

Respiration Physiology (Mammalian Physiology '07/08)

Acid/Base Simulations

(Human 7, 11/08/07, 11/4/08)

Note to outside Skidmore readers. The following maneuvers allow the user create a primary respiratory and metabolic acidosis and alkalosis of any desired amount and to observe the model's attempt to compensate for the disturbance. They are also each available in simpler form as acid-base vignettes via links on this page.

1) Learning four interventions that are useful in acid-base simulation

After a brief introductory demo, you will 'experiment' on your own with each of the four interventions below by changing the listed variables (and any appropriate others you may find useful in any Help Info on: screen under View summary of all variables) so as to effect an acid-base disturbance and follow its' compensatory correction.

The techniques to be utilized to effect the desired acid-base disturbance include the following:

- a) Infusion - simulates an IV infusion of controlled time, duration and content. [IFMIN, IFVOL, IFBIC]
- b) Control of metabolism- controlling metabolism so that it produces more or less acid [BACID]
- c) Control of ventilation- controlling ventilation via the use of the artificial respirator [ARTRES, ARVOL, ARRT]
- d) Control of atmospheric CO₂- controlling atmospheric % CO₂ [FCO2AT]

2) Sample simulated acid-base intervention- induction of metabolic alkalosis via infusion of bicarbonate

a) Set tables under View Output: for acid-base output (and possible use in plotting on a Davenport diagram)

PH, PCO₂A, BICARB, AVENT, IFMIN, EXBIC (note: look these up in Help)

b) Set up the infusion (note order in which variables are set)

1) IFMIN = 60 2) IFBIC = 240 (Run for 0 min, 0 printouts) 3) IFVOL = 1000

c) run for 1H, 10 (min) between printouts

d) Characterize acid-base status at 0.0, 0.5 & 1.0 hour (by a Davenport plot if available), identify the primary acid base problem and secondary compensations (if present).

3) 3 more elementary Acid- base problems to work out (for those who desire more structure in setting up see the Hints on the last page; they contain the protocol for the other 3 conditions)

Acid-base simulations - setup, run and characterize the other three possible primary acid-base disturbances and accompanying compensations by

- - designing an appropriate experiment
- - gathering data from *web*-HUMAN
- - recording / plotting* at least initial, final & one intermediate state
*on a Davenport diagram (if available)
- - very briefly analyze each result

4) Diagnose 2 Acid- base "Unknowns"

Login to the HUMAN database and go to the folder [RenalPhysBi306Files](#)

and find the four files labeled as unknowns (i.e. =>Acid-Base etc.).
Try your hand at them (particularly 1,3,4).

Note: a Hints page follows that should be used if you need more
guidance in setting up any of these experiments.

Hints (Run #1 was already done as the practice run)

Run #1 – Make certain IFVOL is entered third as moving it off zero begins the infusion. (note: units of IFVOL are ml)

Run #2 – Use 10 times normal basic acid production, monitor BACID, run for 7H with 1H between printouts, to trace record (& plot*) 0, 4 and 7 hour values. *on Davenport plot (if available).

Run #3 – View output: (tables)- add VENT, UPH; Run 1H, 15 min. intervals for baseline. In sequence change ARVOL(750), ARRT(15) (Run for 0 min, 0 printouts and then ARTRES(1). Run for one hour with 10 min. between printouts

Run #4 – try FO2AT = 0.05, monitor UPH, run 3D at 12 H intervals, how complete is the compensation?

For Patient Charts or Lab tests: the following are recommended:

<u>Run no.</u>	<u>Patient Charts...</u>
1,2,4	Kidney Summary
3	Lungs and Ventilation Summary