

Examination of the Master Course "Fatigue, Aging and Disease"

Thursday, May 27th, 2010 from 12.00 to 14.00 hrs

Do not forget to write your name and student number on each sheet!!

Explain all your answers!!!!!!

1. An elderly, generally healthy, person twisted his ankle and was not allowed to stand on his left leg for a period of 3 weeks. Therefore, his left leg was suspended via a cord around the waist. He could walk with the aid of crutches.
Measurements could be performed before and after the suspension period.
 - a. What are the main effects you would expect in characteristics of the knee extensors and plantar flexors, *respectively*, of the left leg as a result of the 3-week suspension?
 - b. Fatigability of the knee extensor muscles of the left leg was measured with a brief high-intensity test. What are the differences you expect as a result of the suspension and which adaptations would be responsible for the differences?
 - c. Explain whether you expect differences in adaptation if the person would have been younger.
 - d. Please list which actions you would suggest to prevent or diminish the effects of the suspension, including the rationale for the actions.

2. Two physically identical persons having the same lifestyles are starting resistance training to increase the strength of their leg and arm muscles. After four weeks one of the two shows a substantial hypertrophy and stronger muscles, whereas the other person shows only half the effect of that of the other. The person with a limited response is visiting a sports physician for advice. The physician suggests to perform a genetic screening for the IGF-1 gene.
 - a. The screening shows that for one of the myostatin genes, a mutation is found in the E-domain at exon 5. The mutated gene contains an UAG (stop) codon in exon 5 instead of AAG. The other gene is not mutated. Explain the consequence for the amount of protein expressed from the genes in the muscles of this person.
 - b. To compensate for the lack of hypertrophy, it is proposed to use an IGF-1 Ea nose spray. Describe and explain how and via what mechanisms this could improve the result of the resistance training.
 - c. Name and explain two potential negative side effects
 - d. In addition, the physician proposes to take a muscle biopsy and analyze the caspase 3 activity within the muscle fibers. Explain why this information is relevant and explain two mechanisms/factors which counteract the consequences of elevated caspase 3 activity

See overleaf for question 3

3. After a long period of relative inactivity, a 30-year old man decides to climb a mountain during his next holiday period in 9 months time.
- a. Explain the content of training you would suggest improving his condition up to the necessary level. Clarify why the different components are included and which results you expect from these components.
 - b. How would you test/measure whether your suggested training actually results in the expected improvements on the targeted components of performance?
 - c. Describe two important signalling molecules within a muscle fiber which play an important role in the realization of the aimed adaptations?
 - d. Explain from a molecular point of view why it is so difficult get optimally prepared for mountain climbing?