**Do the plant extracts contain any toxins?**

 You have extracted compounds from two plant tissues and we want to know if there are any significant survival differences with the four treatments (two tissues, two doses). We are going to use the Fisher Exact statistical test online at: <<http://www.quantitativeskills.com/sisa/statistics/fisher.htm>>.

Generate a electronic or paper table that looks like the one below. We have provided you with some simulated data so you can walk through the sample analysis process and know that you have done the test properly.

|  |  |  |  |
| --- | --- | --- | --- |
| Treatment | # Alive | # Dead | Notes |
| Water control |  |  | Should add to 40; obtain results of water control from other groups |
| Methanol control |  |  | Should add to 40; obtain results of methanol control from other groups |
| Tissue A low concentration | 31 | 9 | = 40 (1st set of tubes #3-6 pooled) |
| Tissue A high concentration | 21 | 19 | = 40 (1st set of tubes #7-10 pooled) |
| Tissue B low concentration |  |  | = 40 (2nd set of tubes #3-6 pooled) |
| Tissue B high concentration |  |  | = 40 (2nd set of tubes #7-10 pooled) |

*Null Hypothesis = the two treatments are equally toxic.*

 When you go to the online test site, you will see a table that looks like this:

|  |  |  |
| --- | --- | --- |
|  | Col 1 | Col 2 |
| Row 1 |  |  |
| Row 2 |  |  |

You can convert the labels to this:

|  |  |  |
| --- | --- | --- |
|  | Alive | Dead |
| Low A | 31 | 9 |
| High A | 21 | 19 |

When you hit “Calculate” you will see this output:

The total number of cases= 80

The smallest value= 9

The smallest marginal= 28

Use of \* (starred) statistics is advised

The p for exactly this table= 0.01233

**One sided p-values: for p(O>=E):** [Use this is you predicted high dose was more toxic than the low dose.]

**p(O>=E): 0.01699 \***

p(O>E): 0.0046553

mid-p: 0.0108227

**p(O<=E): 0.9953447** [if outcome is the opposite of what you predicted (e.g. low dose was more toxic than high dose)]

**Two sided p-values p(O>=E|O<=E):** [Use this if you predicted the two plant extracts would be different.]

p= 0.03398 \* (sum of small p's)

p= 0.0123347 (left+right-exact)

p= 0.0216453 (left+right)

p= 0.03398 (double the single sided p)

p(O>E|O<E)= 0.00931 (sum of small p's)

mid-p 0.0216453 (sum of small p's)

For help go to SISA.

Chi squares

(both with 1 degree of freedom):

Pearson's= 5.495 (p=0.019076) \*

LRX= 5.587 (p=0.0181)

**One sided test:** (e.g. high dose is more toxic than low dose; null hypothesis = the two treatments are the same.)

 If you hypothesized that one condition was more toxic than the other, AND the data trend in the direction you hypothesized, then use the one-sided p-value that is highlighted (**bold and underlined**) above (0.017). That is the ONLY value you need from the table.

 However, if you hypothesized that one condition was more toxic than the other, AND the data trend in the OPPOSITE direction you hypothesized, then use the one-sided p-value that is **bold**) above (0.99). You could restate your hypothesis and subtract the p value from one to get 1 – 0.99 = 0.01.

**Two sided test:** (berries have a different level of toxicity than leaves; null hypothesis = berries and leaves are equally toxic.)

 You might only predict that two conditions are different, but not be specifically predict which was more toxic than the other. In that case you would use the two-sided p-value that is underlined above (0.034).

**Full Analysis**

 You will need to perform 7 Fisher Exact tests, making the following comparisons:

Water control vs. Methanol control (what are you testing here?)

Methanol control vs. [LOW] Tissue A (what are you testing here?)

Methanol control vs. [LOW] Tissue B (what are you testing here?)

[LOW] Tissue A vs. [LOW] Tissue B (what are you testing here?)

[HIGH] Tissue A vs. [HIGH] Tissue B (what are you testing here?)

[LOW] Tissue A vs. [HIGH] Tissue A (what are you testing here?)

[LOW] Tissue B vs. [HIGH] Tissue B (what are you testing here?)

**Written Lab Report**

 Your next graded assignment is to write a paper that incorporates all the data associated with taste, genotyping and shrimp bioassay for toxicity. This paper is due at the beginning of lab on November 29 (no lab on Thanksgiving day). It is a group project with CATME peer evaluation used to account for student participation in the collective effort.