Available online at www.elixirpublishers.com (Elixir International Journal)

Applied Mathematics

Elixir Appl. Math. 118 (2018) 50577-50580

ISSN: 2229-712X

Creating a Room of Epsilon for Analyzing Variations of Melatonin

S. Lakshmi[1] and Akanksha A. Desai[2]

[1]Department of Mathematics, Kunthavai Nachiyaar Government College, Thanjavur/ Bharathidasan University, Trichy, Tamilnadu, India.

[2]Bharathidasan University, Trichy, Tamilnadu, India.

ARTICLE INFO

Article history:

Received: 8 March 2018;

Received in revised form: 25 April 2018;

Accepted: 5 May 2018;

Keywords

Melatonin,
Epsilon of Room,
Pineal Gland.

ABSTRACT

The problem of generating epsilon of room is drawing the attention of the reliability analyst. Amongst those approaches, the characterization approach and the modelling approach are very appealing. In fact characterization approach is of interest to both theoreticians and applied workers. Here we have created an epsilon of room for application through characterization approach. In our application we have considered days of Menstrual Cycle with Melatonin hormone as variable compared with both control group and experimental group as women stress effects. Here we have used epsilon room (soft analysis) in the pineal gland. We have further discussed the main important point for saving energy to fight with the stress effects. The Hormones like Melatonin in the night time will be regulated as Melatonin is the night hormone which secretes in the pineal gland. If it secretes uniformly all other hormones like serotonin will be regulated in the day time.

1. Introduction

More recently, it has been discovered that an imbalance of reactive oxygen species, or 'oxidative stress', can have a negative impact on the success of infertility treatments, and furthermore, investigators have begun addressing potential mechanisms of preventing these effects with the use of novel oxygen scavengers such as melatonin. It may be that these agents have a positive effect on pregnancy success rates following IVF treatment. [11]

Melatonin

Melatonin is a hormone made by the Pineal gland, a small gland in the brain. Melatonin helps control our sleep and wake cycles. Very small amount of it are found in foods such as meats, grains, fruits, vegetables. Our body has its own internal clock that controls our natural cycle of waking & sleeping hours. Melatonin levels begin to rise from mid to late evening, remain high for the night and then drop in the early morning hours.[1]

Uses of Melatonin

Melatonin supplements are sometimes used to treat jet lag or sleep problems (insomnia). Scientists are also looking at other good uses for melatonin, such as:

- Treating seasonal affective disorder (SAD).
- Helping to control sleep patterns for people who work night shifts.
- Preventing or reducing problems with sleeping and confusion after surgery.
- Reducing chronic cluster headaches

Melatonin has been identified as a key factor in the regulation of circadian rhythms and the sleep-wake cycle. Long exposure to artificial lighting leads to a reduction in endogenous melatonin exposure. Melatonin is thus associated with sleep disturbances including insomnia, and much of the literature is focused in this area.

Tele:
E-mail address: desaiakankshaa@gmail.com

2. Methods & Results

In humans, the only data on cyclical melatonin changes comes from women undergoing ovarian stimulation. Levels of melatonin reach a nadir in the preovulatory phase and peak in the luteal phase. This suggests that melatonin has variable effects dependent on the menstrual phase.

It is also well known that shift-workers are more likely than daytime workers to experience circadian disruption and longer menstrual cycles, more menorrhagia and dys-menorrhoea. These results are corroborated by a very large cohort study, which also found that duration of shift work was modestly associated with menstrual cycle irregularity. A Japanese study found that melatonin levels varied significantly between night and day shift workers, while LH and FSH levels did not, suggesting that the menstrual irregularity associated with shift-work could be explained by melatonin fluctuations[11][12]

Control Group

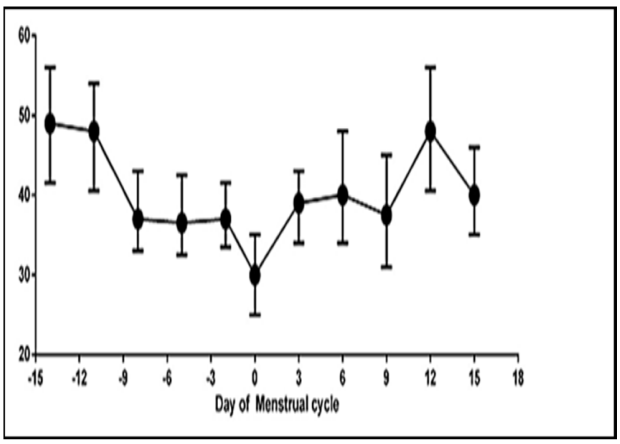

Fig 1. Melatonin : Relative concentrations of Plasma Melatonin treated with respective day of menstrual cycle.

Experimental Group

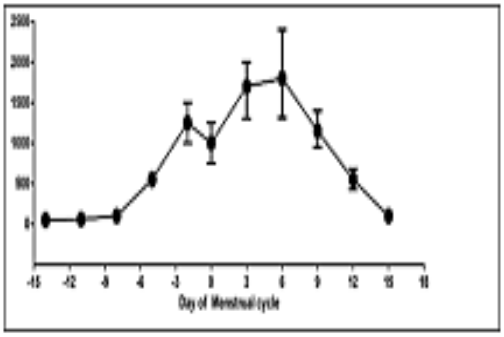

Fig 2. Melatonin: Relative concentrations of Plasma Melatonin treated with respective day of menstrual cycle.

The role of Melatonin in Assisted Reproductive Technology:

Oxidative stress occurs at many levels during the treatment of infertility. Interventional studies have begun recently, with an emphasis on oral supplementation of melatonin during the ovarian stimulation phase of the IVF cycle and its effects on gamete and embryo quality. [10]

Effects of Melatonin on Oocyte Quality

- Melatonin is an effective mitigator of mitochondrial DNA damage, likely as a result of an increase in electron transport efficiency within mitochondria, thus preventing the formation of ROS. In some situations melatonin may be even more effective at performing this function than specific mitochondrial antioxidants, and this particular characteristic may have relevance to its use in the treatment of infertility and the improvement of oocyte quality and maturity. [1][2]

3. Mathematical Model

Suppose one wants to prove some statement S_0about some object X_0(which could be a number,a point, a function, a set, etc.) To do so, pick a small $\epsilon \to 0$, and first prove a weaker statement S_ϵ (which allows for losses which go to zero as $\epsilon \to 0$) about some perturbed object X_ϵ. Then, take limits $\epsilon \to 0$. Provided that the dependency and continuity of the weaker conclusion S_ϵ on ε are sufficiently controlled, and X_ϵ. is converging to X_0 in an appropriately strong sense, you will recover the original statement. One can of course play a similar game when proving a statement S_∞about some object X_∞, by first proving a weaker statement S_N on some approximation X_N to X_∞ for some large parameter N, and then send $N \to \infty$ at the end. Some typical examples of a target statement S_0 and the approximating statements S_ϵ that would converge to S appear in the following table.

Of course, to justify the convergence of S_ϵ to S_0, it is necessary that $X_\epsilon$converge to X_0 (or $f_\epsilon$converge to f_0 , etc.) in a suitably strong sense. (But for the purposes of proving just upper bounds, such as $f(x_0) \le M$, one can often get by with quite weak forms of convergence, thanks to tools suchas Fatou's lemma or the weak closure of the unit ball.) Similarly, we need some continuity (or at least semi-continuity) hypotheses on the functions f,g appearing above. It is also necessary in many cases that the control S_ϵ on the approximating object x_ε is somehow "uniform in ε", although for "σ-closed" conclusions, such as measurability, this is not required. By giving oneself an epsilon of room, one can evade a lot of familiar issues in soft analysis. For instance, by replacing "rough", "infinite complexity", "continuous", "global", or otherwise "infinitary" objects x_0 with "smooth", "finite-complexity", "discrete", "local", or otherwise "finitary" approximants x_ε, one can finesse most issues regarding the justification of various formal operations (e.g., exchanging limits, sums, derivatives, and integrals). Similarly, issues such as whether the supremum $M := \sup\{f(x) : x \in X\}$ of a function on a set is actually attained by some maximiser x_0 become moot if one is willing to settle instead for an almost-maximiser x_ε, e.g., one which comes within an epsilon of that supremum M (or which is larger than $1/\varepsilon$, if M turns out to be infinite). Last, but not least, one can use the epsilon of room to avoid degenerate solutions, for instance by perturbing a non-negative function to be strictly positive, perturbing a non-strictly monotone function to be strictly monotone, and so forth.

The soft analysis components of any real analysis will contain a large number of examples of this trick in action. In particular, any argument which exploits Littlewood's three principles of real analysis is likely to utilise this trick. Of course, this trick also occurs repeatedly , and thus was chosen as the title of this book. (Riemann-Lebesgue lemma). Given any absolutely integrable function $f \in L1(R)$, the Fourier transform $\hat{f} : R \to C$ is defined by the formula.

$f(\xi) := \int_R (f(x)e^{-2\pi i x\xi})dx$. [13]

The Riemann-Lebesgue lemma asserts that $f(\xi) \to 0$ as $\xi \to \infty$. It is difficult to prove this estimate for f directly, because this function is too rough: it is absolutely integrable (which is enough to ensure that $\hat{f}$ exists and is bounded), but need not be continuous, differentiable, compactly supported,bounded, or otherwise nice. But suppose we give ourselves an epsilon of room. Then, as the space C_∞^0 of test functions is dense in $L_1(R)$, we can approximate f to any desired accuracy $\varepsilon > 0$ in the L_1 norm by a smooth, compactly supported function $f_\varepsilon : R \to C$, thus

$\int_R |f(x) - f_\varepsilon(x)|\, dx \le \varepsilon$. [13]

The uses of forming an ϵ-room (Soft Analysis) in the pineal gland.

1. The important point is to save energy to fight with the stress effects.

2. The hormones like Melatonin, LH, FSH and Prolactin in the night time will be regulated.

3. Melatonin is the night hormone which secretes in the pineal gland. If it secretes uniformly all other hormones like serotonin will be regulated in the day time.

Claim : Suppose there is an ϵ-room in the pineal gland.By using Riemann-Lebesgue lemma, $f \in L^1(R)$We can define the sample function as

$f_\epsilon(x) = f_{\epsilon R}$, visible part

$= f_{\epsilon C}$, invisible part

$= f_{\epsilon B}$,boundary part

The fourier transform $f : R \to C$ such that

$f(\xi) := \int_R (f(x)e^{-2\pi i x\xi})dx$

By Riemann- Lebesgue lemma,

$f(\xi) := \int_R (f(x)e^{-2\pi i x\xi})dx$,

$f(\xi) \to 0$ as $\xi \to \infty$

This function exists and is bounded but need not be continuously differentiable, compactly supported , bounded and otherwise nice.

As C_0^∞ of test functions dense in $L^1(R)$,we approximate the function to any desired accuracy $\epsilon > 0$ in the L^1 norm by a smooth compactly supported function $f_\epsilon : R \to C$ then

$\int_R |f(x) - f_\varepsilon(x)|\, dx \le \varepsilon$.

f (x) is not an illusion function.

It is uniformly convergent.

Here the trick is to work not with the function u directly , but with the modified function.

$t_1 = x \text{ and } t_2 = y$

$u^{\epsilon}_{(x,y)} = u(x,y)_{+\epsilon}\{\exp$

$[\mu_1 x + \mu_2 y + 0.5\,(\sigma_1^2 x^2 + 2P\sigma_1\sigma_2 xy + \sigma_2^2 y^2)]\}$

If x and y are jointly Gaussian and uncorrelates, then ρ = 0

$\mu^{\epsilon}_{x} = \exp$

$[\mu_1 x + \mu_2 y + 0.5\,(\sigma_1^2 x^2 + 2P\sigma_1\sigma_2 xy + \sigma_2^2 y^2)(\mu_1 + \sigma_1)$

$\mu^{\epsilon}_{xx} = \exp$

$[\mu_1 x + \mu_2 y + 0.5\,(\sigma_1^2 x^2 + 2P\sigma_1\sigma_2 xy + \sigma_2^2 y^2)(\mu_1 + \sigma_1)^2$

$\mu^{\epsilon}_{yy} = \exp$

$[\mu_1 x + \mu_2 y + 0.5\,(\sigma_1^2 x^2 + 2P\sigma_1\sigma_2 xy + \sigma_2^2 y^2)(\mu_2 + \sigma_2)^2$

$\mu^{\epsilon}_{xx} + \mu^{\epsilon}_{yy} = \exp$

$[\mu_1 x + \mu_2 y + 0.5\,(\sigma_1^2 x^2 + 2P\sigma_1\sigma_2 xy + \sigma_2^2 y^2)[(\mu_1 + \sigma_1)^2 + (\mu_2 + \sigma_2)^2]$

u^{ϵ} is bounded by this value.

Substituting the values for $\mu_1, \sigma_1, \mu_2, \sigma_2$ in this equation we can get the bound (μ + ϵ) on the boundary of the disk , we conclude that u^{ϵ} is bounded by (μ + ϵ) on the interior of the disk as well. Sending $\rightarrow 0$, we obtain the claim.

4. Mathematical Results

For different values of shape & scale parameters we have following figures for the application part

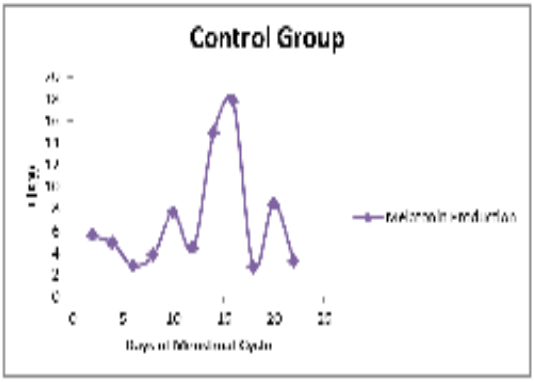

Figure A. Effects of Melatonin on Control Group u(x,y) for Days of Menstrual Cycle.

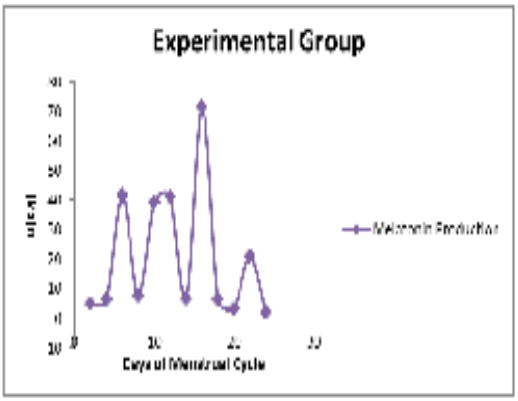

Figure B. Effects of Melatonin on Experimental Group u(x,y) for Days of Menstrual Cycle

5. Conclusion

a. Mathematical Conclusion

Figure A shows effects of Melatonin for days of Menstrual Cycle. It is clearly seen from Mathematical Graph that the Function in the form of two variables Melatonin and Time is a continuous curve which actually tends to Sine curve. The curve specifies the Effects of Melatonin on Control Group u(x,y) for Days of Menstrual Cyclewhich shows the highest peak at the ovulation period of the menstrual cycle thereby giving a low secretion during the remaining phases of the menstrual cycle as compared to that with the experimental group very clearly seen in the figure.

Figure B shows effects of Melatonin for days of Menstrual Cycle. It is clearly seen from Mathematical Graph that the Function in the form of two variables Melatonin and Time is a continuous curve which actually tends to Sine curve. The curve specifies the Effects of Melatonin on Control Group u(x,y) for Days of Menstrual Cycle which shows the highest peak at the ovulation period of the menstrual cycle thereby giving a preferably higher secretion during the remaining phases of the menstrual cycle as compared to that with the control group very clearly seen in the figure.

b. Medical Conclusion drawn from Mathematical Model

Infertility treatments are associated with significant levels of reactive oxygen species which have the potential to negatively affect the quality of oocytes and embryos. Melatonin shows promise as an adjunctive therapy in the treatment of infertility. Its unique anti-oxidative characteristics and safety profile make it an ideal potential adjuvant therapy to be further investigated in well designed manner.

6. References

1. Biran V, Phan Duy A, Decobert F, Bednarek N, Alberti C, Baud O: Is melatonin ready to be used in preterm infants as a neuroprotectant? Dev Med Child Neurol 2014, 56:717–723.
2. Bai J, Dong L, Song Z, Ge H, Cai X, Wang G, Liu P: The role of melatonin as an antioxidant in human lens epithelial cells. Free Radic Res 2013, 47:635–642.
3. Chakravarty S, Rizvi SI: Physiological effects of melatonin: implications on human health. Biomedicine 2008, 28:252–255.
4. de Matos CA, de Bruin P, de Bruin V, Nunes D, Pereira E, Cavalcante M, Andrade G: Melatonin reduces lung oxidative stress in patients with chronic obstructive pulmonary disease: a randomise, double-blind,
placebo-controlled study. J Pineal Res 2012, 53:238–244.
5. Dr,S.Lakshmi and M.AgalyaA, MathematicaL Model For Finding Maximum Likelihood Estimator Functions of Luteinizing Hormone, Follicle Stimulating Hormone, Estradiol and Progesterone., Feb2014.PP 41-46.
6. Barlow,R.E and Proschan, F., Mathemmatical Theory of Reliability , John wiley ,New York ,1965 Advanced mathematical treatment of maintenance policies and redundancy optimization
7. Lakshmi,S and Agalya,M., A Mathematical model for finding the Association of Thyroid Stimulating hormone with LH and FSH ,International Journal of Mathematical Sciences Vol-13,No.1-2.P-85-93,2014.
8. Lakshmi,S and Geetharani,B.,M/M/1/N queuing model for the secretion of DHEA due to human stress, Bioscience Research Bulletrin Vol-26,Issue No.2,2010,PP:123-129.
9. Lakshmi,S and Shanmugapriya,S ,Stochastic Model for endocrine stress responses in chronic fatigue syndrome ,Bioscience Research Bulletin V0l-24,No-2,2008,P-63-67.
10. Lundsberg L, Pal L, Gariepy A, Xu X, Chu M, Illuzzi J: Knowledge, attitudes, and practices regarding conception and fertility: a population-based survey among reproductive-age United States women (in press). Fertil Steril 2014, 101:767.

11. Madalinski M: Does a melatonin supplement alter the course of gastroesophageal reflux disease? World J Gastrointest Pharmacol Ther 2011, 2:50–51.
12. Scheuer C, Pommergaard H, Rosenberg J, Gögenur I: Melatonin's protective effect against UV radiation: a systematic review of clinical and experimental studies [Epub ahead of print]. Photodermatol Photoimmunol Photomed 2013, 30:180.
13. Terence Tao, "Create an epsilon of a room ", Department of Mathematics, Ucla, Los Angeles, Ca 90095, 323:331.