

*Theme: Healthy Immune System*

# Inflammation, Disease and Exercise

*Robert Mazzeo, Ph.D., FACSM*

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## Letter from the Editor

*A. Lynn Millar, PT, Ph.D., FACSM*

Welcome to the July 2016 edition of the *ACSM Fit Society® Page*. No one likes to catch a cold—especially when being sick keeps us away from being active.

In this issue, you will read advice about working out while you're sick, exercise as a preventive measure for illness and what to do when you get the flu.

After you have read this information that ACSM experts have prepared for you, please feel free to share it with friends and family. We hope these articles will help you as you pursue a healthy and active life.

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### INSIDE THIS ISSUE:

- 1** Inflammation, Disease and Exercise
- 2** Exercise is Prevention
- 3** Nice-to-Know Facts about the Flu
- 4** Q&A
- 5** Athlete's Kitchen: Fighting Fatigue: Why am I so tired....???



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**Y**ou may have heard the term “chronic inflammation” but may not know what it is or why it is important. Inflammation is an immune system response to harmful agents or damaged cells and is usually termed acute or chronic. Chronic inflammation refers to a more gradual, prolonged inflammatory response that involves progressive

changes in various cell types and functions that can persist for several years with deleterious effects. For example, chronic low-grade inflammation associated with obesity plays a central role in the development of insulin resistance and type 2 diabetes (the most common form of diabetes). Similarly, this type of inflammation also contributes to the underlying mechanism responsible for the atherosclerotic process in the coronary arteries, which is the hallmark of the most common form of heart disease and associated with stroke. Further, a number of inflammatory markers are known to increase with advancing age, likely contributing to the development of a number of age-associated diseases (mentioned above but also including dementia and cognitive impairment).

Now the good news. Participation in regular aerobic exercise has been shown to have numerous beneficial effects resulting in an improved inflammatory profile and overall immune function in individuals suffering from chronic low-grade inflammation. These benefits stem from the anti-inflammatory effects associated with physical activity. Not only can regular exercise help individuals who already have chronic inflammation and the associated diseases, but exercise can also serve as a prevention strategy to lower the risk of ever developing chronic inflammation in healthy populations. The extent to which regular exercise will exert these beneficial effects will be dependent upon the frequency, duration and intensity of your exercise program. While the exact causes for this anti-inflammatory effect of exercise are not completely understood, contributing factors include the reduction in visceral (belly) fat and alterations in the responsiveness to stress hormones. Along those lines, it has been known for some time that chronic stress plays a significant role in the development of prolonged low-grade inflammation. While short, transient periods of stress do not have this negative impact, more prolonged periods of stress, (whether from financial, family/relationship, work environments, etc.) clearly have multiple deleterious effects on your overall health and risk of disease. Here again,

*(continued on page 2)*

participation in regular exercise can help to offset the negative effects of chronic stress. Studies have shown that exercise can improve your “resistance” to the negative effects of stress thereby decreasing the unwanted impact it would likely have on your immune system, inflammatory response and eventual risk for disease.

Finally, we all realize that a number of our biological systems decline as we get older. This includes a decline in immune function accompanied by an increase in chronic inflammation. Several studies have demonstrated that an inverse relationship exists between the amount of physical activity one engages in and the degree of inflammation in older populations. Thus, of the many potential health benefits associated with regular physical activity, you can add a reduction in the pro-inflammatory state to the list.

While the benefits of regular exercise are numerous, it is important to recognize that some individuals have a compromised immune response and must balance rest with exercise and monitor their health. An altered immune response can be due to the type of underlying disease, such as rheumatoid arthritis, or medication interactions.

# Exercise is Prevention

Sue Brown



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**R**ecently, I received a letter from my health insurance agency regarding a free online service which provided supportive self-help tools for health. It caused me some concern when they referred to high blood pressure and high cholesterol as common conditions. While these may be common conditions, the risk of developing many of these can be decreased with lifestyle choices, which was the aim of the on-line service. Studies show that with lifestyle modifications, including diet and exercise, both heart disease and stroke are 75 to 80 percent preventable and type 2 diabetes is 90 percent preventable. For those individuals who have a genetic predisposition to a disease or have already been diagnosed, lifestyle choices can help the individual manage the disease and reduce potential complications. Numerous authorities have noted the importance of exercise and lifestyle. As early as 1979, the U.S. Surgeon General’s Report stated that risk could be “reduced if persons at risk improved just five habits:..... diet,.....exercise.” In 1996, the Surgeon General’s Report addressing physical activity and health summarized the findings, suggesting that “people of all ages can improve the



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quality of their lives through a lifelong practice of moderate activity.” More recently, Dr. Jordan Metzl from NYC’s Hospital for Special Surgery claims that “Exercise is the best preventive drug we have and everybody needs to take that medicine.”

But are we taking that medicine? ACSM and the CDC recommend an accumulation of at least 2.5 hours of moderate-to-intense aerobic exercise a week. That’s 30 minutes five days a week. Yet data show that only about 21 percent of the adult population is meeting those guidelines. Other research puts the percentage as low as 5 percent. Most of us realize the importance of exercise so why aren’t we exercising? That might be a question we each need to ask ourselves. The evidence in favor of exercise is certainly there.

Additionally, if exercise is prevention, perhaps the emphasis should be on starting the habits at an early age. Research shows that children who participate in regular exercise are better off in many ways when they grow up. Considering the epidemic of childhood obesity and its associated co-morbidities that reach into adulthood, intervention at an early age is vital. By reducing caloric intake, reducing sedentary behavior and increasing physical activity, we will be setting a strong foundation toward preventing adverse health conditions in our youth, while instilling healthy habits that will pay off later on. Here are some of the noted benefits of childhood exercise:

- Children who are physically active tend to keep being active as adults
- Exercise will help maintain stronger bones
- It assists in maintaining healthy body weight
- Team activities help the development of interpersonal skills
- It helps prevent or delay the development of chronic conditions such as heart disease, type 2 diabetes and hypertension.

So, put in a good amount of physical activity when you are planning family time, and when you’re considering an ounce of prevention for better health, remember that a good dose of exercise goes a long way. While there are some risks associated with increased activity, the rewards outweigh the risks. Your body will thank you for it!



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## Nice-to-Know Facts about the Flu

James A. Peterson, Ph.D., FACSM



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**T**his article originally appeared in the January/February 2015 issue of *ACSM’s Health & Fitness Journal*®.

1. **SOBERING STATISTICS** Between 5 and 20 percent of Americans (of all ages) will get the flu during a particular year. Of those individuals, approximately 200,000 (on average) will be hospitalized. As such, up to 49,000 people will die each year from flu-related causes, which makes influenza (along with pneumonia) the eighth leading cause of death in American men.
2. **NOT THE SAME** A cold and the flu, while having a few similar symptoms, are quite different conditions. Knowing these differences can lead to more appropriate, as well as more effective, treatment. The main characteristic they share is the fact that they’re both respiratory illnesses. Unlike the common cold (which is called “common” for a reason), the flu can develop into something more serious (such as pneumonia, for example). Another key difference is the fact that the flu is generally seasonal (i.e., transpiring from the fall to the spring, peaking during the winter months). In contrast, a cold can occur at any time.
3. **CAUSE AND EFFECT** Seasonal flu is caused by the active strains of a variety of flu viruses. Although most health care experts believe that at least three different flu viruses currently exist in America, all types of flu tend to have similar symptoms, including a fever, a dry hacking cough, a sore throat, aching muscles, a running or stuffy nose, chills, fatigue

(continued on page 4)

and so on. As a rule, most typical cases of the flu run their course in a week or less.

4. **A RISKY SITUATION** The flu is a highly contagious viral infection of the respiratory tract that affects individuals of all ages, some more than others. Among the groups that are more likely to experience complications from the seasonal flu are children, pregnant women, older adults and people who are suffering from one or more chronic health conditions.
5. **SENSIBLE SAFEGUARDS** The flu is spread by virus-infected droplets that are coughed or sneezed into the air. Individuals get the flu by either having these germs land in their mouth or nose or by touching a surface or object on which these droplets have landed and then touching their mouth, nose or eyes. As such, people can take certain steps to help protect themselves, including washing their hands frequently with soap and water; avoiding touching their eyes, nose and mouth; and practicing sound health habits.
6. **IMPROVING THE ODDS** Overwhelmingly, most experts believe that the best way for individuals to protect themselves from the flu is to be vaccinated. In that regard, the common recommendation is that everyone who is six months or older should get vaccinated annually (preferably in September) against the flu.
7. **MIMICKING THE REAL THING** Vaccines help individuals develop immunity to the flu by imitating a particular infection in their body. This infection causes the person's immune system to produce "memory" antibodies. In turn, this supply of antibodies, which typically is produced within a few weeks after the individual is vaccinated, remembers how to fight the flu in the future.
8. **NOTHING WORTHWHILE IS EVER EASY** Developing flu vaccines can be challenging for several reasons. First and foremost, flu viruses are constantly changing and mutating—sometimes suddenly and in other instances across time. Because these changes occur frequently enough, an individual's immune system often cannot recognize a particular flu virus from year to year. Accordingly, a new flu vaccine must be developed every year.
9. **THE BEST MEDICINE** As a rule, fluids and rest are the most effective means for treating the flu. Individuals also can take certain over-the-counter medicines to help provide relatively immediate relief for their symptoms. For example, a decongestant can be helpful in controlling nasal or sinus congestion. In turn, an antihistamine can help relieve such symptoms as sneezing, nasal discharge, watery eyes, and itching.
10. **MYTHS AND MADNESS** Like many subjects, considerable misinformation exists concerning the flu. One of the biggest whoppers involving the flu is the claim that "the flu vaccine can give a person the flu." In fact, it is an impossibility given that injected flu vaccines only contain dead viruses, which are incapable of infecting anyone. Another folk tale involving the flu is that "the flu is annoying, but harmless." The underlying falsehood of this particular myth is illustrated by the fact that the flu kills more than twice the number of Americans who die annually from AIDS.

## Q&A

James MacDonald, M.D., FACSM



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**Q: I mostly exercise to keep my weight down, but I am intrigued by some things I read about boosting my immune system by working out. What's the evidence for this? In short, "what's the skinny" on working out to fight off colds?**

"Exercise is medicine" is a concept near and dear to the heart of ACSM, but even we want to note that, in the real world, there is no panacea. Exercise comes close to being that magic "cure all," but it remains important to look skeptically at any intervention you might take up for your health. And so, we appreciate your question.

Indeed, is there evidence that exercise can boost the immune system to help fight off infections?

Yes is the brief answer, especially if you are exercising moderately.

If you are hoping to avoid infections, it appears that there may be a "J-shaped curve" where we see people with both low and very high exercise levels having increased risks. That is, the proverbial "couch potato" will be more at risk for catching a cold than the regular exerciser. However, this may also be the case for someone who is in the middle of an intense, strenuous build-up for a competition, though the evidence for the heavy exerciser is somewhat mixed, according to a joint consensus statement on overtraining from the European College of Sport Science and the American College of Sports Medicine.

I would like to emphasize that most of us will not approach the levels of exercise that may result in "overtraining" and the associated theoretical risk of a depressed immune system. Most of us can usually stand a bit more physical activity, and the regular, moderate exerciser can definitely expect to enjoy a reduced rate of infections, with a wealth of evidence to support that claim.

So, get outside or head to the gym for a workout, and you may not need that box of Kleenex.

**Q: That sounds like good news. But what about conditions that pose bigger risks to me, such as cancers. I've read a healthy immune system can prevent cancers. Can physical activity help me fight off cancers the way it helps me fight off colds?**

If you are wondering about the fitness of your immune system to ward off worse conditions than a cold or flu—cancers for instance—we have, possibly, even better news for you.

There are many factors involved in the development of a cancer. Poor immune function is thought to be a part of the development of many cancers. Physical activity has been suggested to enhance immune function and, thus, to be involved in cancer prevention. For instance, regular moderate exercise can improve the number and function of natural killer cells that are able to attack most types of cancer, and this action has been thought to aid in tumor suppression.

To give you a less theoretical flavor of the benefits of exercise in cancer prevention, I want to share two meta-analyses with you. Meta-analyses are a type of modern research study that looks at all the evidence and comes up with an overall, science-based conclusion about a question. A meta-analysis that looked at physical activity and lung cancer prevention was just published in 2016, for instance. It reported some intriguing results: if you were a current or former smoker, being physically active reduced your risk of lung cancer by 21 percent, and the more physically active you were the better. On the other hand, the researchers found no protective effect for exercise in those who had never smoked.

And so the results of this study are nuanced. If you have never smoked, your overall risk for lung cancer is very low, though it is not zero. This study would suggest that exercise won't bring your already low risk any lower. However if you, or anyone you know, ever did smoke, then by all means increasing the physical activity level will reduce the risk. And if you are a current smoker, then definitely try to stop. But also try to get more physically active, as both decisions will help lower your risk of lung cancer.

The second meta-analysis looked at the question of preventing colon cancer. The authors of this 2009 study found an inverse relationship between levels of physical activity and risk of developing colon cancer. They found the overall risk of developing colon cancer in those with moderate levels of physical activity as compared to those who lived sedentary lives was 24 percent lower. They found that both men and women benefited. Unlike the story with lung cancer, there was no group in this study that did not benefit. Exercise was found to help everyone lower their risk of developing colon cancer.

There are many more studies looking at physical activity and prevention of different cancers, and most of these tell a similar story: exercise is not a “panacea” for reducing the cancer risk for everyone, but it's close.

# Fighting Fatigue: Why am I so tired?

Nancy Clark MS, RD, CSSD



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*“I feel tired a lot. What vitamins will give me more energy?”*

*“When I get home from work, I'm just too tired to cook dinner...”*

*“I feel like taking a nap most afternoons. I get up at 5:00 a.m. to exercise—but really, should I feel this tired at 3:00 p.m.?”*

**A**thletes commonly complain about fatigue and feeling too tired, too often. Granted, many of them wake up at early o-thirty to run, attend a morning spin class or row with the crew team. Some do killer workouts that would leave anyone feeling exhausted. Many routinely get too little sleep. And the question remains: How can I have more energy?

Vitamin pills will not boost your energy. Vitamins help convert food into energy, but they are not a source of energy. Save your money.

Adequate sleep, however, will indeed boost your energy. Sleep is essential to recharge your body with the rest needed to feel fully functional and perform well. Eating the right foods at the right times is also energizing and fights fatigue.

The combination of adequate food plus adequate sleep not only sharply reduces fatigue—but also the need for caffeine. In particular, the late-afternoon cup of joe that contributes to the bad cycle of sleeping poorly at night, snoozing through breakfast, under-fueling and fighting chronic fatigue during the day. Sound familiar?

*(continued on page 6)*

If you feel too tired, too often, you might want to learn from this case study. Tom, a 45-year-old hard-core gym-rat met with me because he wanted to have more energy, eat better and ideally lose a few pounds of excess body fat. Here is his spreadsheet for a typical day of food and exercise:

Time	Food-Exercise	Calories
5:00 a.m.	Mug of black coffee	0
5:30-6:30 a.m.	Exercise x 1 hour	(- 600)
7:30 a.m.	Protein bar + banana	400
8:30 a.m.	More coffee	0
9:30 a.m.	Small packet almonds	100
Noon	Salad/chicken/dressing	500
2:00 p.m.	Piece of fruit	100
3:00 p.m.	Iced coffee with milk	100
3:00-5:00 p.m.	Tired, unable to focus	
5:30 p.m.	Gets home "starving"	
	Calories eaten during active part of his day	Only 1,200
	Ideal pre-dinner intake for less fatigue	2,300
All day	Total calories needed	3,000

No wonder, when Tom got home from work, he felt starved. He had consumed less than half the calories he deserved to have eaten for the entire day.

### Three ways to fight fatigue

Here are three suggestions I gave Tom to fight fatigue:

1. Eat a substantial breakfast and lunch—plus a second lunch. A second lunch at 3:00 or 4:00 boosts afternoon energy. It does not add extra calories; it's just trading evening snacks for a healthy afternoon meal. You are better off eating those calories at the proper time of day, when you need the energy, and not before bed.
2. Limit caffeinated beverages. Little is wrong with enjoying a morning cup of coffee, but a lot is wrong with abusing coffee to keep you alert in the afternoon. Eat food for true energy, not caffeine, for a stimulant.
3. Make sleep a priority. You might not be able to go to bed earlier every night, but maybe every other night?

### Making a calorie spreadsheet

Most athletes have no idea how much food is appropriate to eat at breakfast, lunch #1 and lunch #2. No wonder they are tired all the time! Many think a yogurt for breakfast, salad for lunch, and an apple for a snack is appropriate. That's only 700 to 800 calories—way too little!



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The best way to estimate your calorie needs is to meet with a local sports dietitian (use the referral network at [www.SCANDpg.org](http://www.SCANDpg.org)). For a reasonable estimate, add together these three components of your daily energy needs:

Resting Metabolic Rate (RMR)	Weight x 10 calories/lb.
Calories for daily life:	30% to 50% of RMR
Calories for training:	± 400 to 600 cals/hour

Sample energy needs for Tom, who weighs 180 lbs:

1,800 calories to stay alive	(RMR; 180 x 10 cals/lb)
600 calories for desk job/light activity	(33% x 1,800)
600 calories for hard training for an hour	
3,000 calories /day to maintain weight. 2,400-2,600 to lose weight	
Target intake: 600-800 calories every 4 hours	

Tom started eating:

Breakfast: a banana pre-exercise; then refuel with bagel + PB + latte
Lunch #1 at 11:00: Soup + sandwich
Lunch #2 at 3:00: Graham crackers + peanut butter
Dinner: smaller meal that contributed to better sleep.

After just one day of eating enough food at the right time, Tom commented, "I feel great! I have more energy and less fatigue..."

Food is indeed a powerful energizer. Give it a try!