HAPS 2002

(adapted from Spring 2002 Comparative Vertebrate Physiology - Skidmore College - by Loretta Parsons & Roy Meyers)

Introduction to *web*-HUMAN

(This introduction is designed to be used while also interactively running the *web*-HUMAN program)

Note: The *introductory section* (not printed here) to this exercise is available on-line via the HAPS 2002 link. It is left off this hard copy to save space & carrying weight. The introductory section covers background material including the topics:

What is *web*-HUMAN?

How will we use *web*-HUMAN in this workshop (and in your courses)?

What are some key features of the program one needs to know in order to run *web*-HUMAN?

Practice using *web*-HUMAN

Call up *web*-HUMAN by going to http://www.skidmore.edu/academics/human and click on <**Run**>.

1. Finding Values for Variables (and familiarization with web-HUMAN variable names)

A. **Use the printed lists*** to find the normal values for the following variables:

Note- We will **NOT** be using printed lists in this workshop but you may wish to use this option with your classes depending on their ability to "not misplace" their lists from class to class.

* Users can at any time print out their own variables list hard copy by clicking on the List all variables option (see below) and printing the list.

B. **On-line variables list access** –

- Load *web*-Human. (The address for the *web*-Human Front End page is http://www.skidmore.edu/academics/human).

- The default values for the "Run the Model" commands are "OK as is" for this step, so simply click the "**Run**" button.

From the <List all variables> option on the main HUMAN output page control panel access the *web*-HUMAN Variables and Parameters list. You can use then use the Netscape or Explorer "Find on Page" feature
(CMD-F) to search for key words or parts of words that occur in the lists.

Lets go through the four below *as a group*.

Code	Variable or Parameter	Normal Value	Units
BV	Blood Volume	_____	_____
HCT	Hematocrit	_____	_____
IFV	Interstitial Fluid Volume	_____	_____
ARVOL	Artificial Respirator, Tidal Volume	_____	_____

Try each of these *on your own* and then *stop* for group discussion.

Code	Variable or Parameter	Normal Value	Units
_____	Blood Lactate	_____	_____
_____	Ambient Temperature	_____	_____
_____	Pulmonary Membrane Surface Area	_____	_____
_____	Muscle Oxygen Debt	_____	_____

C. **Using the model's <View Variable> option**- Use the *web*-HUMAN program itself to find the values necessary to complete the table below.

To look up the variables and their normal values, pull down the menu next to "View Variable - Choose" section and scroll through to choose a variable. Then at the bottom of the screen click "Go". When the data are returned, you will find the most recently updated information (i.e. your requested variable) at the bottom of the Output from *web*-HUMAN section.

Code	Variable or Parameter	Normal Value	Units
PH	_____	_____	_____
MFLOL	_____	_____	_____
SWETC	_____	_____	_____
VENT	_____	_____	_____

2. Changing Table Column Headers

A. Begin a new simulation by clicking on "**Start Over**" to return to the initial *Web*-HUMAN page.

B. Select Experiment number 2, for 30 minutes, print every 5 minutes and then **Run** the model.

C. In the "**Change Table Columns**" section, pull down the menu for any table location (2-7).

D. Column 1 is always reserved for time (i.e. Day/Hour).

E. Use the scrollable "**Change Table Columns**" menus to set the column headings as indicated below. Look up the missing information by any one of the methods practiced above.

Column	Code	Variable or Parameter	Units
2	RESPRT	_____	_____
3	_____	Tidal Volume	_____

Column	Code	Variable or Parameter	Units
4	_____	Arterial Oxygen Content	ml/ml
5	PCO2A	Arterial CO2 tension	_____
6	_____	Blood PH	pH units
7	CO	_____	ml/min

F. Now click "**Go**" to enter your changes to the table. The resulting output will inform you of the current values for these variables.

3. Run a High Altitude Experiment

A. Once students have set up the table (as above) to record variables related to respiratory function, they are well poised to conduct an experiment revealing the responses and stresses created by altitude ascent. What is the basic stress encountered when one moves to a high altitude? What are the physiological responses to this and succeeding perturbations? What are the variables that trigger these responses?

B. Test their/your predictions by continuing to run the *Web*-HUMAN program. As you already have your Tables set up, the next step is to alter the environmental conditions to simulate high altitude.

- First, click on one of the menus in the section entitled "**Change Variable - Choose**".
- Then, scroll to the variable BAROP (barometric pressure). The default value appears in the Info box on the right.
- Enter a numerical value for barometric pressure that is one-half the normal pressure at sea level.
- Click "**Go**" to put this change into effect.

C. Run the experiment (Run Experiment option) for 480 minutes at 30 minute intervals (enter these numbers into the boxes) and click "**Go**".

D. Review the results and answer the following questions.

Over the eight hours at high altitude, how did your subject's breathing pattern change? How rapid was the onset of these changes in breathing pattern? What was the magnitude of these changes?

Though your subject is working harder to ventilate his lungs, is he maintaining a normal level of oxygen in the arterial blood? Characterize the time course and magnitude of changes in his blood oxygenation.

Has the heart function been affected? If so, what factor(s) may have caused the change?

E. Observe the CO2 and PH responses graphically*.
Use the "Graph the latest data" option (lower right), picking column 5 (the CO2 data) and column 6 (PH) and click on "**do it**". * (It is always a good idea to Close graph windows *after* using them as they take up extra memory)

What effects does the hyperventilation have on your subject's blood carbon dioxide? Why does this happen?

The amount of CO_2 in the blood is a crucial factor in determining the pH of the blood. Based on the results of your experiment, is dissolved CO_2 an acid or a base? Explain.

Note: The student version of this introductory exercise is available on the opening *web*-HUMAN screen at the link About HUMAN - an introduction.