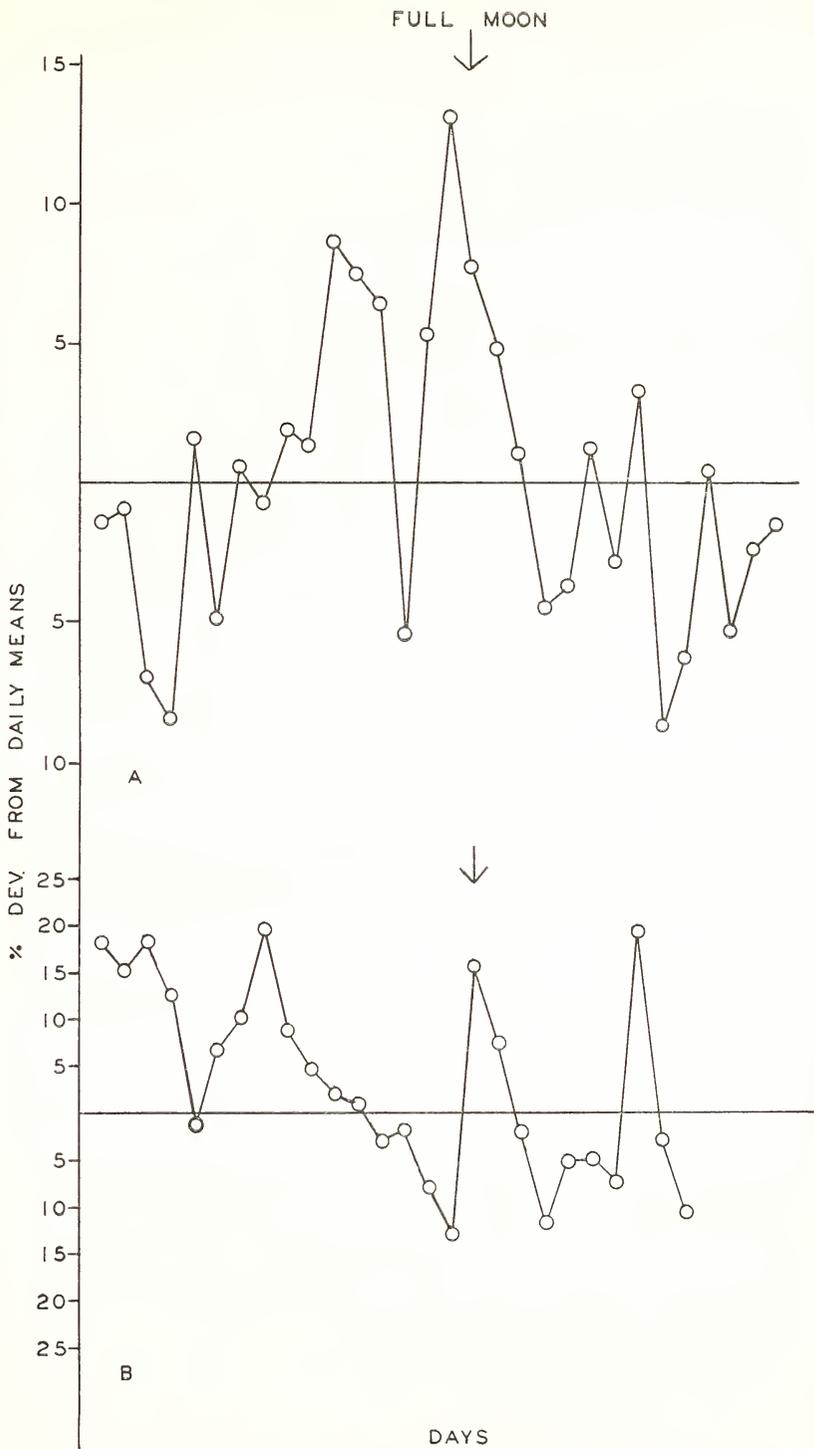


Figure 1 A. The mean temperature value for the females for each day of the lunar month. B. The same for the males.

and Menaker in their work on lunar periodicity in human reproduction found the day of maximum births to be the day before full moon (7). The temperature data for the male records shows a rather random temperature fluctuation (Figure 1B).

An attempt was made in this study to demonstrate a correlation of monthly temperature change in females with mean daily barometric pressure. Other workers have shown that barometric pressure changes show a rather close correlation with some biological rhythms (4). Figure 2

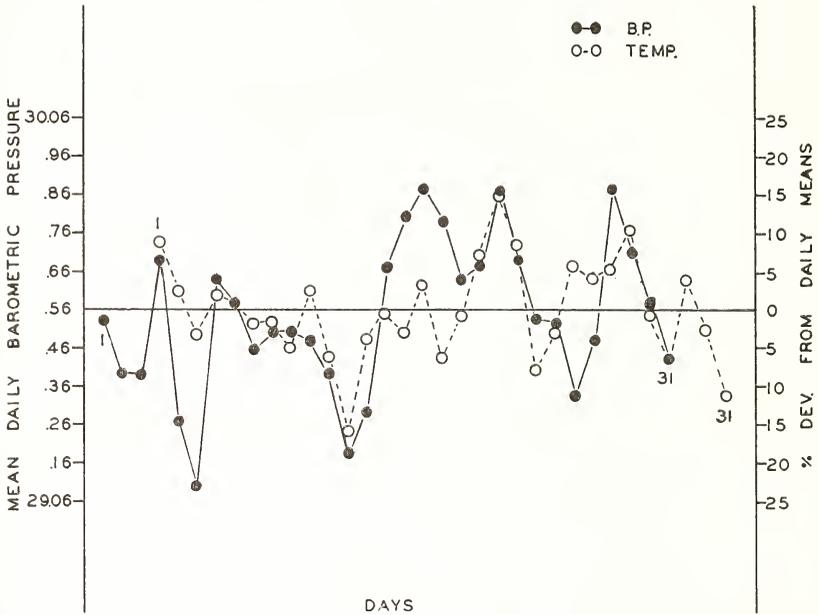


Figure 2. Comparison of the mean daily temperature for the females and the mean daily barometric pressure for the month of March, 1959.

shows the mean daily values for females and the mean daily barometric pressure for the month of March 1959. The correlation was obtained by sliding the barometric pressure over three days resulting in a three day lead-lag relationship between temperature and pressure. A two day lead-lag relationship was shown between respiration in several organisms and barometric pressure by Brown, Webb and Macey (6).

Discussion

The results suggest that there is a definite lunar frequency for female temperature variation. The major temperature drop starts on the day of full moon. This temperature drop in an individual is usually interpreted by obstetricians and endocrinologists as signaling ovulation. A period of 266 days is accepted as the mean duration of the period between conception and birth in the human female. Recalling that a lunar month is 29.5 days it is seen that 9 lunar months equal 265.5 days; therefore, it would appear to be more than mere coincidence that these results show a major temperature drop on the day of full moon and Menaker and Men-

aker's work shows a significant birth increase on the day before full moon. Knowing how many factors, both physical and psychological, can disrupt the menstrual cycle it is quite remarkable to obtain a mean temperature cycle of this magnitude.

The three day lead-lag relationship between human temperature change and barometric pressure would appear extraordinary if previous work by Brown and co-workers had not suggested this type of correlation might occur. Further work may uncover a closer correlation with another parameter of barometric pressure or with some other cosmic frequency. Experiments with other organisms (quahogs, fucus, fiddler crabs, etc.) have shown that the correlation with barometric pressure is not a correlation with the immediate causative force (1). Rather one is more apt to regard the correlation as being an indirect one, with human temperature variations being correlated with some causative force which is also correlated with barometric pressure. Further work may indicate that there is no single causative force but rather there is a complexity of causative forces by which living systems are regulated and correlated. If one considers the idea of a complexity of external physical cycles which have an effect on biological rhythms, it is possible to explain the persistence of many biological rhythms, in so-called "constant conditions." Elimination of one or several of the external physical forces might change the magnitude of the biological rhythm but would not destroy it. If, on the other hand, it is ever possible to eliminate all external contributing forces, then lacking a phasing or setting force, the endogenous timing mechanisms of the living organism will, with a passage of time, dissipate and disappear; and in turn all biological rhythms will disappear.

It is hoped that future work on a more extensive scale may uncover more long term cycles in man.

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