

ChixFix Scenario: Antibiotic Resistance

I give the first two pages to students in pairs, with some pairs being the chicken farmers, and others being the scientists. They must put their names on the papers, of course. Then I have them get together in groups of 4. The chicken farmers explain to the scientists what they've found, and the scientists must write out a concise statement of those findings. Then the scientists explain to the chicken farmers what they found, and the chicken farmers must write out a concise statement of those findings. Note that the 4-person page has places for all 4 names, with numbers 1-4 for them.

Then I give them the last page. Their "identity" is determined by which number their name is on the prior page. This part gets fun.

Names: _____

Growing Chickens

You work for ChipperChicken, Inc., a moderate-sized chicken farm. Your boss comes to you and says:

“Y’know, sometimes them birds get sick, and we cure ‘em with ChixFix Antibiotic Treatment. I betcha that if we gave ‘em ChixFix all the time, they wouldn’t get sick, and they’d grow faster, too. It’d kill all them bacteria that hang around makin’ ‘em not-so-chipper. Whaddya think?”

So, you do the work to find out.

Experiment: you grow some chickens without ChixFix, and some with ChixFix, and you weigh them every month.

Month:	1	2	3	4	5	6	7	8
Weight of chicken without ChixFix	0	0.8	1.8	2.5	3.1	4	4.9	5.1
with ChixFix	0	1.1	2.2	3.0	4	5	5.6	5.9

Calculations:

Compared to chickens without ChixFix, chickens with ChixFix grow _____ .

Chicken food costs \$1.20 per chicken per month.

ChixFix costs \$0.12 per chicken per month.

We can sell our chickens when they reach a weight of “4,” so:

without ChixFix, it costs \$_____ per chicken to reach marketable age

with ChixFix, it costs \$_____ per chicken to reach marketable age

Therefore, using ChixFix all the time saves \$_____ per chicken

This is a savings (profit) of \$_____ per million chickens (i.e. per year)

What do you tell the boss?

Salmonella

You have joined Eli Lilly for a summer internship. You are working with *Salmonella*, a species of bacteria that causes intense, life-threatening diarrhea in humans—but that makes chickens only slightly sick.

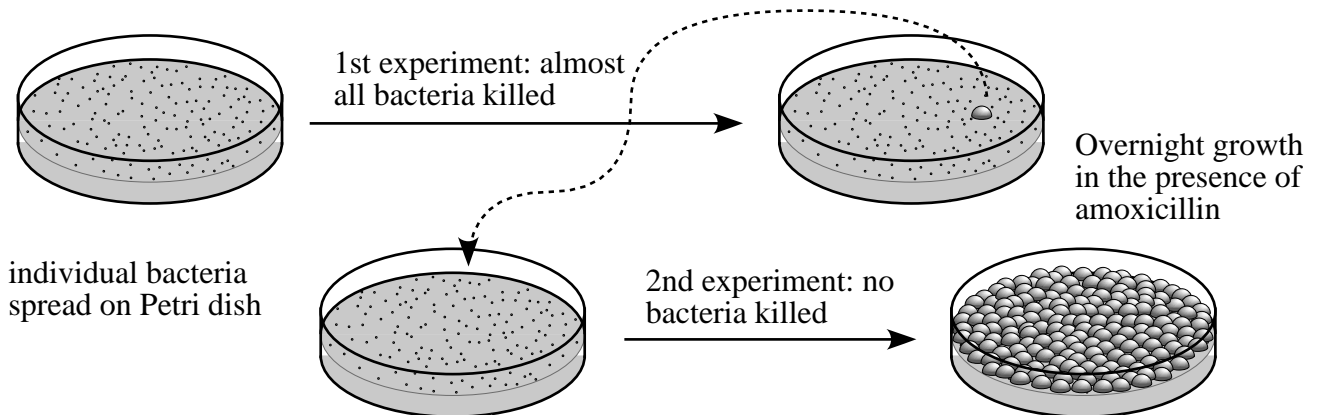
You are testing the ability of amoxicillin, the antibiotic in ChixFix Chicken Treatment, to kill *Salmonella*. To do so, you spread a culture of bacteria on a Petri dish, add amoxicillin, and see how many of the bacteria grow. Each bacterium that grows forms a “colony” on the plate, which you can see the next day.

You make 21 identical Petri dishes. On each one, you spread 50,000 bacteria. You set one of the Petri dishes aside, so you know what “untreated” bacteria do, and then you add amoxicillin to the other 20 Petri dishes.

The next day, you look at the colonies on your Petri dishes. The untreated Petri dish is covered with bacterial colonies—way too many to count. The others give these results:

Dish #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
# of bacterial colonies:	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

Why is there a colony on dish #7? Amoxicillin normally kills *Salmonella*! Here, *one* cell out of _____ cells survived. To figure out what happened, you take bacterial cells from that single colony, and spread them on another Petri dish, then add amoxicillin. This time, all of the bacteria grow. The picture below shows what your experimental results actually looked like:



The colony that grew on dish #7 shows a *heritable* change in characteristics—all of the offspring of the original amoxicillin-resistant bacterial cell are resistant to amoxicillin.

What is the origin of amoxicillin resistance?

If a human were infected by the *original strain* of *Salmonella*, how could you cure her?

If a human were infected by the *resistant strain*, how could you cure her?

1 _____
2 _____
Names: 3 _____
4 _____

Summary

1-sentence summary of Chicken Farming—what’s the story on ChixFix?

1-sentence summary of Salmonella biology—what’s the story on antibiotic resistance (particularly with regard to ChixFix)?

1 _____
2 _____
Names: 3 _____
4 _____

Congressional Legislation

House Bill 1437 is up for a vote. 1437 would ban the routine use of antibiotics in poultry farming. Does House Bill 1437 pass? Each of you must argue for, or against, the legislation, according to how you believe it will affect you.

Person #1. You represent the ChipperChicken company, whose yearly profits are \$50 million. They donate 0.1% of this profit to the political party that is least likely to pass legislation requiring “restrictive regulations.” That’s \$_____.

To avoid accusations of vote-buying, they also donate 0.02% to the other political party. That’s \$_____.

Person #2. You represent the Drug company that makes ChixFix Chicken Treatment, from which they earn \$50 million annually. They donate 0.1% of this profit to the political party that is least likely to pass legislation requiring “restrictive regulations.” That’s \$_____.

To avoid accusations of vote-buying, they also donate 0.02% to the other political party. That’s \$_____.

Person #3. You are a scientist. You make \$75,000 per year. You really care about public health, and you worry about amoxicillin-resistant Salmonella. To help support life-saving legislation, you donate fully 2% of your income to the political party that is most likely to pass legislation protecting public health. That’s \$_____.

Person #4. You are a Congressman. How do you vote?

Things to consider:

- the price of meat for the consumer
- the health of the economy
- annual taxes that run the government
- political and financial support for re-election
- backlash that results from passing unfavorable legislation
- convincing arguments that unfavorable legislation is truly necessary