

BRAIN GUT 11: IS TECHNOLOGY OUR ACHILLES HEEL?

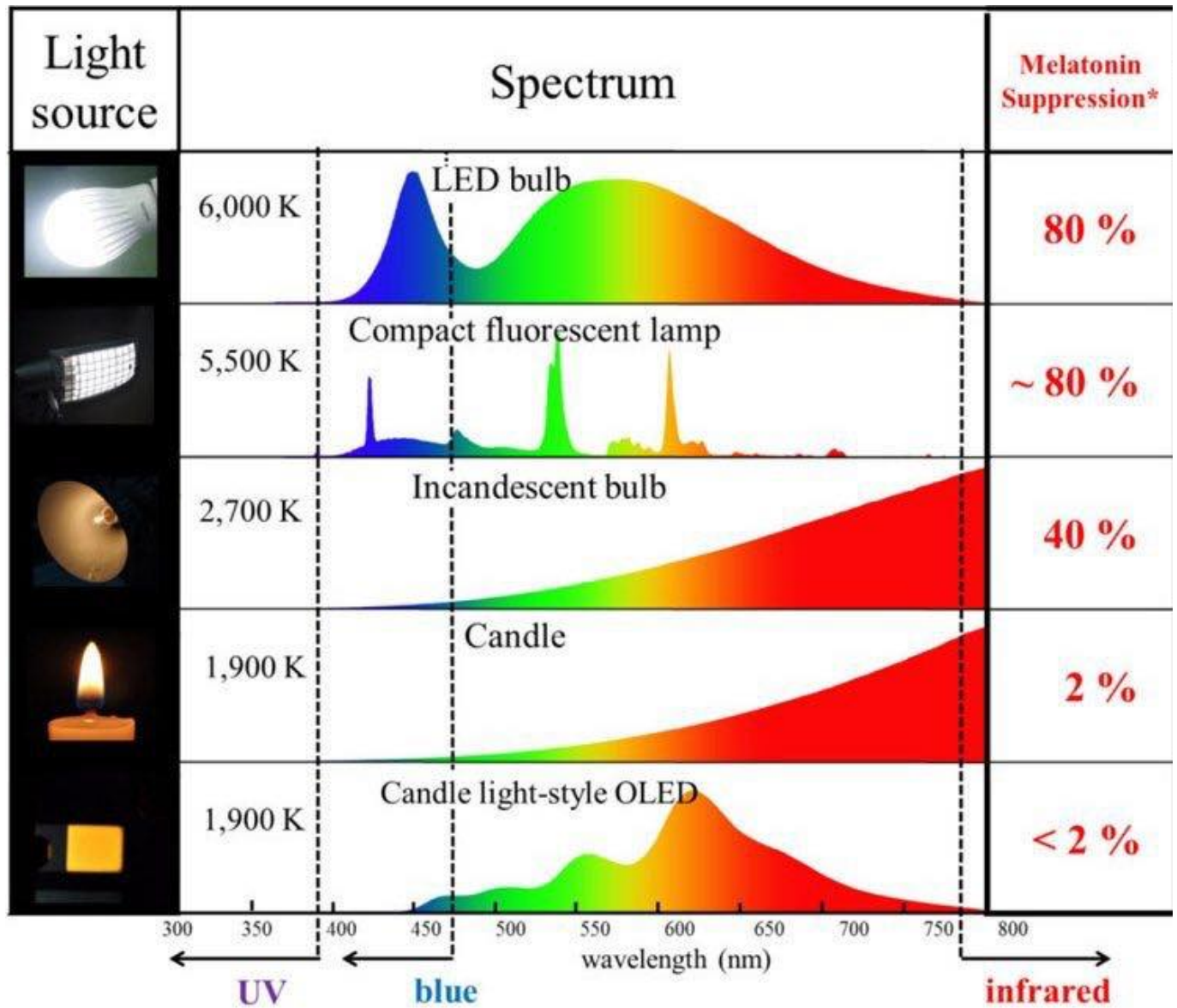
READERS SUMMARY:

1. A QUESTION DURING AN EDUCATIONAL CONSULT STIMULATES A DISCUSSION
2. HOW DOES ARTIFICIAL LIGHT DESTROY THE SIGNALING OF THE CORTISOL/DHEA/MELATONIN AXIS?
3. HOW DOES ARTIFICIAL LIGHT AFFECT THE GUT FLORA?
4. CAN ARTIFICIAL LIGHT AFFECT HUMAN BIOLOGY DIRECTLY?
5. IS BODY COMPOSITION TIED TO ARTIFICIAL LIGHT AND IMPAIRED SLEEP CYCLES?

Question asked to me during an educational consult: I still don't understand the significance of the prolactin surge especially in older people like me. Since I am post-menopausal, what happens if I eat carbohydrates within 4 hours of going to sleep? What does it have to do with leptin resistance? I am neither a science person, so is there any way to explain it in less technical terms?

BEFORE WE BEGIN to TAKE A LOOK HERE AND TELL ME IF YOU THINK EVOLUTION HAS A PLAN FOR THIS?

I hope everyone realizes that artificial light has only been around on our planet since 1874. But fire and candles can affect our melatonin cycles too. Even a full moon can do it.



Just so we are clear. Chronic artificial blue light is equivalent to chronic excessive carbohydrates because both contain excessive photoelectric energies. This alters mitochondrial functioning after a period of time because our mitochondria evolved expecting a seasonal variation of energies in both photons and electrons/protons. Here is a link to look at.

So you might be wondering what exactly does artificial light do to a human brain?

In a word, it destroys its ability to properly signal environmental signs to our cellular machinery. It affects this molecular machinery pretty quickly by fast forwarding our circadian chemical clocks to light. These clocks are all biologically tied to the cell cycle that controls growth. How does this happen? I believe the initial stimulus occurs on the skin and the first clinical sign physician notice is a change in a hormone's secretion in the brain. It dramatically alters the surge of the pituitary secretion of Prolactin. This happens after 4 hours of darkness or after a really big release of oxytocin.

NON GEEKS: The surge of Prolactin is normally quite large in normal darkness but is significantly diminished in artificially lit environments after sunset. This was shown in the CT 2 video. This has big implications for modern humans. The reason is that prolactin release is coordinated with sleep cycles where autophagy is at its highest efficiency and where Growth Hormone is released. If this is diminished we generally see lower DHEA levels clinically and higher IL-6 levels on cytokine arrays. Remember when we see lowered DHEA levels this sends a signal to our gut flora that something is amiss. It allows more permeability of our intestinal brush border to inflammation that destroys signaling. We covered that in the DHEA blog. This is how I measure of uncoupling of sleep from normal metabolism. When sleep is bad paleo says you gain weight. Dr. K says you might get cancer. Read this link. I base every case I examine I do on this step in circadian biology because it is the most important to humans. Why do you ask?

GEEKS: For evolution to work, a cell first must adapt to its environment. So the first thing a cell would encounter in an earth day is a period of day and night. The cell also has to make energy and it also has to control its own cellular division. In essence, the **circadian cycle** has to “yoke” to the metabolic cycle and its growth cycle. Evolution harnessed these environmental signals to control both metabolism and cellular growth. When it is dark at night time, the cell becomes more reduced chemically and electrically. (A lower redox state like we saw in the mitochondrial series). During a low redox time, cells are usually recycling their components using **autophagy**. In the mitochondria this is called mitophagy.

During the day with sunlight, energy is being made to explore the environment, the cell is more oxidized because of increased leakiness of the mitochondria at cytochrome number one. This is how the environmental light signal is coupled to the chemical signal in the mitochondria. Another interesting coupling occurs between the circadian cycle with the cell cycle. They are linked via the PER 1 and PER 2 genes. PER 2 directly affects the cell cycle in **mitosis**. Mitosis requires a cell pulsing an ELF-UV signal to occur. We need oxygen and ROS to generate this light signal. Mitosis is the phase of the cell that occurs just before cell division to generate an offspring. Mitosis occurs via a light signal in between cells. The signal is usually UV light and it is in the extreme low-frequency range of the UV part of the spectrum.

The mammalian period 2 gene plays a key role in tumor growth in mice; mice with a mPER2 knockout show a significant increase in tumor development and a significant decrease in apoptosis (levee 19). This is thought to be caused by mPER2 circadian deregulation of common tumor suppression and cell cycle regulation genes, such as Cyclin D1, Cyclin A, Mdm-2, and Gadd45, as well as the transcription factor c-myc, which is directly controlled by circadian regulators through E box-mediated reactions. E-box reactions involve regulation of

the *hTERT* gene encoding the telomerase catalytic subunit. Here is where circadian biology directly impacts telomere biology. Because the telomerase enzyme is altered in these E box reactions, light, especially artificial light during sleep cycles, plays an important role in human cell senescence, immortalization, and carcinogenesis.

This implies that sleep is tied directly into to cell cycle functioning and directly into cell-mediated immunity at some level. It appears that sleep directly affects the chronic diseases of aging and likely plays a role in cancer development.



It also implies that light, especially artificial light may cause several cancers because of this effect. Why do you ask? Take a look at this link.

THIRD GRADE MATH QUESTION: 48% vs 10%

Humans have the largest brain of any mammal. We have 8 lobes in our brain. We have 2 frontal, parietal, temporal, and occipital lobes. The Occipital lobes in the back of brain control most of the neuron circuits for light and vision. This implies that 25 % of our brain is tied to light

circuits. It gets more interesting for us. The other six lobes have areas within them called the association cortex.

Light also wires directly to these areas too! What does this mean? It means if you're a human with a big ass brain 45-48 % of your brain is wired to light circuits. We recently discovered two visual systems in humans. There are two pathways for sight in the retina. One is based on classic photoreceptors (rods and cones) for regular vision, and the other, newly discovered, based on photoreceptive ganglion cells which act as rudimentary visual brightness detectors.

These circuits are very important for circadian signaling of day and night. Your hypothalamus is in control of accounting for energy by accounting for electrons from food. These electrons are sent to your mitochondria's inner membrane to generate energy. Your hypothalamus integrates and yokes sleep and metabolism as I laid out here a year ago. The hypothalamus only makes up 1 % of the total volume of your brain. Moreover, the outflow tracts of the leptin receptors in the hypothalamus only project to **ten percent** of the rest of the neurons in your entire brain.

What does this imply? It means that the conventional wisdom that diet is the main controller of metabolism might be dead wrong. Maybe, light is the master controller of how you account for calories after all? It also means light is tied to body composition, cancer, illness, and our gut flora composition. How do we sense light? It appears the eye and skin are the major organs capable of it. Are you starting to connect any dots yet?

What if I told you a sleep researcher in California is now using light to help modify hormones and affect sleep and memory function? Well, he is doing just that. It is called Optogenetic sleep research. My bet is we will soon find out we can alter the gut flora this way as well and impact obesity and sleep. It may even replace CPAP machines for the treatment of Obstructive Sleep Apnea. That researcher is Dr.

Luis DeLecea from Stanford. Dan Pardi and I talked about his work at Paleo Fx in 2012. Light has a massive effect on the human brain because it is wired to it on many levels of function.

HOW DOES ALL THIS WORK?

The normal large circadian prolactin surge we should see at around midnight after leptin enters the brain does not happen if the patient has leptin resistance, sleep apnea, or has eaten food too close (within 3-4 hours) to bedtime. This blocks leptin's ability to enter the brain because insulin spikes block leptin from binding to its receptor in the hypothalamus. As mentioned above, this step is usually impaired if you are a post-menopausal female as well. Just being postmenopausal alone make you more insulin resistant (IR) because of the intrinsic loss of your progesterone to estradiol ratio. The reason is simple, most postmenopausal women have a very altered circadian cycle to both carbs and to artificial light because their gut flora changes as their hormones change as they age. This happens in men as well who are in andropause. This is just not a women's story guys! It happens to us too. We also know from new research that as we age our gut flora changes to a more simplified one that favors increase deposition of fat from our diets. This is fostered by alterations in our hormones as we age.

GEEKS AND NON GEEKS UNITE: When I test people, I consistently find that their AM cortisol's are low and this implies that their dopamine levels in their brain are also low too. To increase their central dopamine stores we can use a drug like **cycloset** and low dose **metformin** to help their blood sugars, protect their intestinal brush borders and lower the leakiness to ROS at cytochrome one. This increases their ability to

clear superoxides created in their brain's mitochondria. The science of this area involving neurons mitochondria is quite complex but I may tackle it down the pike for you if you guys decided you want your head to hurt even more.

It also allows the brain to use its favorite fuels, ketones, and lactate. The brain burns clean on them. What does that mean? It means we have the lowest amount of ROS from superoxide being produced in our neurons mitochondria.

GEEKS: Lower ROS means better cognition and function because the ATPase spins faster.

NON GEEKS: This means the Ferrari engine in our head purrs like a kitten and not a 1990 Nissan Sentra.

These things can all be used to reset the circadian chemical clocks in the brain by altering the levels of adenosine in our cells. Adenosine is the cellular signal that signals our cells we are entering a nighttime phase or renewal.

NON GEEKS: Adenosine rises at night because during the daytime activity we use up all our ATP! Adenosine is the result of using up ATP during daylight. Peroxiredoxins are linked to ATP functions in the matrix. We have a total of six isoforms and all are heme proteins. Peroxiredoxin 3 (PRX3), is located exclusively in the mitochondrial matrix, is the principal peroxidase responsible for metabolizing mitochondrial hydrogen peroxide, a byproduct of cellular respiration originating from the mitochondrial electron transport chain. Electron leakage, primarily at complexes I and III, leads to the incomplete reduction of molecular oxygen which forms superoxide radical [link]. Superoxide is an unstable intermediate that is spontaneously or enzymatically dismutated to hydrogen peroxide (H_2O_2), the primary oxidant implicated in redox signaling.

Catalase then deals with hydrogen peroxide. Low levels of H_2O_2 produced by the mitochondria regulate physiological processes, including cell proliferation, while high levels of

H₂O₂ are toxic to the cell and cause apoptosis.



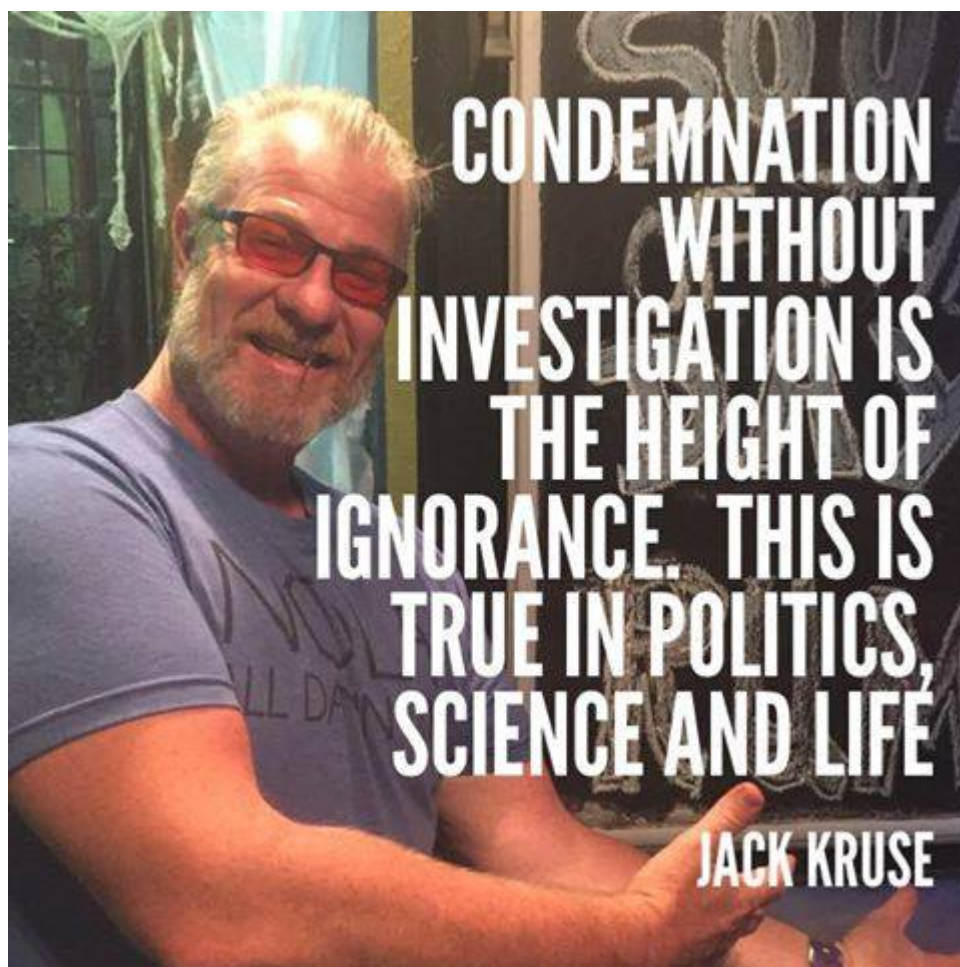
WE RENOVATE U.....WITH LIGHT, WITH NATURE, AND WISDOM. GET MELANOPSPIN PROTECTION FOR YOUR HEALTH

EA OPTICS

DISCOUNT CODE 'OPTIMAL'

Coffee and artificial light block adenosine receptors and this is why it destroys normal sleep cycles. Artificial light, especially the new LED lights and halogens, with its powerful blue light spectrum, speeds up our chemical clocks to cause massive mismatches. In clinical medicine, carbohydrates out of their growing season and artificial light also cause low AM and higher PM cortisol levels in humans and are often associated with type 2 diabetics (T2D). This is why T2D always seems to have altered sleep and dietary issues with artificial light at night, eating carbohydrates at the wrong

time of the day/season, and industrial seed oil PUFA's with manufactured versions of hydrogen in them. It is because our sleep clocks and metabolic clocks no longer work in unison because of altered cellular signaling due to inflammation caused by these mismatches. Our adenosine receptors account for them all and degrade our sleep cycles. It is as if our left-hand does not know what the left on is doing at any time when this occurs. Blue-blocking glasses and clothing are mandatory for all diabetics in my view.



What else might we consider to do? T2D have metabolic inefficiencies from their disease, and this implies low intracellular magnesium levels, low DHEA levels, and insulin resistance. Insulin resistance is strongly associated in the gut with altered production of Vitamin K2 from our gut flora. Exogenous vitamin K2 can help people with insulin resistance, menopause, peri-menopause, and andropause. We can also use vitamin K2 to sensitize them to insulin helps further. Both

of these molecules are solar substrates. In artificial light environments, we find alterations in the gut flora because it becomes simplified. Simplified means lower sheer numbers of bacteria and decreased species of bacteria. When this happens as we mentioned in Brain Gut 9, we don't make enough vitamin K2 from our gut flora. This often will increase their androgen levels too. Often times, it may give them their lost libido back too. One of the clinical signs I ask about in these cases is the ease and power of their orgasms. This usually shocks people initially. Then when they think about it, they realize that their libido and sexual performance has also lost its power and luster too. When this axis is re-engineered, women often report they seem to climax easier. They also the depth of the experience of orgasm is back to when they were young.

In MJ's guest blog, this discussion caught her totally by surprise. I told her and Danielle that a **good orgasm is like a great exercise**, because hormonally, sex and exercise do the same things to our brain, via our ATPase spin rate. If you cannot make ATP fast enough you likely will not experience orgasm. Orgasms increase the anti-oxidant protection of our brain to ROS from any cause because they are associated with optimal melatonin and oxytocin levels! Both affect mitochondrial function. The duration and intensity is the only major difference in this case. Oxytocin is the second most powerful anti-oxidant in the brain and lowers inflammation and makes neurons more reduced chemically as we see in normal sleep. Recently, I have noticed older women asking about exercise-induced orgasms done during abdominal crunches on a "Captain's Chair" machine at their outdoor gyms. Rarely does this happen indoors under blue light? They seem to be experiencing them more outside more often now and are wondering if it is pathologic or normal? The response I give is that it means their hormones are approaching what they were when the 17-25 years old and that is a great clinical sign their circadian cycles are becoming entrained back to normal

once again. It is hard to get women to this point who is not doing a lot of this right, but it can be done with persistence and the knowledge of the clinician. There is a cite below that discusses this phenomenon. It not a mirage. It is a clinical sign a woman is re-emerging back to optimal. This is how "Stella found her groove" again.

WEIGHT GAIN AROUND MENOPAUSE/PERI-MENOPAUSE/ANDROPAUSE:

This may begin to make you why perimenopausal or PM women gain weight no matter what they do with their diet or exercise. This is where paleo fails many people. Their Rx is to exercise more at the CrossFit and consider "carb-ing" up diet wise to support T3, and this only worsens the plight. You will see precisely why when Brain Gut 12 is live. This is where I begin on my blog. I focus on those of us who are broken and not working well. It is all driven by a massive change in their hormones once they lose their period or in men when their androgens and vitamin D3 levels fall apart for many reasons. This is often why older women sleep badly and gain weight they can not seem to lose in the gym (fake light) even with a good dietary template and good exercise habits. This is another reason I am a big advocate for bio-identical hormone optimization in women and men when it is required. This need is greatest in women who are warm adapted because they have the worse PG/E2 ratios. The need is lower in the cold-adapted females because their leptin levels are already low due to the cold protocols, and this implies that their hormone panels are not too far off the optimal path. Everyone's mileage varies because our Ferrari engines are all different and at different points in our life cycle. Men tend to have very low free testosterone, low DHEA, low pregnenolone, and low sulfated Vitamin D3 levels.

Did you know that even the AMA says fake light now causes breast cancer? Watch the video here at this hyperlink.

Postmenopausal women who are cold-adapted tend to do amazingly well clinically in most disease parameters in my clinical experience. The cold-adapted to use a ketogenic diet match to cold thermogenesis while being outside in nature. This tends to keep their HS CRP quite low so cellular signaling is not destroyed. The main problem they face is that their vanity and dogma keep them from using the cold pathways to become rockstars as they age. Exercise training tends to frustrate postmenopausal women and men with andropause because if their hormone response is altered they have a lot of trouble as they age. Men, on the other hand, do not lose their growth hormone levels (IGF-1) until 50-55 years old usually. They are also protected by their testosterone levels which can and should persist throughout life, provided that they are not suffering from inflammation which directly lowers their free and total testosterone levels. Art DeVany is a perfect example of this in the paleo community. Sadly, few share his epigenetics, because they have lived for decades in a life bathed in multiple circadian mismatches. Modern technology is our Achilles heel. I think it is also ironic that many of the younger folks in the paleo community also have altered hormone panels despite their exteriors when they test. This means that eventually they too will face the same set of biologic facts. Art is way ahead of most of the modern folks. GH and testosterone keep a man's heart and muscles in tip-top shape. If inflammation destroys these levels earlier in life, the results can show up in their labs and injury history even in younger people. I am finding this clinical result is an epidemic in my own practice today.

WHAT HAPPENS WHEN THIS IS ALTERED IN MODERN HUMANS?

Well, when a man or woman ages is like an instructive test case for us as clinicians. Peri and PM women have mental fog and fatigue and lowered energy and can't sleep well at all.

Men with andropause have the same issues. This sounds eerily similar to what a diabetic faces every day of their life as well. Very few people have put these two syndromes together clinically, but PM women and men with andropause, are a microcosm of what T2D faces daily. Let's examine this link further.

All diabetics are leptin resistant and that implies their hormones are disordered by the very nature of the biologic process. Diabetics are also chronically dehydrated and their ability to recycle their total body water is reduced. This is a clue to mitochondrial disease. Diabetics get this disorder from altered light cycles and excessive carbohydrates out of season. PM get this too on a smaller scale when their ovaries fail. These processes are commonly thought to happen in diabetics because of diet alone, but most of my readers now know about the temperature and light effects are far bigger issues than modern healthcare realizes. This is why I mentioned the medication '**Cycloset**' earlier. Cycloset was approved for diabetics in 2009, but few physicians even know about it, or how it works in our brain to reset the circadian clock once it has been fast-forwarded by mismatches. It works on the brain to fix the circadian mismatch that light and carbs cause when they are used out of their normal cycles. We look for altered AM and PM cortisol levels on an adrenal stress index test for a clue this is happening. It eventually results in the brain by lowering the dopamine pathways centrally.

How exposure to **blue light** affects your brain and body

BY DISRUPTING MELATONIN, **SMARTPHONE LIGHT** RUINS SLEEP SCHEDULES. THIS LEADS TO ALL KINDS OF **HEALTH PROBLEMS**:

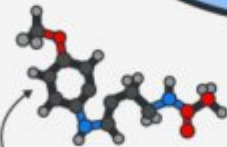
The disruption to your sleep schedule might leave you distracted and impair your **MEMORY** the next day.



A poor night's sleep caused by smartphone light can make it **HARDER TO LEARN**.



Over the long term, not getting enough sleep can lead to **NEUROTOXIN** buildup that makes it even harder for you to get good sleep.

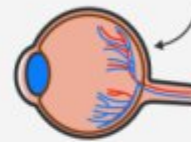


People whose melatonin levels are suppressed and whose body clocks are thrown off by light exposure are more prone to **DEPRESSION**.



By disrupting melatonin and sleep, smartphone light can also mess with the hormones that control hunger, potentially increasing **OBESITY RISK**.

There's some evidence that blue light could damage our vision by harming the **RETINA** over time – though more research is needed.



Researchers are investigating whether or not blue light could lead to **CATARACTS**.



There's a connection between light exposure at night and the disturbed sleep that come with it and an increased risk of breast and prostate **CANCERS**.



SOURCES: Nature Neuroscience; Harvard Health Publications; ACS, Sleep Med Rev, American Macular Degeneration Foundation; European Society of Cataract and Refractive Surgeons; JAMA Neurology

TECH INSIDER

Cycloset actually raises your AM cortisol spike that we normally see in normal humans. I covered this extensively in my August webinar for members on my site. It resets the cortisol/DHEA/melatonin axis of the hypothalamus. When the circadian cycle is off we usually see low melatonin levels. Low melatonin levels are consistently found in epithelial tumors. In modern humans, all epithelial cancers rates are exploding. Maybe now you might realize why.

Melatonin is the third most important anti-oxidant in the human brain. When melatonin is lowered chronically for any reason, we see a sharp rise in epithelial cancers. Epithelial cancers have risen dramatically since 1874 when the light bulb was invented. When Cycloset was approved for use by the FDA in 2009, it validated all my empiric clinical observations of

what really causes diabetes and cancer. I believe the environmental mismatches that have gone on for decades are the real etiology of the modern epidemics we are seeing explode in medicine. It is due to a modern human never facing a true winter, and never giving the brain the appropriate sunlight and sundown stimulus it needs to function optimally.

Prior to 1924, we never had to worry about artificial light much. If you look at the incidence and prevalence of T2D and cancer since 1874, be prepared to be astounded out what I just laid out here. Diabetes and cancer may not be a real disease after all; they maybe epigenetic light-induced phenomena of modern life!! I said this earlier in the year in the Cold Thermogenesis series.

KEY POINT: Diabetics and PM women get the same symptoms from the same lowered dopamine problem, but they differ in intensity and duration. When you add another environmental mismatch it just worsens the defect for those with perimenopause, PM, or andropause. That is why modern medicine thinks T2D is a “carbohydrate” only issue. I don’t and have not for the last ten years.

Most diabetic,s and those in PM, menopause, and andropause are even more sensitive to artificial light after dark. It is now becoming a very common finding in research papers in cancer and metabolism, that this is a huge problem that has been in our blind spot. Artificial light by itself makes us insulin resistant, lowers our sex steroid hormones, destroys vitamin D levels, and alters our gut flora so we do not make enough Vitamin K2. Chronic lowered vitamin K2 also makes us more IR too and pushes us closer to T2D as well. It also sets the stage for atherosclerosis, CAD, osteoporosis, and strokes.

I covered the mechanism of this extensively here in this **blog**.

Think about what I have just shown you earlier, in the brain-gut 7, about how obesity and metabolic syndrome have their own particular gut flora associated with them. Are beginning to see why these are interconnected now? It is all about the light first, when you are mammal with a large brain that wired to light.

KEY POINT: This is also why peri and menopausal women's FBG go up once their ovaries have failed. Ladies pay attention to it. Very few clinicians seem to know this, so they do not pay attention to it. Look at your own glucose levels on your labs. If they are over 88 you likely have this issue as well. I pay attention to it. When we have high normal blood glucose it is a sign of brain damage. High normal blood glucose causes the brain to shrink! I have been on the artificial light rampage for 10 years now because I found I was very sensitive to it myself before I fixed the problem.

Moreover, these artificial lights also tend to be quite bright (because of halogen and LED uses today with massive blue light exposure) and completely un-yokes the normal circadian signals from the hormone response in the brain. Blue light is a powerful known disruptor of the SCN in the eye. **When it is off, we age faster.** We age faster when our hormone levels fall to their lowest levels in our labs. The hormone panel is the Rosetta Stone for humans. I mentioned this in bold in Brain Gut 5. It is probably the most important thing I have written in this series, so far to date.

WHAT DOES BLUE LIGHT SPECIFICALLY DO TO US?



Blue light after sunset reduces the prolactin surge we normally see in humans. When we see chronic lowered prolactin surges we also see lower growth hormone secretion during the anabolic phases of sleep. Lowered chronic GH secretion directly affects cardiac and skeletal muscle function because the process of autophagy is made less efficient as our life continues.

Lowered GH and the sex steroid hormones at sleep lead to loss of cardiac function. This is why heart failure is strongly associated with low IGF-1 and low sex steroid hormone levels. When growth hormone is not released in normal amounts, it also decreases our lean muscle mass and increases our body fat percentage in all our organs and in our body. This leads to slowly declining organ dysfunction and poor body composition. We can measure this process clinically by looking for falling DHEA level (bad) and a falling Growth Hormone level (also bad) as we age.

Look at this 8/3/2012 blog by Joe Mercola. It appears his staff is reading my site now with this recent advice:

He says, "Too Much TV Linked with Thicker, Weaker Kids"

"There can be little doubt that our modern lifestyle is at the

heart of the problem. We eat poorly and don't exercise enough. The results of this sedentary, under-nourished lifestyle are evident in today's children. Today, one-third of all American children ages 2-19 are overweight or obese. Most of these children will become diabetic.

Spending hours in front of the TV or playing video games is, of course, a hallmark of a sedentary lifestyle.

If you needed any more proof that too much time in front of the TV is not good for kids, then you'll be interested in a new study that not only affirms that TV-time is linked to sleep problems and weight problems, but also to weaker muscles [4]. The new study, published in the International Journal of Behavioral Nutrition and Physical Activity [5], shows that the number of hours in front of the TV during preschool years is linked to increased waist size and decreased leg strength."

According to the authors:

"Watching television excessively in early childhood may eventually compromise muscular fitness and waist circumference in children as they approach pubertal age."

This is significant, the study's authors said, "because it not only could affect performance in sports activities, but also cardiovascular health and susceptibility to injuries. TV programming also exposes your children to commercials promoting health-harming junk foods; literally programming them from infancy to have a skewed understanding of what to

eat. Just as you don't want your child exposed to ads for cigarettes during Saturday morning cartoons, neither should your kids be bombarded by non-stop commercials for sugary foods and snacks."

Here is a link to the blog:

What Dr. Mercola believes is at the source of the obesity, is the fact that they are sedentary. This what Mrs. Obama is saying too in her campaign against obesity. **In my opinion, neither one has the science correct.** This is the wrong reason they are getting fat. We know that just sitting around does not make you fat from many studies done on hunter-gatherers and from studies on many predatory mammals in the wild who are sedentary for most of their day. In my opinion, it is all about the blue light from these new LED HD TV's, iPad, and iPhones they use to access this technology. These are massive circadian disruptors to the eye and skin.

KEY POINT: This statistic may shock you, but every ten percent increase of spending on technology we measure corresponds to a 10% spike in obesity in our population. I spoke about this months ago, in the Paleo Summit talk I gave earlier this year. Cycloset is a medication that works to help restore altered circadian signaling in the brain. Blue blockers are better options than pills. It is time, we all realize that blue light is worse then any diet might be for us when the animal is a mammal with a large brain and our largest organ is our skin to support the brain's energy needs.

SO HOW SHOULD LEPTIN AND GROWTH HORMONE DANCE WHEN LIFE IS GOOD?

NON GEEK REVIEW: So you might be wondering how does leptin enter this circadian equation with food and light? The first step is leptin levels rise slowly for four hours post dinner. At midnight leptin then enters the hypothalamus. Once it binds to the receptor two things occur. The first is a second messenger is sent to the thyroid up-regulate free T3 production to stimulate uncoupling protein 3 in muscles to burn fat liberated as we sleep at a higher metabolic rate. These fats are burned not as energy but as free heat at the muscles. We do this as well, in the cold, as I taught you in the CT series.

The key take home is it requires leptin sensitivity and ideal thyroid function at the muscle level. How do we maintain ideal thyroid function? The Epi-paleo template should be the obvious answer to you now. The reasons should be even more obvious. The Epi-paleo Rx makes sure that everything the brain needs and thyroid needs are in the same evolutionary food packages. It also lowers inflammation and leptin levels best. It also provides ample iodine resources to maintain your free T3 levels regardless of your carbohydrate intakes.

Seafood has the optimal nutrient density for humans. When one talks about nutrient density of foods, you are just studying the food values against other foods. It is really useless information that can lead to bad conclusions, when you do not consider the main metabolic actions of the mammal in question.

We hit this topic in Brain Gut 12. With regards to humans, the human brain is a complete energy hog and it requires all the nutrients in seafood and not those in offal. If offal or skeletal meat were critical to forming a human brain, then we should see other predatory mammals that eat meat and offal routinely walking this planet with massive brains. In fact, we see the opposite effect. Eating meat and offal does not make a brain. Nutrient density of food must take into account, the metabolic energy requirement unique to the animal

into consideration to make any claim on what is optimal for it. When people talk about the nutrient density of food, it rarely incorporates this foundational insight.

GEEKS : The second effect of leptin is via another second messenger: the coupled receptor with leptin bound to it, sends a message to the anterior pituitary to release prolactin from 12-2 AM. The prolactin release is required for proper control of sleep stages and yoking sleep and metabolism....but the real benefit is this is the signal the hypothalamus uses to release pulsatile growth hormone release from 2 AM to 5 AM during sleep stages 2-4. This allows the process of AUTOPHAGY to be of maximal efficiency as we sleep. At sunrise, cortisol rises and so does ghrelin, a gut hormone. What does ghrelin do during the day to growth hormone secretion? It stimulates its pulsatile release during daylight hours. This means that proper growth hormone release is completely tied to proper circadian signaling. It also means that an IGF-1 level is instructive to a mismatch to a clinician. When IGF-1 is low, this usually signals an alteration in the cortisol/DHEA/melatonin axis. This is why a lowered AM cortisol is tied to T2D and most neolithic disease states. T2D have some of the lowest IGF-1's measured in clinical medicine. When IGF-1 is low this means the person's body composition is also dramatically altered. **Low growth hormone levels signal higher body fat levels (especially visceral fat) and lowered levels of lean muscle mass.** People with low IGF-1's tend to also have sleep disorders like obstructive sleep apnea. When your AM/PM cortisol levels are off because of artificial light you can not make growth hormone and your body composition declines rapidly. This is why people get fat and lose muscle mass when their light cycle is off.

IS LIGHT OR DIET MORE IMPORTANT TO T2D OR A PM WOMEN? A REVIEW:

Light is most important and it is not close. Why? Simple. **Neurobiology of light is the answer because of how the human brain is wired to light via the eye and skin.**

NON GEEKS AND GEEKS UNITE: Recall that autophagy is the process of cellular renewal. When we recycle proteins, we are able to learn much better, and retool our brains from yesterday's oxidative damage. Think back to earlier in the blog.

People who have sleep apnea are generally obese, inflamed and leptin resistant and never get their pulsatile GH release at the correct times of the day and as a result, autophagy/mitophagy are poorly functional in them. If autophagy is poor, they suffer more diseases and age faster because their sleep is uncoupled from their metabolism. They are chronically using old proteins enzymes that have not be renewed by sleep. When you use old proteins and enzymes chronically you have altered cell signaling and this favors neolithic disease generation.

Moreover, these people can never burn their excess calories they take in from their diet or altered flora, as pure heat because the initial message of leptin was blocked from entering the brain so they remain fat. They can't lose the weight either until they become leptin sensitive and lower inflammation. If you want to know why you are not losing weight look at your inflammation levels as for why that is the

case. When they do begin to lose weight, they notice a tremendous change in sleep efficiency. Sleep is designed to be restorative and is critical for weight loss.

Prolactin is the trigger for GH release at night. GH decreases abdominal fat cells and simultaneously increases your lean muscle mass and allows for major protein synthesis because it optimizes mitophagy and apoptosis to self-regulate mitochondria with melatonin during darkness. Its levels fall off a cliff for most women after age 40 and for men after age fifty and there is a corresponding drop in the efficiency of sleep and autophagy. This is why older people sleep less than younger people. It is also why babies sleep so long, because they are in a massive growth phase body and brain wide. This is when their GH is being released when everything is working optimally. This also fuels their brain growth too with optimal progesterone and cortisol levels. When these hormones are off our brain function takes a direct hit.

I hope this helps you understand why humans need to be quite aware of what the light might do to us when its fake. People who attended the August webinar will be able to now use this blog post as a review. Please consider turning the lights off . The next 30 days are going to pass whether you like it or not, so why not think about something you have always wanted to try and give it a shot for the next 30 days? You might get some of your health back.

Next up: Brain Gut 12.....a real eye opener.

CITES:

Dijk DJ (Jan 2008) Slow-wave sleep, diabetes, and the sympathetic nervous system., *Proceedings of the National Academy of Sciences of the United States of America*, 105 (4), 1107-8

http://www.msnbc.msn.com/id/48682547/ns/health-mens_health/#.UC5BG47T1UQ

<http://www.livescience.com/8094-morning-light-teens-awake.html>

Dijk DJ, Visscher CA, Bloem GM, Beersma DGM, Daan S. Reduction of human sleep duration after bright light exposure in the early morning. *Neurosci Lett* 1987; 73: 181-186.

http://fitness.mercola.com/sites/fitness/archive/2012/08/03/obesity-surpasses-smoking.aspx?e_cid=20120803_DNL_artNew_1

<http://www.sott.net/articles/show/249740-Gut-Bacteria-Linked-to-Obesity-and-Metabolic-Syndrome-Identified>

Johnson MP, Duffy JF, Dijk DJ, Ronda JM, Dyal CM, Czeisler CA. Short-term memory, alertness and performance: a reappraisal of their relationship to body temperature. *J Sleep Res* 1992; 1: 24-29.

<http://news.discovery.com/human/women-exercise-orgasm-120319.html>

Cohen DA, Wang W, Wyatt JK, Kronauer RE, Dijk DJ, Czeisler CA, Klerman EB. Uncovering residual effects of chronic sleep loss on human performance. *Science Translational Medicine*. 2010; 2 (14) 14ra3

Driver HS, Werth E, Dijk DJ, Borbely AA (2008) The menstrual cycle effects on sleep, *Sleep Medicine Clinics*, 3 (1), 1-11