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TEACHING BIOLOGICAL RHYTHMS IN ENDOCRINOLOGY: CORTISOL AND WRIST TEMPERATURE

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Abstract

This work has been developed as part of the *Endocrinology and Metabolism* student's laboratory formation from Biology degree at the University of Murcia. *Endocrinology and Metabolism* is an elective one-term course that is taught in the fourth year (4.5 ECTS) for "Biosanitary and Biotechnology" intensification. The course focuses on the study of global and intermediary human metabolism and hormonal regulation, both under normal and special situations.

It is our objective to get undergraduate students of Endocrinology and Metabolism with the importance of hormonal diurnal fluctuations in endocrine systems through their involvement in an innovative research program. In addition, with the participation of PhD student in this program, we try to improve their skills in innovative teaching.

In humans cortisol circadian rhythm peaks in the morning and shows the lowest levels during the midnight. This fluctuation of cortisol plasma level is reflected in saliva, allowing a simple, non invasive and unstressful sample collection. The influence of different factors, exercise, schedule and weekend shifts, on the rhythmic pattern of cortisol has been studied along various years.

Teaching methodology:

1. Lectures.
2. Laboratory sessions and computer simulation.
3. Seminars: Students must summarized and give an oral presentation of a scientific work related to the therorical contents of the subject. This task is evaluated both individually and on a group basis.
4. Tutorials to follow and guide the work of each student group.

One practical session was scheduled with the specific aim of working cognitive, methodological and technological abilities in addition they must apply the scientific method. We also requested the collaboration of our PhD students in this practical session in order to take advantage of their experience in research and transmit it by first hand to graduate students. In addition our PhD students increase their experience in innovative teaching.

Volunteer students took part in the study. They collected saliva samples immediately after awakening and 4, 8, and 14 hours later on a representative weekday. Then cortisol levels were determined using a commercial luminescence immunoassay (LIA, IBL Hamburg) by all students in lab. In addition, the volunteers completed a sleep/wake cycle and meal time diary for two weeks and their peripheral temperature (iButtom®, Thermochron) was monitored every ten minutes for the same period.

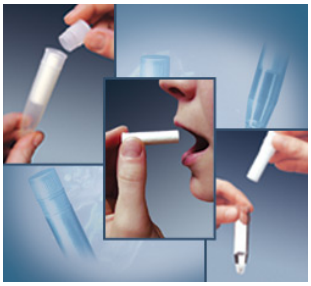

Figure 1. Saliva samples were collected using Salivette tubes. The students were instructed to chew the cotton wool Swab. Recovery of the saliva sample is achieved by returning the swab to the Salivette and centrifuging the container.

Figure 2. One of our students wearing a wristband with the Thermochron® (iButtom) temperature sensor inside.

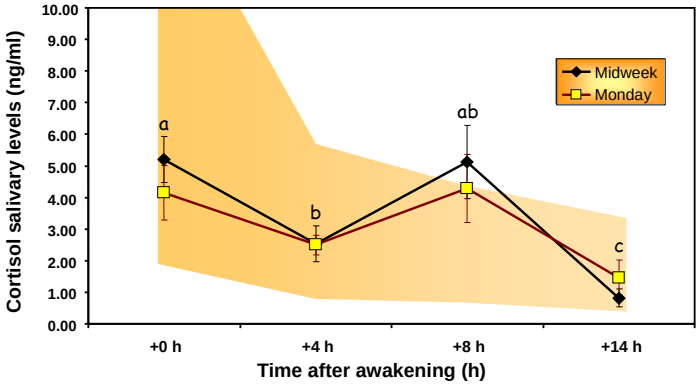

Figure 3. Salivary cortisol levels (mean ± SEM) on a midweek day and a Monday after a weekend sleep/rest phase delay. Different letters indicates significant differences ($p<0.05$, repeated measures ANOVA). The shaded area indicates 5% - 95% percentile range obtained from the manufacturer expected values.

References

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Conclusions

This laboratory session (including cortisol determination and skin temperature measurements) integrates both theoretical contents and its practical application. Students develop organization, analysis, critical thinking, team work, scientific precision and lab skills. Since the students themselves are both experimental subjects and scientists they are more motivated to work increasing their interest for the subject.

Also, our PhD students get involved in this practical session to take advantage of their experience in research and transmit it by first hand to graduate students. Besides PhD students increase their experience in innovative teaching.