# Is it Safe to Eat? 

## Part I Directions: For each of the scenarios, using the information provided, complete the table and determine if the food is safe to eat.

Example: Shigella has a generation time of 40 minutes and an infectious dose of 10 cells. Mom's tuna salad was infected with 4 cells of Shigella and has been sitting on the dining room table for 2 hours. Is it safe to eat?

| Important Information |  | Bacteria type: | Shigella |
| :---: | :---: | :---: | :---: |
| Total Time: | 2 hours | Infectious dose: | 10 cells |
| Generation Time: | 40 minutes | \# of cells at start: | 4 cells |


| \# of Times <br> Cells Divide | Time Elapsed <br> in Minutes | Number of <br> Cells |
| :---: | :---: | :---: |
| 0 | 0 | 4 |
| 1 | 40 | 8 |
| 2 | 80 | 16 |
| 3 | 120 | 32 |



## No, the tuna salad is not safe to eat after 2 hours of sitting on the table.

1. E. coli $\mathrm{O} 157: \mathrm{H} 7$ has a generation time of 20 minutes and can make you sick with as few as 10 cells. Judy likes to eat her hamburgers medium rare. If her hamburger was contaminated with 2 E. coli O 157 :H7 cells that were not killed during cooking and she waited 20 minutes to eat the hamburger, is it safe to eat?

| Important Information | Bacteria type: |  |
| ---: | ---: | :--- |
| Total Time: | $\square$ | Infectious dose: |
| Generation Time: | $\square$ | \# of cells at start: |


| \# of Times <br> Cells Divide | Time Elapsed <br> in Minutes | Number of <br> Cells |
| :---: | :---: | :---: |
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## Is it safe to eat?

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2. Under ideal conditions, Salmonella has a generation time of 30 minutes and an infectious dose of $15-20$ cells. Aunt Susie's homemade Ranch salad dressing has been sitting on the picnic table for 2.5 hours. If the dressing started out infected with 3 Salmonella cells, is it safe to eat now?

| Important Information | Bacteria type: |  |  |
| ---: | ---: | ---: | :--- |
| Total Time: | $\square$ | Infectious dose: | $\square$ |
| Generation Time: | \# of cells at start: |  |  |


| \# of Times <br> Cells Divide | Time Elapsed <br> in Minutes | Number of <br> Cells |
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determine if the food is safe to eat.

## Is it safe to eat?

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3. Using the information provided, write your own food safety scenario. Then, complete the table and to

| Important Information |  | Bacteria type: | Campylobacter jejuni |
| :---: | :---: | :---: | :---: |
| Total Time: | 3 hours | Infectious dose: | 400-500 cells |
| Generation Time: | 90 minutes | \# of cells at start: | 150 cells |

## Scenario:

## Is it safe to eat?

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Part II Directions: Now, rather than using a table, use the formula for exponential growth to determine if the food is safe to eat. Show your work. Then create a line graph for each scenario illustrating the exponential growth curve.
4. E. coli $\mathrm{O} 157: \mathrm{H} 7$ has a generation time of 20 minutes and can make you sick with as few as 10 cells. If Judy's hamburger was contaminated with 2 E. coli $\mathrm{O} 157: \mathrm{H} 7$ cells that were not killed during cooking, determine if it is safe to eat in each of the following situations.

| Important Information |  | Formula: | $y=a(1+\mathbf{b})^{x}$ |  |
| ---: | :--- | ---: | :--- | :--- |
| Total Time: |  | \# of cells at start | $a$ |  |
| Generation Time: |  | Growth Rate | $b$ |  |
| Infectious dose: |  |  | \# of times cells divide | $x$ |$]$

a. How many E. coli cells would be present $(y)$ if she waited 40 minutes to eat the hamburger? Is it safe to eat?
b. How many E. coli cells would be present $(y)$ if she waited 1 hour to eat the hamburger? Is it safe to eat?
c. Create a graph of the exponential growth curve where the number of times the cells divide is along the $x$-axis and the total number of bacterial cells is along the $y$-axis.

Challenge: How many E. coli cells would be presented $(y)$ if she waited 3 hours to eat the hamburger?
5. Under ideal conditions, Salmonella has a generation time of 30 minutes and an infectious dose of $15-20$ cells. If the dressing started out infected with 3 Salmonella cells, determine if it is safe to eat in each of the following situations.

| Important Information |  | Formula: | $y=a(1+\mathrm{b})^{x}$ |  |
| ---: | :--- | ---: | :--- | :--- |
| Total Time: |  | \# of cells at start | $a$ |  |
| Generation Time: |  | Growth Rate | $b$ |  |
| Infectious dose: |  |  | \# of times cells divide | $x$ |$]$

a. How many Salmonella cells would be present (y) if the homemade salad dressing had been sitting on the picnic table for 1 hour? Is it safe to eat?
b. How many Salmonella cells would be present ( $y$ ) if the homemade salad dressing had been sitting on the picnic table for 3 hours? Is it safe to eat?
c. Create a graph of the exponential growth curve where the number of times the cells divide is along the $x$-axis and the total number of bacterial cells is along the $y$-axis.

CHALLENGE: How many Salmonella cells would be present $(y)$ if the homemade salad dressing had been sitting on the picnic table for 6.5 hours?

