1 Berridge, N. J., *Adv. in Enzymol.*, **15**, 423 (1954).
2 Foltmann, B., *C.R. Trav. Lab. Carlsberg*, **35**, 143 (1966).
3 Holter, H., and Andersen, B., *Biochem. Z.*, **269**, 285 (1934).
4 Henschel, M. J., Hill, W. B., and Porter, J. W. G., *Proc. Nutrit. Soc.*, **20**, 40 (1961).
5 Dotti, L. B., and Kleiner, I. S., *Amer. J. Physiol.*, **138**, 557 (1942).
6 Tang, J., Wolf, S., Caputto, R., and Trucco, R. E., *J. Biol. Chem.*, **234**, 1174 (1959).
7 Taylor, W. H., *Physiol. Rev.*, **42**, 519 (1962).
8 *Ann. NY Acad. Sci.*, **140**, Art. 2, Part 1 *passim* (1967).
9 Andersen, B., *C.R. Trav. Lab. Carlsberg*, **19**, No. 19 (1933).
10 Malpress, F. H., and Seid-Akhavan, M., *Biochem. J.*, **101**, 764 (1966).
11 Cheeseman, G. C., *Nature*, **205**, 1011 (1965).
12 Texter, E. C., jun., Chou, C., Laureta, H. C., Towne, J. C., Meyer, M. A., and Cosey, E. J., *Ann. NY Acad. Sci.*, **140**, 734 (1967).

## Diurnal Cycle in Serum Concentrations of Follicle-stimulating Hormone in Men

A DIURNAL rhythm in the activity of human follicle-stimulating hormone (FSH) has been recognized by the use of a sensitive and specific radioimmunoassay technique[1].

In one study we used twenty-three healthy men, aged from 22 to 38 yr. Venous blood (provided by courtesy of Dr George G. Jackson of the Department of Medicine, University of Illinois) was collected on 2 successive days at 5.30 a.m., when each subject was awakened from sleep, and at 2.30 p.m. The subjects for the second study were three healthy hospital interns (24–27 yr) carrying out normal hospital routines. One doctor (K. A.) slept from 1 a.m. to 6 a.m. and his colleagues from 3 a.m. to 6 a.m. Samples were collected at intervals of 4 h throughout the day, and all subjects were awakened for sampling at 5 a.m. All blood samples were allowed to clot and were then centrifuged. Sera were stored at $-20°$ C. Samples of 0·5 ml. were analysed in duplicate.

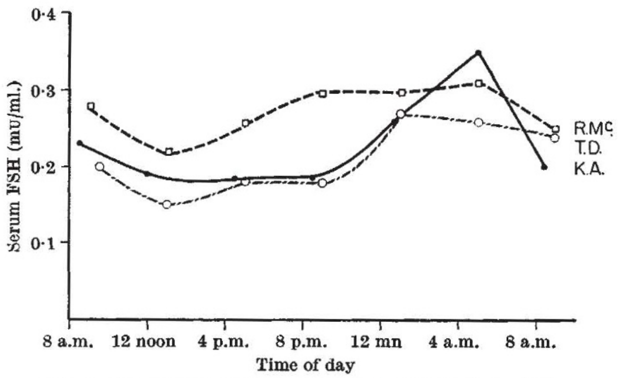


Fig. 1. Variation in serum concentrations of FSH during 24 h.

The results are expressed in mU/ml. of serum (1 U equals the activity in 1 mg of the *S*1 ovine standard for FSH from the National Institutes of Health, Endocrine Study Section, Bethesda, Maryland). Forty-five pairs of sera from the twenty-three subjects were studied (specimens of one day from one subject were lost). The mean concentrations at 5.30 a.m. were $0·201 \pm 0·016$ (standard error) and at 2.30 p.m. were $0·146 \pm 0·018$, with the overall mean being $0·174 \pm 0·012$. The mean error of duplicate determinations was $\pm 11·1$ per cent. Thirty of the forty-five pairs of sera were greater in the morning, six showed no change and nine were greater in the afternoon. The difference between morning and afternoon concentrations was statistically significant (*t* test for paired data: $P < 0·05$). There were no significant differences in the concentrations at comparable time periods of the 2 days of the study.

The results of the study of the three subjects with multiple samplings during 24 h are shown in Fig. 1. It can be seen that the concentrations were greatest in the early morning, near 5 a.m., and that they decreased between noon and 4 p.m. These data were examined for the presence of a diurnal cycle by an analysis of variance technique as previously described[2]. The results were very significant ($P < 0·001$). No diurnal cycle was seen in concentrations of luteinizing hormone (LH) measured by a specific radioimmunoassay for human LH similar to the one used for FSH (in preparation).

The timing and amplitude of this FSH cycle resembles that in plasma testosterone[3] and also the well known rhythm in serum concentration of adrenocorticotrophic hormone[4], but the possible causal connexions among these rhythms are unknown.

The finding of a diurnal cycle in serum concentrations of FSH in men can be added to an already growing list of physiological phenomena showing a diurnal rhythm[2,5].

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1 Faiman, C., and Ryan, R. J., *J. Clin. Endocrinol.*, **27**, 444 (1967).
2 Faiman, C., and Moorhouse, J. A., *Clin. Sci.*, **32**, 111 (1967).
3 Resko, J. A., and Eik-Nes, K. B., *J. Clin. Endocrinol.*, **26**, 573 (1966).
4 Demura, H., West, C. D., Nugent, C. A., Nakagawa, K., and Tyler, F. H., *J. Clin. Endocrinol.*, **26**, 1297 (1966).
5 Mills, J. N., *Physiol. Rev.*, **46**, 128 (1966).

## Carbon Dioxide Laser Hazards to the Eye

LASER radiation in the infra-red, for example from a carbon dioxide laser, is heavily absorbed in the surface layer of any biological tissue. The laser beam interacts strongly with tissue to produce heat, and thermal lesions can easily occur in the bare skin on the hands and the face. Protective reflex mechanisms will prevent long accidental exposures of the skin to a continuous infra-red laser, as they do to any other source of heat.

In the eye carbon dioxide laser radiation is absorbed by the cornea. The corneal blink reflex, released after a latent period of 80 msec, acts to close the eyelids, but it is slow enough to make even low power carbon dioxide lasers dangerous to the eye. Heat coagulation causes irreversible damage to the cornea which can impair vision. Because the infra-red radiation has a very small penetration depth, the damage will be localized chiefly in the surface layers of the cornea. This is also true of damage caused by ultra-violet radiation, which is also heavily absorbed by tissues. On the other hand, the outer parts of the eye are transparent to visible and near infra-red radiation. Laser hazards with such radiation are connected with the focusing properties of the optical system of the eye, and the retina may be damaged.

We have studied eye hazards from carbon dioxide laser radiation ($\lambda = 10·6$ μm) in rabbits. A conventional laboratory model carbon dioxide–nitrogen–helium laser with a maximum single mode power of 4 W was the source. A rabbit was placed about 3 m from the laser exit mirror, and a beam splitter and calibrated bolometer monitored the beam power. The absolute power/unit area at the position of the rabbit's eye could be checked calorimetrically between exposures. The measured intensity distribution across the beam is Gaussian, and we used for the power/unit area its average value inside the $1/e^2$ intensity circle. The average thus defined is 43 per cent of the maximum value. The power level could be varied in steps, through precalibrated damping filters. A calibrated camera shutter set the short