

Quiz Policies

Eligibility

The NCSF online quizzes are open to any currently certified fitness professional, 18 years or older.

Deadlines

Course completion deadlines correspond with the NCSF Certified Professionals certification expiration date. Students can obtain their expiration dates by reviewing either their certification diploma or certification ID card.

Cancellation/Refund

All NCSF continued education course studies are non-refundable.

General Quiz Rules

- You may not have your quiz back after sending it in.
- Individuals can only take a specific quiz once for continued education units.
- Impersonation of another candidate will result in disqualification from the program without refund.

Disqualification

If disqualified for any of the above-mentioned reasons you may appeal the decision in writing within two weeks of the disqualification date.

Reporting Policy

You will receive your scores within 4 weeks following the quiz. If you do not receive the results after 4 weeks please contact the NCSF Certifying Agency.

Re-testing Procedure

Students who do not successfully pass an online quiz have the option of re-taking. The fees associated with this procedure total \$15 (U.S) per request. There are no limits as to the number of times a student may re-test.

Special Needs

If special needs are required to take the quiz please contact the NCSF so that appropriate measures can be taken for your consideration.

Quiz Rules

What Do I Mail Back to the NCSF?

Students are required to submit the quiz answer form.

What do I Need to Score on the Quiz?

In order to gain the .5 NCSF continued education units students need to score 80% (8 out of 10) or greater on the CEU quiz.

Where Do I Mail My Quiz Answer Form?

You will mail your completed answer form to:

NCSF

Attn: Dept. of Continuing Education

5915 Ponce de Leon Blvd., Suite 60

Coral Gables, FL 33146

How Many CEUs Will I Gain?

Professionals who successfully complete the any continuing education quiz will gain .5 NCSF CEUs per quiz.

How Much does each quiz cost?

Each quiz costs the student \$15.00.

What Will I Receive When The Course Is Completed?

Students who successfully pass any of the NCSF online quizzes will receive their exam scores, and a confirmation letter.

How Many Times Can I Take The Quizzes For CEUs?

Individuals can take each NCSF quiz once for continuing education credits.

Congestive Heart Failure and Muscular Fatigue

A common inquiry among exercise enthusiasts is the specific physiological cause of muscular fatigue. Scientists at Columbia declare that they have not only come up with a response, but have also devised an experimental drug that has been tested in mice that can actually prolong exercise time to exhaustion. The physiological cause of muscular fatigue has been largely ignored and misunderstood for decades. Muscular fatigue due to lactic acid release was a popular theory early on, but exercise physiologists realized it is simply a plausible component based on intensity and physical condition and has since been discredited as the main cause of muscular fatigue according to Dr. George Brooks, from the University of California, Berkeley. In a recent report published in an early online edition of Proceedings of the National Academy of Sciences, Dr. Andrew Marks, the principal investigator of the new study, claims that calcium flow inside the muscle cells is the most likely cause of fatigue.

Calcium stimulates muscle contractions when it is released from the sarcoplasmic reticulum in response to an electrical signal, known as an action potential, from the nervous system. Under normal resting conditions, a weak bond exists between the myofilaments myosin and actin. When calcium is released it binds to the troponin allowing actin and myosin to strengthen this bond into an active state. If adequate amounts of ATP are present, this active state can produce tension when the high-energy phosphate bond is broken, resulting in an end product ADP and an inorganic phosphate. After prolonged activity, it seems that the responsive of the calcium channels is dampened. When muscles become fatigued and tired, the sarcoplasmic reticulum becomes less functional and calcium tends to leak out of the tissue through tiny channels, thereby weakening the contractions. Furthermore, the calcium leakage kindles enzyme activity that negatively affects the actions of the muscle fiber, thereby contributing to localized muscle exhaustion.

Dr. George Brooks of the University of California, Berkeley, states that the new work in mice is very “exciting and provocative.” The findings of Dr. Marks’ research actually came about as a result of very different research. As a cardiologist, Dr. Marks was conducting research on congestive heart failure and methods to improve treatment for his patients with the disease. Congestive heart failure is a chronic and debilitating condition affecting nearly 4.8 million Americans. The disease may be described as having a damaged heart, which usually occurs from a heart attack or high blood pressure. Struggling to pump blood, the heart undergoes centralized hypertrophy, or an enlargement. As the disease progresses, the heart struggles to continually pump blood, and eventually a backup of fluid fills the lungs. Individuals with congestive heart failure often complain of extreme fatigue. This is due to the combination of a poorly functioning heart and the buildup of fluid in the lungs. Approximately 50% of those diagnosed with congestive heart failure die within 5 years of their diagnosis.

Dr. Marks began to investigate why the heart weakens by focusing on the heart’s molecular and physiological events. As the body’s demand for oxygen increases, the heart’s contractile capacity, the ability to pump out oxygenated blood efficiently, must

increase with that increased oxygen demand. The nervous system, specifically the sympathetic branch, stimulates the release of epinephrine and norepinephrine, the body's fight or flight hormones, in an attempt to encourage the heart to satisfy the body's oxygen demands. Eventually, due to the inefficiency of the heart, there comes a point where the brain is constantly stimulating the release of these hormones, resulting in overstimulation of the calcium channels within the heart. This ultimately leads to calcium leakage and decreased contractility of the heart.

Once this mechanism for fatigue and decreased contractility was understood, researchers were able to develop experimental classes of drugs that would reduce the calcium leakage, thereby allowing for prolonged, sustained efficiency of the working muscle, in this case the heart. The drugs, originally created to assist in better managing and lowering blood pressure, were altered by Dr. Marks and his colleagues, and called rycals since they attached to the ryanodine receptor/calcium release channel in cardiac muscle. This resulted in minimized calcium leakage and more efficient contractions. When the rycals were tested on mice, it was determined that the mice experienced fewer arrhythmias and were less likely to develop heart failure.

Since skeletal muscle tissue operates in a very similar manner to cardiac muscle tissue with regard to the calcium channel system, Dr. Marks wondered whether the mechanism he discovered may apply to skeletal muscle tissue. Patients suffering from heart failure tend to complain that their muscles are extremely weak. Dr. Marks and his colleagues tested their theory by making mice exercise to exhaustion, swimming and then running on a treadmill, an amount of activity that resulted in fatigue. Upon examination of the muscles of the mice at the point of exhaustion, the calcium channels were determined to be leaky. Investigators then gave the mice the experimental drug and surprisingly enough the mice were able to run 10%-20% longer. The fact that the leakage of calcium was minimized resulted in increased exercise duration and performance. The practicality of a drug like this could result in significant ergogenic effects for endurance athletes.

A human study was conducted at Appalachian State University in Boone, N.C. by Dr. David Nieman to find out if endurance athletes experienced fatigue for similar reasons as congestive heart failure patients testing the calcium leakage theory. A group of highly trained cyclists were subjected to intense training for three consecutive days. As a control, other highly trained cyclists did not perform the high intensity training. At the culmination of the three day protocol, muscle biopsies were taken from both groups of trained cyclists – those who rode at a high intensity for three days and those who were sedentary for three days – and sent to Dr. Marks for review. Upon examination of the muscle biopsies, it was determined that the athletes who intensely trained for three days had muscle fibers with leaky calcium channels, a possible cause of fatigue. Within a couple days, the muscle tissue had repaired itself and the calcium channels were back to normal working condition.

Dr. Marks' intentions are to develop the drug in an on-going effort to improve the quality of life of his congestive heart failure patients. Hopefully, the drug will slow down

the progress of congestive heart failure and allow individuals to continue to function at a reasonable level with minimal fatigue. A concern is that athletes might also be tempted to take the drug for its possible ergogenic potential – increased endurance capabilities and longer time to exhaustion. Dr. W. Robb McClellan, a heart disease researcher at U.C.L.A., says that the odds are against the drug being approved and says, “In heart failure, there are three medications that improve mortality, but there have probably been 10 times that many tested.” Dr. McClellan states that even if the first drug that prevents calcium leakage doesn’t get approved or work perfectly, the important thing to take away from this research is a greater understanding of the physiological and molecular workings of the body related to congestive heart failure and muscular fatigue so that proper therapies can be developed.



CEU Quiz

1. A build-up of _____ has been discredited as the main cause of muscular fatigue.
 - a. Mitochondria
 - b. Calcium
 - c. Lactic acid
 - d. ATP

2. An action potential causes the release of _____ from the _____.
 - a. Calcium; mitochondria
 - b. Calcium; sarcoplasmic reticulum
 - c. Lactic acid; sarcoplasmic reticulum
 - d. Myosin; mitochondria

3. Calcium is needed to form a strong, active bond between which two myofilaments?
 - a. Actin & Myosin
 - b. Golgi Tendon & Myosin
 - c. Actin & T-Tubules
 - d. Golgi Tendon & T-Tubules

4. After prolonged activity, research suggests that leaky _____ may result in weakened muscular contractions and eventual fatigue.
 - a. Atria
 - b. Ventricles
 - c. Calcium channels
 - d. Neuromuscular junctions

5. Which of the following occurs in individuals with congestive heart failure?
 - a. An inefficient heart
 - b. Build-up of fluid in the lungs
 - c. Complaints of fatigue
 - d. All of the above can be experienced with congestive heart failure

6. When conditions arise that require the heart to pump more oxygenated blood, the sympathetic nervous system stimulates the release of _____ and _____ to stimulate the heart.
- ATP; calcium
 - Testosterone; estrogen
 - Leukines; ATP
 - Epinephrine; norepinephrine
7. The drugs that minimize calcium channel leakage, developed by Dr. Marks and his colleagues are called _____.
- Rycals
 - CRCs
 - Calcium blockers
 - Epinephrines
8. When the modified experimental drugs were laboratory tested on exercising rats, the time to _____ was increased by approximately _____.
- VO₂max; 10%-20%
 - Exhaustion; 10%-20%
 - VO₂max; 25%-30%
 - Aerobic metabolism; 40%-50%
9. During the experiment at Appalachian State that examined trained cyclists, the control group was comprised of _____.
- Deconditioned individuals
 - Highly trained cyclists who did not participate in the study protocol
 - Elite power trained athletes
 - A diverse grouping of members of the general population
10. When the muscle samples from the cyclists who completed three consecutive days of high intensity training were examined, Dr. Marks was able to determine _____.
- The fiber type of each muscle
 - That calcium channels were leaky after near exhaustive training
 - That after 3 days of recovery, the calcium channels were functioning properly.
 - Both B and C are correct

Quiz Answer Form

FIRST NAME _____ LAST NAME _____ M.I. _____

TITLE _____

ADDRESS _____ APT. _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

COUNTRY _____ POSTAL CODE _____

CERTIFICATION NO. _____ CERTIFICATION EXP. ____/____/____

MEMBERSHIP NO. _____ MEMBERSHIP EXP. ____/____/____

Quiz Name	Member Price	Total
	\$15	



Discover



Visa



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Amex



Check/Money Order

Account No. _____

Exp. Date _____

Security Code _____

Signature _____

Date _____

Quiz Answers

- | | |
|----------|-----------|
| 1. _____ | 6. _____ |
| 2. _____ | 7. _____ |
| 3. _____ | 8. _____ |
| 4. _____ | 9. _____ |
| 5. _____ | 10. _____ |

Fill in each blank with the correct choice on the answer sheet. To receive 0.5 CEUs, you must answer 8 of the 10 questions correctly.

Please mail this Quiz answer form along with the proper enclosed payment to:

NCSF
5915 Ponce de Leon Blvd., Suite 60
Coral Gables, FL 33146

Questions? 800-772-NCSF