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A Trichinellosis Outbreak: A Teaching Case-Study

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**Learning from
Practice: Public
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Case Studies
from Eastern
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Central Asia**



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A Trichinellosis Outbreak: A Teaching Case-Study

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Abstract

On December 4, 2023, the local authorities notified a suspected outbreak of trichinellosis in Jahliyah [Mount-Lebanon], having approximately 6000 residents. We investigated to identify the outbreak source, estimate the magnitude, and implement preventive measures. We defined a suspected case as a Jahliyah resident who experienced at least three symptoms [fever, myalgia, oedema, and/or hypereosinophilia], or was diagnosed by a physician, after October 1, 2023. We inspected local butcher shops and searched for suspected cases who have visited health facilities for case management or medical advice. We described suspected cases by demographic characteristic, symptoms, and possible exposures. We tested leftover food samples at the Lebanese Agriculture Research Laboratory. During November – December 2023, a total of 146 suspected cases were identified, with one case confirmed via a positive muscle biopsy. Of 44 cases tested, 20 had hyper-eosinophilia [> 500]. 30% [n=43] cases were hospitalized. The median age of cases was 38 years [range: 2-82], 59% were female. Almost all cases [n=144] reported purchasing meat from local butcher shop, with 86% [n=126] consuming beef or lamb but abstaining from pork, and 12% [n=18] consuming pork. Additionally, 41% [n=60] reported consuming the meat uncooked, while 48% [n=71]

consumed it either fried or barbecued. Inspection of the butcher shop revealed inadequate hygiene practices and improper meat storage. Both minced and sausage beef samples contained *Trichinella*. Our preliminary investigation suggested that contaminated beef was the vehicle of infection. The butchers were likely mixing untested pork with other types of meat. We recommend training butchers on food safety and meat handling along with regular inspections. Additionally, we recommend educating the local communities on the risk associated with raw meat consumption.

How to Use the Case Study

General instructions: This case study should be used as adjunct training material for novice epidemiology trainees to reinforce the concepts taught in prior lectures. The case study is ideally taught by a facilitator in groups of about 20 participants. Participants are to take turns reading the case study, usually a paragraph per student. The facilitator guides the discussion on possible responses to questions. The facilitator may make use of flip charts to illustrate certain points. Additional instructor's notes for facilitation are coupled with each question in the instructor's guide to aid facilitation.

Audience: This case study was developed for novice field epidemiology students. These participants are commonly health care workers working in the county departments of health whose background may be as medical doctors, nurses, environmental health officers or laboratory scientists who work in public health-related fields. Most have a health science or biology background.

Prerequisites: Before using this case study, participants should have received lectures on disease surveillance and outbreak investigation.

Materials needed: Flash drive, flip charts, markers, computers with R and R Studio

Level of training and associated public health activity: Novice – **Outbreak investigation**

Time required: 3-4 hours

Language: English

Goal of Case Study:

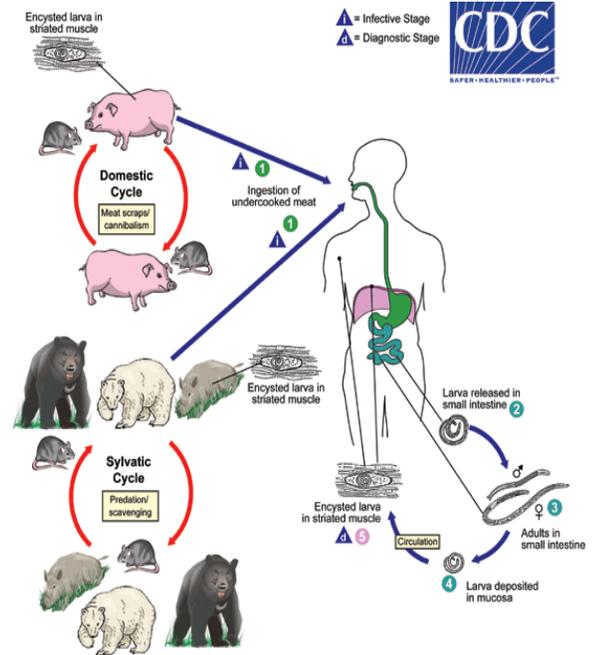
The goal of this case study is to develop learners' capacities in analyzing surveillance data and reporting findings from a field investigation during a Trichinellosis outbreak in Lebanon 2023.

Learning Objectives – At the conclusion of the teaching session, participants will be able to:

1. Define an outbreak and identify the essential data needed for its investigation.
2. Perform basic descriptive analyses of outbreak cases by person, place, and time using R software.
3. Create an epidemic curve in R to visualize the progression of the outbreak.
4. Draft a comprehensive outbreak report utilizing R to summarize findings and recommendations.
5. Calculate attack rates to assess the proportion of affected individuals in the population at risk.
6. Evaluate the significance of effective communication in disseminating findings and recommendations during outbreaks.

Introduction/Background of the case study

Trichinellosis, also known as trichinosis, arises from the ingestion of raw or insufficiently cooked meat from animals harboring the larvae of *Trichinella* worms. It commonly afflicts certain wild carnivores like bears or cougars, as well as omnivores such as domestic pigs or wild boars. The disease occurs globally. The severity of trichinellosis correlates with the quantity of viable larvae ingested, resulting in symptoms ranging from none or mild to severe or potentially fatal. Treatment typically involves appropriate anti-parasitic medications. Prevention strategies focus on meticulous inspection of slaughtered pigs and horses for disease, coupled with thorough cooking of meat to sufficient



cooking of meat to sufficient

Figure 1: Trichinellosis Causal Agents Life Cycle

According to the World Health Organization [WHO], approximately 10,000 human infections occur annually worldwide with gastrointestinal symptoms typically manifesting in the initial phase before the onset of the muscular phase, during which larval migration into muscle tissues occurs. Additionally, there is a risk of occasional life-threatening complications, such as heart failure, pneumonia, or encephalitis. In 2021, the highest notification rate was reported in the EU/EEA at 0.42 cases per 100 000 population and accounted for 58% of all cases reported. The global number of disability-adjusted life years [DALYs] due to trichinellosis be 76 per billion



Figure 2: Map of localities in Lebanon

persons per year [95% credible interval: 38–129]. Lebanon is a Mediterranean country bordered by Syria to the north and Occupied Palestine to the south with a population of

almost 6 million. Since the end of nineteenth century no trichinellosis cases were reported. In the year 2023, a trichinellosis outbreak was detected in Koura.

Trichinellosis Fact sheet

What is Trichinellosis

Trichinellosis, also known as trichinosis, is an illness caused by consuming raw or undercooked meat infected with the larvae of the *Trichinella* worm.

Signs and Symptoms

Symptoms vary but commonly include nausea, diarrhea, vomiting, fatigue, fever, and abdominal discomfort. Additional symptoms may include headaches, joint and muscle pains, swelling of the face and eyes, and difficulty coordinating movements. Severe cases can lead to heart and breathing problems, and in rare instances, death.

Timeline of Symptoms

Abdominal symptoms may appear 1–2 days after infection, while further symptoms usually arise 2–8 weeks after consuming contaminated meat.

Mild cases may go undiagnosed, often mistaken for the flu or other common illnesses.

Transmission

Infection occurs when meat containing *Trichinella* larvae is consumed

Larvae are released in the stomach, mature in the small intestine, and then travel to muscles, where they encyst. Infection cannot be spread from person to person.

Diagnosis

Trichinellosis can be diagnosed through blood tests or muscle biopsies

Prevention

Cook meat to safe temperatures using a food thermometer.

Freezing pork less than 6 inches thick at 5°F [-15°C] for 20 days can kill any worms.

Ensure thorough cleaning of meat grinders after each use.

Curing, drying, smoking, or microwaving meat alone may not kill *Trichinella* larvae effectively.

Part 1 Story [Narrative]

On Monday, December 4, 2023, the Lebanese Ministry of Public Health's epidemiological surveillance unit received a troubling call from a physician in the Jahliyah Municipality, Chouf district. The report indicated a cluster of residents exhibiting similar gastrointestinal symptoms, with several requiring hospitalization at Z Hospital. That same day, X Medical Center confirmed a case of Trichinellosis through histopathological analysis, which was reported via the DHIS2 platform.

The situation quickly escalated as an unexpected surge of individuals sought medical attention, presenting with fever, muscle pain, swelling around the eyes, and diarrhea, with some also experiencing nausea and vomiting. Further investigation revealed a common link: many affected individuals had recently consumed meat from a local butcher shop. It appeared that this shop had inadvertently mixed pork with beef and lamb, leading to widespread Trichinellosis cases among the community. The urgency of the outbreak highlighted the need for a swift and effective response to prevent further spread and to manage the public health crisis.

Part 1 questions

- Question 1: Confirm the existence of an outbreak based on available background information.

Surveillance data: Since the end of nineteenth century no trichinellosis cases were reported in Lebanon.

Unusual numbers of trichinosis cases: The report indicated a cluster of residents exhibiting similar gastrointestinal symptoms, with several requiring hospitalization at Z Hospital

Case Confirmation: That same day, X Medical Center confirmed a case of Trichinellosis through histopathological analysis, which was reported via the DHIS2 platform.

- **Question 2:** Discuss operational aspects of case definitions.

Time:

Place:

Person:

Clinical [Include common and relevant signs and symptoms of the disease under surveillance]

Laboratory [Includes a list with methods used to confirm the pathogen]

Epidemiological criteria [Are met when an epidemiological link is established]

Operational aspects:

Sensitivity and Specificity:

- *The definitions should be sensitive enough to identify true cases without missing many, and specific enough to avoid false positives.*

Updates and Revisions:

Definitions should be regularly reviewed and updated based on new evidence or changes in epidemiological patterns.

Training

Health professionals should be trained in recognizing symptoms and using appropriate diagnostic tests to ensure accurate case classification.

Consistency:

Ensure that the case definitions used are consistent across different healthcare facilities and public health agencies to avoid discrepancies in data collection and reporting.

- **Question 3:** List various approaches to case finding.

Active surveillance

Passive surveillance

Community engagement

Part 2 Methods [NARRATIVE]

At this stage, the ESU team decided to visit the local butcher on December 6. The inspection revealed inadequate hygiene practices and improper storage of meat, facilitating the transmission of the parasite.

After deciding to initiate the outbreak investigation, the ESU team visited the medical center - where people were coming for medication - to collect data about ill people. On December 12 and 13 a visit to **Y Primary Healthcare Center** was conducted to collect data about patients who were referred by physicians to do blood test. Blood test results were sent via email to the Epidemiological Surveillance Unit. Focal points at neighbouring hospitals were contacted to notify ESU team about people having symptoms suggestive of trichinellosis and coming from Jahliyah.

ESU team had the chance to contact some recovered cases and gather some information on the most common symptoms and dates of onset.

KfarHim Primary Healthcare centre has sent the results for 44 blood tests done. Among cases, 44 individuals underwent blood tests, revealing hypereosinophilia [> 500] in 20 cases. In addition, left-over samples were collected for testing at the Lebanese Agricultural Research Institute.

Part 2 Questions

- **Question 4:** With information being sufficient, how would you distinguish between confirmed, probable, and suspected cases?

A case was defined as a person living in Jahliyah whose signs and symptoms appeared after October 1st, 2023.

The following three case definitions have been proposed:

- A **confirmed** case was defined as a person with a *Trichinella*-positive muscle biopsy with recent signs and symptoms suggestive of trichinosis or a positive serodiagnosis by immunofluorescence and clinical signs suggestive of trichinellosis.

- A **probable** case was defined as a patient with at least three of the following signs and symptoms suggestive of trichinosis: fever, myalgia, oedema or Eosinophils > 500 [hyper-eosinophilia].
- A **suspected** case was defined as a patient with at least one of the following symptoms suggestive of trichinosis: Fever or oedema and whose diagnosis was stated by his physician. Anyone with signs suggestive of trichinellosis and whose diagnosis of trichinellosis was made by the attending physician, or anyone with unexplained hyper-eosinophilia.
 - Question 5: Draft the short questionnaire sections.
 - Demographic information
 - Date of Consumption
 - Illness,
 - Date of Illness
 - Fever, Myalgia, Abdominal Pain, Periorbital Edema, Photophobia, Thirst, Sweating, Nausea, Diarrhea, Other
 - Case management
 - Hospital admission
 - Visited medical center
 - Visited private cabinet
 - Outcome
 - Lab testing [CBC]
 - Leukocytes count / mm³
 - Eosinophilia %
 - Result date
 - Meat source
 - Pork consumption
 - Pork meat preparation
 - Left over from Becharra Rahhal
 - Cow/meat consumption
 - Meat preparation
 - Left over from Amjad Ayas
 - Related cases
 - Investigation

- *Status*
- *Investigation Date*
-
- **Question 6:** Describe the data collection methods.

Online questionnaire to be deployed on a data collection tool [such as DHIS2]. To facilitate data collection in areas with limited internet connectivity, the questionnaire is designed for offline use on Android devices.

- **Question 7:** Open R Studio and create a new project “trichinellosis_outbreak” to import the dataset.

Tips for R:

a] Install packages and load libraries.

Load the R packages you will be using. Update this list of packages as you dig into the code: You may realise you need packages you didn't think about at the beginning. Remember that it is a good practice to load tidyverse at the end of your package list, to avoid masking functions.

b] Import your data.

You can find the trichinellosis_raw.csv file in your working directory. Explore the codebook for your reference.

1. Open R Studio and Create a New Project

a. Open R Studio: Launch R Studio from your desktop or start menu.

2. Create a New Project:

a. Go to the top menu and select `File` > `New Project...`.

i. In the `New Project` dialog, choose `New Directory` if you want to create a new folder or `Existing Directory` if you want to use an existing folder.

b. If creating a new directory, select `New Project` and then specify the project name. Enter `trichinellosis_outbreak` as the project name.

c. Click `Create Project`. R Studio will create a new directory with this name and set it as the working directory.

Install Packages and Load Libraries

3. Install Packages:

a. Open a new R script or R console within R Studio.

- b. Install any necessary packages that you will need for your analysis. Common packages include ``tidyverse`` for data manipulation and visualization. To install packages, use the ``install.packages[]`` function. For example:

```
``R
install.packages["tidyverse"]
install.packages["readr"] # if not included in tidyverse
# Add more packages as needed
```
```

#### 4. Load Libraries:

- a. After installing, load the libraries in your script. Use the ``library[]`` function to load each package. It is good practice to load ``tidyverse`` at the end to avoid masking issues. For example:

```
``R
library[readr]
Load other libraries as needed
library[tidyverse] # This should generally be loaded last
```
```

5. Import Your Data

Locate the Dataset:

Ensure that the ``trichinellosis_raw.csv`` file is located in your working directory. The working directory should be automatically set to the directory of your R Studio project.

If not already present, move or copy the ``trichinellosis_raw.csv`` file into the project directory.

- a. Import the Data:

- i. Use the ``read_csv[]`` function from the ``readr`` package [part of ``tidyverse``] to import the dataset. Add the following code to your R script:

```
``R
# Set the file path [assuming the file is in the project directory]
file_path <- "trichinellosis_raw.csv"

# Import the data
trichinellosis_data <- read_csv[file_path]
```
```

### 3. Explore the Codebook:

- If a codebook is available, refer to it to understand the structure and meaning of the data columns. This can help in analyzing and cleaning the data appropriately.

- Question 8: Explore and clean your data.

Hint: you could use `head[]`, `dim[]`, `str[]`, or `skim[]` to have a quick look at the data and get an idea of which variables you want to explore further. You can also do some tables.

```
head[trichinellosis_data]
```

```
skim[trichinellosis_data]
```

- Question 8.1: How many observations and variables does the dataset contain?

```
dim [trichinellosis_data]
```

- Question 8.2: What types of variables do you have and what types of values are recorded?

```
str[trichinellosis_data]
```

- Question 8.3: Do any of the values of the other variables look implausible? Which ones and why? What will you do about it?

Hint: use `gtsummary::tbl_summary[]`.

- Question 9: Clean your data as you see fit.

You might want to adjust certain "column types" for two main reasons: Firstly, R might require specific data types for certain variables to function properly, and secondly, it could aid in clearer visualization and interpretation of the data. For instance, consider the "illness" variable which is currently represented as 0s and 1s. When generating a table later, it's preferable to replace these numerical values with meaningful labels, transforming the variable into a factor. This ensures that the output in the table is more understandable. To achieve this, you can utilize the `mutate` function to alter the types of the specified variables.

| <b>Variable name</b>        | <b>Original</b> | <b>Desired</b> | <b>Hint: you could use...</b>         |
|-----------------------------|-----------------|----------------|---------------------------------------|
| <b>sex</b>                  | Character       | factor         | mutate[], as.factor[]<br>as.integer[] |
| <b>Nationality, outcome</b> | Character       | factor         |                                       |
| <b>Age, year of birth</b>   | Character       | Integer        |                                       |

|                                                                         |           |         |                                   |
|-------------------------------------------------------------------------|-----------|---------|-----------------------------------|
| <b>All the clinical symptoms variables</b>                              | Integer   | logical | mutate[across[]],<br>as.logical[] |
| <b>All the food variables</b>                                           | Integer   | logical |                                   |
| <b>Date of illness,<br/>date of consumption,<br/>investigation date</b> | Character | Date    | lubridate::ymd[]                  |

- **Question 10:** Apply case definition.

Next, you'll create a new column in the dataset to store the case definition determined in an earlier stage of your investigation. This column can be named "case\_definition." You'll utilize this column subsequently for various calculations such as descriptive statistics, constructing two-by-two tables to compute measures of association, etc., to discern the cause of this outbreak.

10. To apply the case definition criteria, you need to identify the relevant variables. These variables likely include those related to symptoms, exposure, medical history, or any other criteria outlined in your case definition. When creating a new case column to hold the binary case definition variable, it's best to break down the process step by step:

- 10.1 Identify criteria: First, determine the criteria that define a case in your investigation. This could involve symptoms, exposure history, laboratory results, or other relevant factors.
- 10.2 Define the variable: Based on the criteria, create a variable case\_definition, with values: probable, suspected, confirmed or non-case.
- 10.3 Apply the case definition criteria to each observation in your dataset.
- 10.4 In the new column in your dataset called "case\_definition", store the case definition variable.

Hint: Use mutate [], ifelse[]

```
trichinellosis_data <- trichinellosis_ data %>%
 mutate[
 case_definition = ifelse[
 illness == 1 & [periorbital_edema == "yes" | myalgia == "yes" | eosinophils_count > 500]
& visited_medical_center == "yes",
 "suspected",
 ifelse[
```

```

illness == 1 & sum[fever == "yes", myalgia == "yes", periorbital_edema == "yes", eosin
ophilia > 500, na.rm = TRUE] >= 3,
 "probable",
 "pending"
]
]
]

```

### Part 3: Results [Narrative, figures, tables]

- Question 11: Describe data by time, place and person
  - Question 11.1: Describe the outbreak in terms of time
  - Create an epicurve for the date and time of onset [using date of illness], limiting the input data to cases.
    - Use `scale_x_datetime[]` and set `date_breaks`.
    - Label your x and y axes using `labs`.

Building up on your previous epicurve, create a comparison between sexes, you can follow these steps:

- Use `fill = sex`:

This will allow you to distinguish between males and females in the epicurve by filling the bars with different colors.

- Use `sex` as your facets for `facet_wrap[]`:

This will generate separate panels for males and females, allowing for easier comparison between the sexes.

```

Fetch data:
epicurve_date <- trichinellosis_data %>%
Filter for cases where dayonset is not missing:
filter[case_definition == "suspected" & !is.na[date_of_illness]] %>%
Add factor date_of_illness to ggplot aesthetic:
ggplot[aes[x = date_of_illness]] +
Add geom_bar:
 geom_bar[] +
Adapt scale to data and adjust axis label angle:
 scale_x_datetime[
date_breaks = "1 day",
labels = label_date_short[]] +
Update x and y axis labels:
 labs[x = "Date of onset",
 y = "Number of cases"] +
Remove unnecessary grid lines:
 theme_bw[]
Print epicurve:

```

epicurve\_date

- Question 11.2: Describe the outbreak in terms of person

Use `tabyl[]` to:

- Create a Cross-tabulation of cases with `age_group`

```
tabyl[trichinellosis_raw$age_group]
```

- Create a Cross-tabulation of cases with `sex`.

```
tabyl[trichinellosis_raw$sex]
```

- Create a Cross-tabulation of cases with `nationality`.

```
tabyl[trichinellosis_raw$nationality]
```

- Question 11.3: Explore the distribution of all clinical signs [symptoms].

```
symptoms_tab <- cases_df %>%
```

```
 select[myalgia, fever, periorbital_edema, diarrhera, abdominal_pain] %>%
```

```
 gtsummary::tbl_summary[]
```

```
symptoms_tab
```

Generate a summary table displaying symptoms categorized by case definition, and include an overall column. You have the option to utilize either ``tabyl[]`` or ``gtsummary::tbl_summary[]``. For more details on ``gtsummary``, refer to the Epidemiologist R handbook section dedicated to it.

- **Question 11.4:** Calculate the overall attack proportions.

```
summary_table <- trichinellosis_data %>%
```

```
 tabyl[fever, case_defintion] %>%
```

```
 adorn_totals["row"] %>%
```

```
 adorn_totals["col"]
```

```
print[summary_table]
```

Calculate the overall attack proportions [percentage of cases among the total observed individuals]. You could use `tabyl[]`.

- Question 11.5: Calculate attack proportions.

```
tabyl[trichinellosis_raw$case_definition] %>% adorn_pct_formatting[]
```

Calculate attack proportions for `age_group`, `nationality` and `sex` by case status. You could use `tabyl[]` or `gtsummary::tbl_summary`.

- Question 11.6: Present the cases in an age-sex pyramid.

```
age_sextab <- cases_df %>%
```

```
 select[age_group,sex_factor] %>%
```

```
 gtsummary::tbl_summary[by = age_group]
```

```
age_sextab
```

- Question 11.7: Present the distribution of Trichinellosis cases by hospital admission.

```
Hospital_admission_tab <- trichinellosis_data %>%
```

```
select[case_defintion, hospital_admission] %>%
gtsummary::tbl_summary[by = case_definition]
age_sextab
```

#### Part 4: Discussion [Narrative, Drawings]

The data was entered to DHIS2 platform and then exported using an API to R. Data was cleaned and analyzed on R. Graphs, tables and other visualizers were exported and saved in the weekly report issued.

- **Question 12:** Calculate the response rate using the investigation status variable.

```
tabyl[trichinellosis_raw$status_factor] %>% adorn_pct_formatting[]
```

To calculate the response rate count the number of closed investigations divided by the number of opened/pending investigations.

- Question 13: What does the resulting percentage signify in the context of your analysis?

```
trichinellosis_raw$status_factor n percent
 Closed 257 55.0%
 Open 4 0.9%
 <NA> 206 44.1%
```

```
valid_percent
 98.5%
 1.5%
 -
```

High Response Rate: A high percentage indicates that a large proportion of investigations have been completed, suggesting efficient follow-up and resolution of cases.

- **Question 14:** What is the benefit of using R instead of MS Excel?

*Reproducibility*

*Automation*

*Scalability*

*Advanced Analytics*

*Integration*

*Visualization*

*Data Wrangling*

- Question 15: What additional indicators can be monitored using R

*Geospatial analysis*

*Investigation adequacy*

### **Part 5: Case study conclusion**

- **Question 16:** What are key attributes of good public health recommendations?

*Good public health recommendations should have the following key attributes:*

1. **Clarity:** Recommendations should be easily understood by the target audience, avoiding medical jargon when communicating with the public.
2. **Actionable:** Provide specific, realistic, and practical steps that individuals and organizations can take to protect health.
3. **Evidence-Based:** Root recommendations in scientific research, epidemiological data, and established best practices.
4. **Timeliness:** Offer guidance promptly to address immediate health concerns and reduce risks effectively.
5. **Transparency:** Clearly communicate the reasoning behind the recommendations, including benefits, risks, and uncertainties.

- Question 17: Prepare a press release to inform the public

#### **Press Release: Public Health Advisory on Trichinellosis Outbreak**

**2024-12-17**

##### **Contact:**

Ministry of Public Health – Lebanon

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#### **Health Authorities Issue Advisory on Trichinellosis Outbreak**

*Beirut, Lebanon – The Ministry of Health is advising the public to take precautions following the detection of a trichinellosis outbreak linked to the consumption of undercooked or raw meat. Trichinellosis is a parasitic disease caused by eating meat infected with Trichinella larvae.*

#### **Key Symptoms and What to Watch For**

*Symptoms of trichinellosis may include:*

- Nausea, diarrhea, and abdominal pain
- Muscle pain, fever, and swelling around the eyes
- Fatigue and headaches

*If you or someone you know has consumed undercooked meat and is experiencing these symptoms, seek medical attention immediately.*

### **Recommendations for the Public**

*To protect yourself and your family, health authorities recommend:*

1. **Cook meat thoroughly:** *Ensure all meat, especially pork and wild game, reaches an internal temperature of at least 71°C [160°F].*
2. **Avoid raw or undercooked meat:** *Do not consume meat that appears pink or bloody.*
3. **Practice good hygiene:** *Wash hands, utensils, and surfaces that come into contact with raw meat.*
4. **Purchase meat from trusted sources:** *Avoid meat products from unknown or unregulated suppliers.*

### **What We Are Doing**

*Health officials are actively investigating the outbreak to identify and remove contaminated meat from the market. Measures include:*

- *Working with food safety authorities to trace the source of the infection.*
- *Educating retailers and the public on safe meat handling practices.*
- *Monitoring health facilities for additional cases.*

### **A Message to the Public**

*The Ministry of Health emphasizes that trichinellosis is preventable through proper cooking and hygiene practices. "We urge everyone to follow food safety recommendations to minimize the risk of infection".*

*For further information or updates, please visit <https://moph.gov.lb/> or contact our hotline.*

---

### **End of Release**

Your task is to prepare a press release to inform the public about the outbreak. What key information would you include in the press release, and how would you communicate it effectively to ensure public awareness and safety? Do not forget to include recommendations for affected individuals.

- Prepare an outbreak report to be released to the public and published to the website.  
Refer to the sample outbreak report in Appendix A.

## Acknowledgements

We wish to acknowledge the Eastern Mediterranean Public Health Network [EMPHNET] for their support to develop this case study

## References

[https://www.cdc.gov/parasites/trichinellosis/gen\\_info/faqs.html](https://www.cdc.gov/parasites/trichinellosis/gen_info/faqs.html)

<https://www.ncbi.nlm.nih.gov/books/NBK538511/>

<https://moph.gov.lb/>

**Appendix A**

MoPH Logo

**Trichinellosis Outbreak Report (Period)**  
Place

**MoPH Hotline**

**X**

Confirmed case\*

Distribution of suspected cases by date of symptoms onset  
Data till .

*Epicurve*

**X**

Suspected case\*\*

Summary text  
\* A confirmed case was defined as.  
\*\* A suspected case was defined as

Distribution of cases by sex

*Pie chart*

Distribution of cases by age group

*Vertical Histogram*

Distribution of cases by hospital admission

*Pie Donut*

Distribution of cases by hypereosinophilia (%)

*Pie Donut*

Food Inspection

Butchers inspected XX  
Butchers revealing inadequacy XX