

Chapter 4
Laboratory Tests for the Anti-Aging Physician
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ABSTRACT

Anti-aging laboratory medicine is becoming much more standardized, and there are laboratory facilities all over the globe that offer tests, protocols, and recommendations. The aim of this paper is to provide a brief synopsis in reference to laboratory medicine in order to clarify the cascade of laboratory tests that are becoming available in the field of anti-aging medicine.

INTRODUCTION

The aim of this paper is to provide a brief synopsis in reference to laboratory medicine in order to clarify the cascade of laboratory tests that are becoming available in the field of anti-aging medicine. In order to talk about laboratory tests for the anti-aging physician, it is important to define aging. Every time the earth circles the sun, we are one year older, chronologically, however, from a biological viewpoint, the rate at which people age varies widely. Hallmarks of aging, such as a loss of muscle tone, deterioration of circulation, a declining immune system, and decreased joint flexibility, occurs much faster in some individuals than others.

We know, from the oldest documented human, that the human lifespan is between 122 and 126 years of age, yet the average life expectancy today is only 76 years. Why does the difference exist? The answer is gene expression. In other words, it depends whether or not you run your aging software at optimal levels. Genes don't change, their expression does, and phenotypic expression can be altered by a whole host of factors, including modifiable factors, such as diet, lifestyle, and environment. And now that we are aware of that, we can start measuring, monitoring, and focusing on how we can improve the phenotypic expression of our genes.

What are the modifiable factors of aging? Poor strength, reduced flexibility, poor aerobic ability, level of body fat, digestive disorders, increased inflammation, arthritis, accelerated brain aging, diabetes and glucose disorders, neurological disorders, coronary heart disease, stroke, Alzheimer's disease, and cancer – we can do something about all of these issues. If we think about treating a patient in terms of anti-aging medicine, there are three main areas that we really need to focus on. The first, is DNA and cellular functioning, for example, here we have to combat, glycation, inflammation, oxidation, and methylation. The only real approach available, at present, for rectifying any problems at this level will be nutritional. The second area is system integration and homeostasis, and here we have to combat problems with the endocrine system, immune system, digestive system, and central nervous system. The approach for treating this area will be hormonal and nutritional. And finally, there is the third area, which is overall total body homeostasis. Here we have to combat mind, body, and stress interrelationships. This area is approached with exercise, diet, and meditation. Far too often, we do not focus on the importance of exercise and diet and stress reduction. They are all part and parcel of integrated medicine and looking at the body in a more fluid, holistic manner.

AGING AND ANTI-AGING MEDICINE

Aging is fundamentally a metabolic process. While clinicians deal constantly with a myriad of symptoms of aging, they are unlikely to obtain optimum results until they address and correct the underlying problem, which is a decrease in anabolic metabolism. This is the most paramount part of anti-aging medicine. The aging process itself is largely divided into two parts. Growing until the age of 40, followed by decline until the age of 80. Between the ages of 20 and 30, the changes are minimal and barely visible, but after the age of 30 everything changes very quickly. No one dies of old age. We die because one or more of our organs or systems gives up early. We are effectively born with adequate functional reserve capacity in each of our organs and systems. Running out of the functional capacity of each of these organs and systems accelerates the deleterious effects of aging.

Anti-aging medicine addresses antioxidant defense, neuroendocrine orchestration, genetic control of aging, a nutritional plan and supplementation, lifestyle modification, anti-aging medicines, and assessing and monitoring the biomarkers associated with aging. The symptoms of aging are numerous, everything from lack of energy, weight problems, depleted memory, stress and anxiety, high cholesterol levels and cardiovascular disease, decreased libido, arthritis, and the list goes on and on. What about targets of anti-aging therapy? What should we be targeting? We really need to focus on targeting hormonal balance. We need to be sorting out people's hormones and hormonal imbalances, and keeping the body more anabolic and less catabolic. And then we should be thinking about mineral balance, antioxidant balance, amino acids and essential fatty acids, atherosclerosis control, cardiovascular control, sex drive, brain and memory control, organ defense, food regulation, and hydration. A lot of patients don't even know what water tastes like. Then there is exercise and flexibility. Far too often, people look like they have been working out, they exercise, but they are very stiff. They don't have that flexibility. Flexibility exercising is just as important as aerobic exercise and resistance training. In a nutshell, the whole process is about juggling and balancing between disease, aging, and death.

LABORATORY TESTS FOR ANTI-AGING PHYSICIANS

In the field of anti-aging medicine, we have strongly correlated with integrated medicine or functional medicine and this is the field of healthcare that focuses on biochemical individuality, metabolic balance, ecological context, genetic predisposition, and lifestyle patterns, as well as other factors that have the potential to strongly influence human physiology, and the push-pull dynamics of health and disease. So what are the assessment categories? First of all there is the gastrointestinal system. Here you have an assessment of gastrointestinal function and the ecology of the GI tract, including intestinal wall integrity, small bowel bacterial overgrowth, yeast presence, immune function, parasitic activity, and specific allergies or food intolerances.

Next is the nutritional category, and here we are concerned with mineral analysis – predominantly of toxic and nutritional minerals, whether macro or trace minerals, amino acid analysis, essential fatty acid analysis, and antioxidant and vitamin analysis. Here, you are basically looking at the most important parts of the building blocks associated with body.

Organic acid analysis is a relatively new test that is available in the industry. It provides us with a metabolic assessment of the patient, the efficiency of their detoxification process, their level of oxidative stress, their antioxidant defense capabilities, and their cardiovascular health. You can get an enormous amount of information from the organic acids that are excreted in the urine on a daily basis. It is a very cost effective test, and that alone may be the best screening test to start with, because it provides us with such an enormous amount of information. If anything comes up as highly positive or abnormal, then it may be a good idea to look at further areas more specifically.

Hormone Assessment

Endocrinology is crucial in anti-aging medicine, and endocrinology should constitute at least 50% of an anti-aging physician's concern. In this area we are measuring endocrine function. Recommended tests include: evaluations of sex and regulatory hormones, adrenals, thyroid, growth hormone, etcetera. Bone resorption assessment is also included in this area. As are glucose and insulin tolerance tests.

The most important thing to focus on in terms of hormone assessment is the differences between conventional medicine and anti-aging medicine. In conventional medicine, we are taught to only treat deficiencies or severe deficiencies. Whereas in anti-aging medicine, we look at all manner of deficiencies from relative to mild, to moderate and severe deficiencies, and we try to bring these back up to physiological levels, never pharmacological levels. Think about hormone supplemental therapy as opposed to hormone replacement therapy. We are not interested in replacing hormones, what we are interested in is supplementing deficiencies back to physiological levels.

Going back to the tests that are available for hormone assessment, it's a jungle out there. It's a minefield. There are a barrage of laboratories offering you every test under the sun, and different ways of carrying out those tests. It is possible to test for hormone levels in blood, urine, or saliva. However, the problem with some of the tests such as saliva or blood is that it only provides information about one interval in time. And that is at that specific point in time that you are collecting the specimen. Therefore these types of tests do not account for circadian rhythms and hormonal fluctuations that occur throughout the day. However, with 24-hour urine specimens, it is possible to overcome that problem, because they

provide an average level of the hormone over a 24-hour period. A major benefit of testing with urine and saliva is that they represent the bioavailable hormone levels and not just the free hormone levels. A patient's symptoms will correlate much better with bioavailable levels obtained from urine or saliva than they will with those obtained from blood or serum, because in serum, over 98% of hormones are bound and inactive. On average, most of the laboratories that specialize in anti-aging medicine will test for 20 or 30 hormones and hormone metabolites from just one urine sample, so urine samples are in effect far more cost efficient and effective.

Another important area in endocrinology is the assessment of hormone ratios. Not all laboratories test for hormone ratios. Hormone ratios are important because a lot of hormones are very antagonistic to each other, for example, a ratio of estradiol to progesterone in the follicular phase versus the luteal phase. You would expect different results there. A ratio of estradiol to testosterone in a young male may be one part estradiol to 50 parts testosterone. However, what about the older male? How do we titrate the patient? Rather than treating laboratorial results *per se*, the ratios give us a lot more information. You can look at the rate limiting steps in the metabolism of hormones, and identify where the bottlenecks are. So, effectively you can then look at what may be required to help facilitate up-regulation or down-regulation of hormonal metabolism and production.

Anti-aging laboratories or laboratories that offer anti-aging protocols and profiles will also offer ranges on these hormones based on gender and age, and the age part is very important. Very often, we order tests from laboratories and we get one generic range for growth hormone. That is ridiculous. An 80-year-old cannot possibly be expected to have the same reference ranges as a 20-year-old. Therefore, looking at age, and at least breaking it down in decades of age, is very important. Reference ranges in females is relative to the day of cycle. Supplemented reference ranges are now available from a number of laboratories that are tailored to whether you supplement your patients with troches, transdermal creams or gels, patches, or intramuscular injections. Some of the reports on the market include customized comments based on results, suggested doses for each hormone, and recommendations on how to prescribe these hormones. A number of laboratories offer an explanation of the reasoning for recommending certain doses and levels of hormones based on mild, moderate, and severe deficiencies, as well as suggesting follow-up actions that may be recommended. Some laboratories even offer A4M recommended treatment protocols.

Estrogen Metabolism

A relatively new field, that we are focusing a lot more as the years progress, is the metabolism of estrogens. 2-hydroxyestrone is a weak estrogen, it has a weak estrogenic activity, and it is often nicknamed the "good" estrogen. Meanwhile, 16 alpha-hydroxyestrone is a strong estrogenic estrogen. It binds in a very covalent way to estrogen receptors, and continuously stimulates target tissues. 16 alpha-hydroxyestrone is a "bad" estrogen and it promotes cancer. The key, of course, is balance. And therefore, we have another ratio to consider. A low 2-16 ratio is associated with an increased risk of estrogen-dependent conditions such as breast cancer and lupus, whereas a high ratio of 2-16 is associated with an increased risk of osteoporosis. Therefore, what we ideally want is a balance between the two. The metabolism of estrogens is a whole area with its own merits, and basically you need to focus on how to help patients up-regulate and remove the abnormal estrogens and focus more on the correct pathways. Rigorous exercise, up-regulating the thyroid, and supplementation with things like diindolylmethane (DIM) and indole-3-carbonyl, have been shown to help facilitate and improve estrogen metabolism.

Inflammatory Pathways

Another area the anti-aging laboratories offer is the assessment of cytokines and leukotriene levels, in order to evaluate inflammatory pathways. Inflammation increases with age. The common tests in this area are for IL-1 (interleukin-1), IL-6, IL-10, tumor necrosis factor (TNF), and essential fatty acid ratios. When ordering essential fatty acids, it is important to look at ratios rather than the individual metabolites of the essential fatty acids.

Single Nucleotide Polymorphism Analysis

Another new area that is progressing, but not many anti-aging physicians focus on it at this point in time because we do not understand the area, is single nucleotide polymorphism (SNP) analysis. This is a spin-off of a lot of the Human Genome Project, and it is used to help identify genetic predispositions towards certain diseases and health states. Some of the SNP profiles that are on the market at present include the polymorphic nuclear expressions of various cardiac diseases, prostate cancer, thrombosis and thromboembolism, and osteoporosis. The comprehensive female profiles and comprehensive male profiles are on the market as standard profiles. And of course, they come with recommendations as to how to treat your patient and what considerations in terms of nutrition etcetera to ah take into account.

CONCLUSION

Anti-aging medicine laboratory medicine is becoming much more standardized, and there are laboratory facilities all over the globe that offer tests, protocols, and recommendations. It is important to look at laboratories that offer anti-aging medicine and integrative medicine, laboratories that specialize in endocrinology and can offer the right tests for the right reasons, and laboratories that offer genetic testing in the form of SNP analysis. These laboratories should offer ranges pertinent to different age groups, but also treatment protocols and hormonal dosing as well.

Should you proceed to perform all of the tests mentioned in this paper? No. The ideal scenario would be for each anti-aging physician to establish their own comprehensive questionnaire – highlighting a patient's symptoms and their frequency and severity – which will correlate to the sorts of tests that you may want to conduct in order to establish or exclude pathologies.

ABOUT THE AUTHOR

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