

## Scenario A – Fish CSI?

### Background:

A recent development in the food industry is the substitution of very expensive meats with a “fake” or less expensive version while still selling it at a relatively high price. Imagine you are a group of scientists hired by the FDA to go to some of the most expensive sushi restaurants in the area and randomly test their more expensive sushi for “imposter” fish. You decide to use the Fish DNA GeneChip microarray\* to do the testing. This microarray contains probes representing specific gene segments of 15 different fish species. The features in the array are organized in the following way:

AC	AB	JSM	AM
AS	BT	EE	EH
GC	JE	ME	RT
ST	SkT	SpT	BFT

The abbreviations are as follows:

AC = Arctic char	AB = Atlantic bonito	AM = Atlantic mackerel
AS = Atlantic salmon	BT = Brook trout	EE = European eel
EH = European hake	GC = Greenland cod	JE = Japanese eel
ME = Mozambican eel	RT = Rainbow trout	ST = Sea trout
SkT = Skipjack tuna	SpT = Spotted tunny	BFT = Blue Finned Tuna
JSM = Japanese Spanish mackerel		

The array is simple to read. DNA is isolated from the sample (food) and then reverse transcribed into tagged RNA. The RNA is added to the array, allowed to hybridize, fluorescently tagged, and analyzed. If the DNA came from one of the species above, the RNA would hybridize to the probes in that specific feature and would fluoresce. In short, if a specific feature fluoresces, then DNA from that fish species is present. (Note, on an actual array, multiple features would be used for each species. For simplicity, in this example each species is represented by a single feature).

\*Note: This scenario uses a “Fish DNA GeneChip microarray” which is based on an actual chip known as the FoodExpert-ID GeneChip microarray from the company [bioMérieux](#).

Your group has recently collected samples of sushi from a first restaurant. You received some inside information that the restaurant may be trying to increase profits by substituting cheaper fish for some of their more popular sushi. You have collected four suspicious samples that the restaurant claimed to be the following: sake (Atlantic salmon), unagi (Japanese eel), maguro (blue finned tuna), and saba (Atlantic mackerel). For each sample you collected enough for 20 tests.

**Results:**

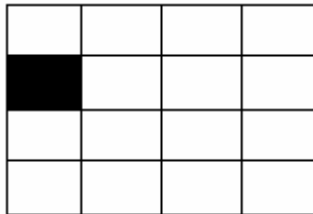
The results are below. For simplicity's sake, use the following key to help you interpret the amount of DNA in each sample take:

Black feature = high DNA levels  
Light Grey = low DNA levels

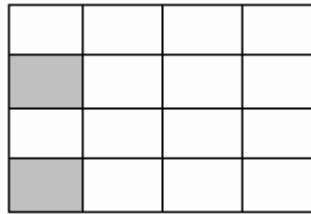
Dark Grey feature = medium DNA amounts  
White feature = no DNA present

Use the key on the page before to interpret what each feature represents.

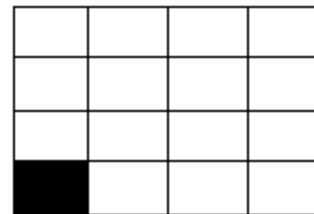
Sample #1 – samples sake (Atlantic salmon)



4 test results

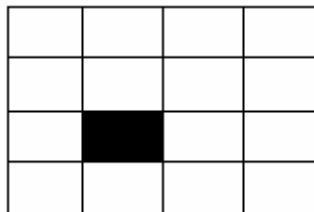


13 test results



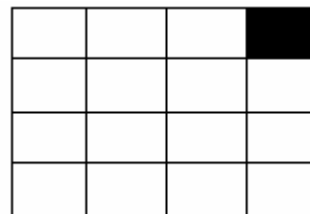
3 test results

Sample #2 – samples of unagi (Japanese eel)



all 20 test results

Sample #3 – saba (Atlantic mackerel)



all 20 test results

Sample #4 – maguro (Blue finned tuna)


4 test results


4 test results


12 test results

**Directions:**

Analyze each sample carefully and work together as a group to come up with a hypothesis on what is happening in each situation. For each situation, be sure to think about why the restaurant may or may not have switched the fish type. What do they have to gain or lose? When finished, be prepared to report back to the class what you have found. Prepare visuals to help with your explanation and make sure you are very clear.