

## Effect of hyperbaric oxygen on the healing of surgical wounds

The data shown to the right were obtained in an experiment conducted by Dr. George Huang of the Department of Surgery at the University of Chicago. The experiment was designed to investigate the effect of hyperbaric O<sub>2</sub> treatment on the healing of surgical wounds in diabetic rats. (Diabetics, both human and animal, tend to have more complications following surgery than non-diabetics.) Thirty rats were first given a drug that has the effect of destroying the pancreas, thereby making the rats diabetic. All the rats underwent surgery, during which an incision was made along the entire length of the back. This was immediately sewn up with staples. The treatment group of 15 rats was subjected to a hyperbaric O<sub>2</sub> treatment, i.e., a 100% O<sub>2</sub> environment at 2 atmospheres pressure, for 90 minutes per day following surgery. The control group also received O<sub>2</sub> treatment for 90 minutes daily, but at normal atmospheric pressure. Six rats had glucose levels that were deemed too low to be considered diabetic, and were excluded from the experiment. (You may assume that these high insulin levels were unrelated to the treatment.) After a 24 day recuperation period the 24 rats still participating in the experiment were sacrificed, i.e., killed. Strips of skin were taken from each of five sites on each rat, each site crossing the surgical scar in a right angle. The strips were put on a tensiometer and stretched to breaking point. The observations in the table give the energy required to break the specimen. Unfortunately some specimens slipped out of the clamps for reasons unconnected with the strength of the specimen. For these specimens, no observation could be made: the values are indicated by -- in the table. Rats 1–14 received the hyperbaric treatment: rats 15–24 were the controls.

The main objective is to determine whether or not hyperbaric O<sub>2</sub> treatment has an effect on the healing of surgical wounds and whether the effect depends on the position of the wound on the back. Obtain confidence intervals for the size of any such effects. Summarize your conclusions in a brief (one page) report for Dr. Huang, supplemented by up to 5 pages of technical documentation. Approximate analyses based on realistic assumptions are preferable to exact analyses based on unrealistic assumptions or exact analyses not carried to completion.

The data are in `.../rats.dat` with missing values coded as zeroes.

<i>Site on the back, ranging in order from near the shoulders to near the tail</i>					
<i>rat</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
1	3.8300	7.3788	44.353	19.555	--
2	27.861	29.974	15.470	23.455	--
3	56.996	60.960	20.306	--	28.123
4	--	38.043	68.080	42.425	30.335
5	16.276	--	59.033	73.891	--
6	38.267	33.702	35.558	44.598	32.678
7	9.0384	11.259	27.121	31.984	--
8	16.728	27.590	13.238	12.139	6.3865
9	11.866	27.983	26.226	15.594	19.225
10	23.352	34.790	27.556	35.883	22.848
11	16.444	31.928	21.495	15.590	7.0750
12	23.342	46.313	33.810	15.686	--
13	15.267	14.452	10.635	22.156	6.8062
14	21.732	20.746	12.293	17.295	10.301
15	82.508	13.645	49.187	--	53.432
16	--	45.919	63.090	68.137	36.500
17	80.147	29.943	71.928	--	46.609
18	31.938	--	36.211	49.815	44.468
19	15.453	31.384	27.127	27.961	9.9035
20	21.183	27.429	20.058	--	--
21	20.445	12.532	15.661	28.694	--
22	16.928	59.579	29.407	18.626	8.8352
23	35.631	21.613	23.155	42.379	16.203
24	20.523	24.621	16.292	--	18.680