CHRONONUTRITION: THE NEW PARADIGM IN NUTRITIONAL SCIENCE

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Note: Definitions for words and phrases appearing in italics are listed at the end of this article

TIMING AND ORDER

What happens if we show up at our job at 3 in the afternoon instead of when we were expected at 9 in the morning? What happens if we choose to drop our children at school at 4 in the morning instead of when the school opens at 8 a.m.? What happens if we get our schedule jumbled and out of sequence, and we buy groceries on our way into work rather than on our way home? I am sure you can imagine the confusion (not to mention stress) that would occur as a result of doing the right things at the wrong times and in the wrong order.

It is no surprise that we are going to get better results in our life when we do the right tasks, at the right times, and in the right order. Our body is no different – it relies on timing and order to do its job well.

THE OBSOLETE APPROACH

How many times has your doctor given you a medicine (or a supplement) and told you to take it three times a day with meals? Do you know why doctors ask you to take your prescriptions in this manner? Do you know why supplement labels invariably have this advice as their dosing recommendation? An even more important question to ask might be "Does this approach to taking medicines and supplements produce the most benefits?"

Experts don't think so. Quoting from a leading researcher in the emerging discipline of *chronopharmacology*, "This approach is obsolete."[1] What would make him say this? Before we answer this question, let's look at the reasons behind the "equal divided doses" paradigm.

One would think that since this "equal divided doses" approach to prescribing medicines and supplements is the norm that hundreds (if not thousands) of scientific studies would have demonstrated beyond a shadow of a doubt that this approach is superior to other possible approaches. Nothing could be further from the truth.

The truth is that for decades medical research completely ignored (with rare exceptions) whether it made a difference when a medicine or supplement was taken. Historically research simply was not designed to study and compare how medicines and supplements worked under conditions where the timing and frequency of dosing was varied. The result is that there never was any evidence that this approach is superior since no one had ever compared it to any other approach.

Why would research ignore something as potentially important as when and how often one takes a prescription?

The answer is because of a belief. This belief was that it made no difference when most things were taken so why bother studying it. Going back in time a bit it was presumed that:

1. The biological need for a medicine or supplement is always the same irrespective of the time of the day or night. In other words, our body's functions are always constant.

2. Most medicines and supplements produce a consistent and uniform effect whenever they are given. In other words, the way the body responds to the medicine or supplement is the same irrespective of when it was taken.

These two presumptions are so flawed as to border on the ridiculous. Biological functions are not in any sense constant.

THE EXPERTS SPEAK:
"Variability is an essential feature of biological processes. As a matter of fact, absence of variability is often a sign of disease."[2] All biological processes studied to date vary in predictable manners over time. In other words, they display rhythmic activity. Because of this rhythmic activity our body's need for and response to many medicines and dietary supplements is not constant – it changes in extremely predictable manners (for better or for worse) depending upon the time of day when something is taken. Why are you advised to take medications and supplements in 3 divided doses with meals? The answer is that when all is said and done, it boils down to 3 simple reasons – convention, convenience and superstition.

THE CASE OF ASPIRIN

Aspirin is among the most widely used over-the-counter medications in the world. It is quite likely that at least one of your close relatives takes an aspirin daily to lower their risk of heart attacks or strokes. The question though is, "when are they taking it?" Did you know that aspirin produces completely different effects in the body depending upon when it is taken?

SELF-TEST:
Which of the aspirin dosing schedules below has been shown to have the most beneficial impact on blood pressure and clotting while simultaneously also producing the lowest likelihood of unwanted gastrointestinal bleeding?

A. Three times daily at meals
B. Once daily at breakfast
C. Once daily at dinner
D. Once daily before bedtime

The optimal dosing time of aspirin is very specific if one is going to take it every day. The best time is approximately 10 PM, so the correct answer is D.

We could take the same dose of aspirin every day and instead of taking it just before bedtime, divide it in 3 doses, take it at each meal and get nowhere near the benefit. Even worse, we could take the same dose of aspirin, take all of it at breakfast and we would maximize the likelihood that the aspirin would cause gastric irritation and bleeding. This is the power of appropriate (and inappropriate) timing.

The reason for this variable effect of aspirin is simple. Aspirin, like literally all biochemical influences, interacts directly with our body's functions that have *circadian rhythms*.[3-4]

EXPERTS KNOW THAT: …[rhythms influence the response to] therapeutic interventions with respect to their timing with reference to body rhythms."[5]

WHAT ARE CIRCADIAN RHYTHMS?

Body function changes in predictable manners in accordance with established biological rhythms. Every menstruating woman is acutely aware of the rhythmic nature of biological function. This is because menstruation is an example of a monthly or lunar rhythm with a cyclical period of about 30 days.

The period of biological rhythms can vary tremendously. Some biological rhythms are very fast while others can be very slow. As an example of a very fast rhythm, the replication of DNA repeats many times every second. A slower rhythm is evidenced by breathing rate and heartbeat which both repeat many times every minute. For a variety of reasons researchers believe that the most dominant rhythm in the body is our circadian rhythm. Any biological process that completes its cycle of change in approximately 24 hours is classified as having a circadian rhythm. Examples of functions that are coordinated by circadian rhythms include our sleep-wake cycles, bone remodeling, digestion, drug metabolism, cardiovascular performance, and immune system surveillance. This is just a short list. The reality is that virtually every area of your health is influenced by circadian rhythms.

THE IMPORTANCE OF CIRCADIAN RHYTHMS

Since function is based upon circadian rhythms, would you be surprised to find out that toxic substances affect animals differently depending upon when they are given? As just one example, if the same dose of acetaminophen that would kill 70% of mice when given in the early evening, were instead given in the early morning, fewer than 10% of the mice would die.[6] Most body functions have circadian rhythms. So do many of your hormones.

As just a few examples, stress hormones like cortisol and DHEA, bone metabolism hormones like osteocalcin, and our nighttime physiology hormone melatonin, all have pronounced circadian rhythms. Why is this important? It is important because some medications and supplements interact directly with these and other circadian hormones. Other medications and supplements interact indirectly with circadian hormones. The result is that *when a medication or supplement is taken can and will influence biological function in different manners.* The most

obvious example of this would be taking a hormone. It has been known for about thirty years that cortisol works best when given in a manner that duplicates its circadian rhythm. The same is true for DHEA and melatonin, both of which are sold as dietary supplements: they work best when taken at the correct time. Conversely, if a person were to take melatonin or DHEA at the wrong time, they would actually worsen function.

Imagine the results that would occur if a person, because of a lack of adequate knowledge or guidance, were to consistently take these hormones at the wrong time. The sad truth is that this does occur all too frequently. Less obvious examples of poor timing of dietary supplements with respect to circadian biological rhythms include vitamins such as vitamin D (which is actually a hormone), minerals, and many herbal products.

KEY POINTS:

1. The time of day (or night) that you take many medications, hormones, vitamins, minerals, and herbs can profoundly influence the benefit you receive.

2. Even worse than missing out on the benefit, taking something at the wrong time can often worsen your health.

CHRONONUTRITION

A rapidly emerging paradigm within both the pharmaceutical industry and medical research is called *chronotherapeutics* – the appropriate timing of interventions. Earlier, it was mentioned that one leading researcher believed that the practice of "equal divided doses" was now obsolete. The reason behind this assertion was simple. This researcher was aware of the fact that when drug research has been conducted comparing an "equal divided dose" approach to an approach that takes into account biological rhythms, with few exceptions, drugs work better and produce fewer adverse effects when given at very specific times. More and more drugs every year are being found to produce better outcomes when given at specific times. The same can be said for dietary supplements. The process of judiciously timing the use of dietary supplements has been referred to as *Chrononutrition*.

(A note from Dr. Powers: My Foundational Formulas are dosed to capitalize on the chronobiology of nutritional support. And, as new breakthroughs are made in this area, the supplements within my formulas will continually be updated to ensure that your personalized nutritional solution remains at the leading edge of science.)

DEFINITIONS

CHRONOPHARMACOLOGY: The scientific study of how biological rhythms interact with the metabolism, clinical benefits, and adverse effects of medications.

CIRCADIAN RHYTHM: Biological rhythms that repeat approximately every 24 hours. These rhythms affect virtually every aspect of our function.

CHRONOTHERAPEUTICS: The study and practice of judiciously timing the dose of a medicine or intervention to optimally interact with biological rhythms in order to minimize adverse effects and improve clinical outcomes.

CHRONONUTRITION: The study and practice of judiciously timing the dose of vitamins, minerals, herbs, and other dietary supplements to maximize functional benefits.

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