

SP.235 Chemistry of Sports or Understanding how exercise affects your body chemistry

Patti Christie
Experimental Study Group (ESG)
Chemistry and Biology Lecturer

Goals of the Course

- Apply the principles of chemistry to studying sports
- These principles include:
 - Atomic and molecular interactions
 - Thermodynamics
 - Acid/base chemistry
 - Bonding
 - Electrochemistry
- There will be weekly reading of scientific literature related to the topic of the week

Goals of the Course

- Understand the chemistry of their own biological system through observations written in a training journal
- Study the science of a triathlon (swim, bike, run) from a molecular / chemical / biological point of view
- Improve your own personal fitness level by training for the Mooseman triathlon (either Olympic distance or Half-ironman) and earn PE credit or by maintaining your own exercise program

Syllabus

- **Week 1 -Wednesday February 7th, 2007**
 - Introduction
 - Talk about the triathlon –
 - do some basic ideas about training
 - present a plan for the novice triathlete
 - make your training journal
 - Fill in the forms for the Mooseman Triathlon
 - Sign up for the fitness evaluation at the Z center with the personal trainer
 - Explain the tests that are going to be done

Syllabus

- **Week 2-Wednesday February 14th, 2007**
 - Basic systems of your body:
 - Organs including Cardiovascular, Breathing, Nervous system. skeletal
- **Week 3-Wednesday February 21st, 2007**
 - Training your body: Lungs, Muscle and Repair and maintenance of body
 - Glucosamine and other joint lubricants
- **Week 4-Wednesday February 28th, 2007**
 - Nutrition and fueling you body
 - picking the best training food
 - How to determine how much you need to eat each day

Syllabus

- **Week 5-Wednesday March 6th, 2007**
 - repair and maintenance
 - how to rebuild your body after a workout
 - Glucosamine and other joint lubricants.
- **Week 6-Wednesday March 13th, 2007**
- **Science of swimming**
 - wetsuit making,
 - how chlorine affects you (why do you wear goggles, how does your hair turn green), chlorine removal products,
 - swimming in cold vs. warm water
 - mechanics of swimming (guest speaker Bill Paine, coach of MIT masters swimming)

Syllabus

- **Week 7-Wednesday March 20th, 2007**
 - Science of running AND shoes
 - Correct form, how its important to minimize damage.
 - Hopefully including a guest speaker to come and talk to us about how running shoes are designed and manufactured
- **Week 8 -Wednesday March 27th, 2007**
 - SPRING BREAK - NO CLASS – continue training
- **Week 9- Wednesday April 4, 2007**
 - Science of bicycles, including a field trip to a bicycle shop

Syllabus

- **Week 10-Wednesday April 11, 2007**
 - Inside your head
 - competition and what it does to your brain and body.
 - Guest Speaker: Dr. Holly Sweet (3 to 4 pm)
- **Week 11-Wednesday April 18, 2007**
 - Chemistry of clothing
 - looking at the manufacture of swim suits through the years,
 - running gear and cycling gear

Syllabus

- **Week 12-Wednesday April 25, 2007**
 - Chemistry of cheating
 - illegal substances and how they test for them
 - Affects on your body: Anabolic steroids, EPO
- **Week 13-Wednesday May 2, 2007**
 - Legal means of manipulating your body
 - Examples include: Glutamic acid, isoleucine and lysine – used by athletes to enhance performance
- **Week 14-Wednesday May 9, 2007**
 - Triathlon logistics
 - get a guest speaker to talk about doing a triathlon (Alex Slocum, Mark Cote)

Syllabus

- **Week 15-Wednesday May 16, 2007**
 - Chemistry in other sports
 - Do another set of testing to see how improved your system is.
 - Course evaluation material
- **Week 16 - week of Finals (May 21)**
 - continue training
- **Week 17 - week of May 27th**
 - continue training
- **Week 18 - June 2 and 3 -Race day!**

Mooseman Triathlon

- <http://www.timbermantri.com/moosemanindex.html>
- June 2- International (Olympic) Distance
 - 1.5K (.93 mile) fresh water lake swim in pristine Newfound Lake
 - 44K (27.25 miles) spectacular, scenic one-loop course on the shores of Newfound Lake
 - 10K (6.2 miles) Run is a scenic out and back course along the shores of Newfound Lake with rolling hills, passing by the majestic Granite Ledges
 - Fee is \$90.00
- June 3 - Half Iron Distance
 - 1.2 mile fresh water lake swim in pristine Newfound Lake
 - 56 mile spectacular, scenic two-loop course on the shores of Newfound Lake
 - 13.1 mile Run is a scenic double out and back course along the shores of Newfound Lake with rolling hills, passing by the majestic Granite Ledges
 - Fee is \$175.00

Mooseman Triathlon

- Who wants to do it?
- Need to get the forms filled out and back to Alex Slocum
- Talk about logistics after class with those who want to do it

Not interested in the Triathlon?

- You can still participate in the course, but you need to maintain a physical exercise program throughout the semester.

Grades

- Pass/Fail 6 unit seminar
- Meets 2 hours a week on Wednesdays from 3 to 5 pm
- Extra 2 units or 4 units of PE credit available if you complete either the Olympic or Half-Ironman Mooseman Triathlon

Training Journals

- Part of research is to document your experiments
- Since you are using your own body as the experimental device, you need to document how the experiment is going
- You will keep a training journal throughout the term.

Training journals

- Things that you want to think about for your training journal
 - Think about the entire term as preparation for the race in the first weekend of June
 - Write down distance, time, intensity of each of your workouts for each day
 - Indicate how the workout went for instance felt great, was unable to focus
 - Keep track of your eating habits and how it relates to your physical performance
 - Keep track of the amount of sleep you get
 - Keep track of hydration
 - Review on a weekly basis to gauge how your training is going

Make your own training journal

- Class activity

Potential Training schedules

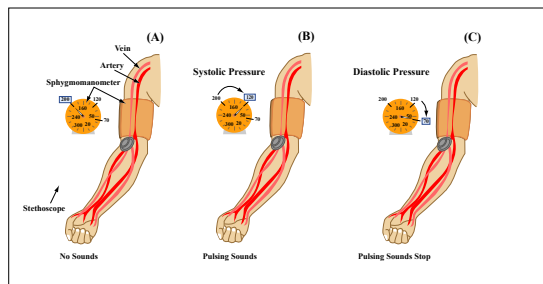
- These are all posted on the class website:
- They are from the book Essential Week-by-Week Training guide by Matt Fitzgerald
- You need to read chapters 1 and 2 and then the specific chapter/fitness level for the event you are training for.

Fitness Testing

- One of the goals of the course is to improve your fitness over the term
- To help gauge this, we are going to do a pre- and post-course fitness tests
- These tests are going to be done at the Z center and are called Fitness Assessments

Fitness Assessment

- What will be done:
 - Age
 - Resting heart rate
 - Resting blood pressure
 - Weight
 - % body fat using calipers to measure skin folds
 - for females - tricep, hip and thigh
 - For males - chest, abs and thigh
 - Flexibility - sit and reach
 - Push-ups
 - Aerobic conditioning VO_2 - bike test



Measuring blood pressure

Figure by MIT OCW.

- a. Pressure in the cuff is increased to close both the arteries and veins. No sounds is audible
- b. Pressure in the cuff is gradually lowered until the sound of a pulsing flow of blood through the constriction in the artery is heard. At this time, pressure in the cuff is just below the peak systolic pressure in the artery
- c. Pressure is further lowered until the sound becomes continuous. At this time, the cuff is just below the diastolic pressure in the artery.

Source of diagram?

Source of text?

Verbatim?

Fitness Assessment

- Goal is to look at your baseline fitness and see if you can improve it over the course of the term
- This is accomplished through a regular exercise program

Fitness Assessment

- Signing up for the fitness assessment: budget on 45-60 minutes
 - Times available:
 - Thursday February 8th - 3:30 pm, 4:30 pm, 5:30 pm, 6:30 pm, 7:30 pm or 8:30 pm
 - Friday February 9th - 3:30 pm, 4:30 pm, 5:30 pm, 6:30 pm, 7:30 pm or 8:30 pm
 - Saturday February 10th - 12 noon, 1 pm, 2 pm, 3 pm, 4 pm and 5 pm