There are two parts to this topic: the first is an introduction to the module itself, and the second is a lesson about the English language and its place in a global society. Students will think about the implications of our world as a global village. They will discuss the “haves” and “have nots” in our world, and will visually create a statistical picture of who has what. They will then write a personal response to this activity. In the second part of the lesson, students will look specifically at the use of English in the world by answering some activation questions; by reading, interpreting, and sharing information from a variety of articles; and by writing a 500- to 600-word essay on some aspect of the topic. Other academic tasks are: creating graphic organizers; creating notes; noticing discourse markers; skimming and scanning; using correct intonation and pronunciation; recognizing implications; using context to discover meaning; defining terms; describing; explaining; predicting; summarize; asking questions, stating a point of view; quoting; comparing and contrasting; classifying; supporting an argument; illustrating and exemplifying ideas; drawing conclusions; and using an academic writing style.
Outcomes

SLO 2.1.3 Use developing control of grammatical features...
SLO 2.2 Use several visual techniques...
SLO 4.2 Communicate effectively to work with others...
SLO 4.3 Use clear and respectful language...
SLO 6.2.7 Use elaboration...
SLO 6.2.9 Use summarization...
SLO 6.3.2 Use co-operation...

Instructional and Learning Sequence

Sequence 1

Activation

Part 1: Introduction to the Module.

Have students reflect for a moment on some of the lessons from previous modules that suggest our world is getting smaller and, according to many, becoming a global village.

Pair students and have them discuss and write notes on the following:

1. Define the term “global village.”
2. Is our world a global village? Why or why not?
3. Explain some of the ideas, concerns, and interests that are shared globally.
4. List some of the technologies that make it possible for a global village to exist.

Discuss these ideas as a class. Using an appropriate graphic organizer suggested by the students, record the information and display for the duration of the module.

Language Features

Discourse Features
- definition patterns (review)
- discourse markers used in discussion (review)
- imperative verbs used in questions (review)

Academic Language Functions
- explaining, defining
In pairs, discuss and write notes on the four questions presented by the teacher. (P)

Discuss ideas that you have identified. (C)

The term “global village” was coined by Marshall McLuhan (1964). Student definitions should reflect the idea that cultures and people around the world are merging. They should mention technological advances in transportation and communication as two of the tools that allow peoples to connect.
Main Activity

Introduce the “have” and “have not” groups in a global village: A group of 15 to 20 people works well for this activity. Some students taking the course may be quite privileged compared to the world population as a whole; others may be not as privileged. This activity should stimulate students to think about their place in the world and to determine their responsibility to others.

**Step 1:** Ask students if they ever think of their place in our global village. Are they better or worse off than others? Tell them they will be taking part in an activity to help them focus on their own status in relation to that of others.

**Step 2:** Students sit in a circle, which represents the population of the world. Starting with question 1, have the students represent the populations of the different areas of the world. For example; the teacher says, “I need 10 percent of this circle to represent the population of Europe.” Students calculate that 10 percent of 20 is 2, so 2 students stand. Give the students the index card with the area they represent. Continue until the population of the world is represented. Have groups hold up the names of the areas they represent so that the class can visualize the breakdown of the world’s population. Have students sit down again.

**Step 3:** Work with the index cards created for questions 2 to 10. Without distributing the cards, read out the statistical information on each card one at a time and have students calculate the number of people needed to represent it. When the group is standing, give them the index card containing the information they represent. They must make a statement based on the question and the statistical information on their card. For example, the students given the index related to question 2 would say, “We represent 30 percent of the world’s people. We are the only people in the world who have drinking water in our homes.” As each statement is made, students should comment, make inferences, and draw conclusions. Students sit down between presenting statistics.

Continue until all the questions have been addressed. You may want to combine two or more statistics to get different visual impressions.

**Language Features**

<table>
<thead>
<tr>
<th>Language Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>This activity requires active listening.</td>
</tr>
</tbody>
</table>

**Note:** Step 4 appears on page 12.
Student Learning Tasks

Actively listen as the teacher reads the population statistics for each region; students from the circle represent each statistic. (I) (C)

Calculate the number of students necessary to represent the percentages read. Formulate statements from questions and statistics. (E)

Discuss each statistic and interpret. Make inferences and draw conclusions. (C)

Teacher Notes and References

Handout 5-1: “Statistics for Index Card Activity”

The directions are for a class of 20. You will have to decide how to represent statistical percentages that only require a portion of a person. You may decide to cover up a portion of a student or have him or her bend over or squat to indicate the correct percentage. Consult students for ideas.

Materials:

• calculator, if necessary
• index cards
  — with a place name on one side and the corresponding statistical information on the other for question 1
  — with a question on one side and the corresponding statistical answer on the other for questions 2 through 10
Step 4: After the activity is completed, have a class discussion. Ask the following questions:

1. Describe how the distribution of the world’s population makes you feel.
2. Explain how the distribution of the world’s resources makes you feel.
3. Determine how the world’s resources could be spread more equally among the world’s peoples.
4. Discuss how each individual in the “have” group might help contribute to the solution of this problem.

Language Features

<table>
<thead>
<tr>
<th>Vocabulary</th>
<th>Structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>to describe feelings: expressive, accurate adjectives</td>
<td>use of imperative “task” verbs (note the use of “how” after each of the imperative “task” verbs)</td>
</tr>
</tbody>
</table>

Discourse Features

discourse markers for discussion (review)

Academic Language Functions

describing, explaining, discussing

Roundup

Have students write a personal response to the day’s activities. Students may synthesize information from the day’s discussions, or they may decide on their own approach to this personal response. What must be included is their own personal plan to become involved in helping the world’s global community.
Discuss the questions presented by the teacher. (C)

Write a personal response to the day’s activities. Synthesize information from the day’s discussions. (I)

OR

Decide on an approach to your personal response. (I)
Outcomes | Instructional and Learning Sequence
---|---
SLO 1.3 Develop and express a personal position... | **Sequence 3**
SLO 1.7 Evaluate a given text... | **Part 2: English: Killer Language or Language of the Future?**
SLO 2.1.3 Use developing control of grammatical features... | **Activation**
SLO 2.2 Use several visual techniques... | a) Ask pairs of students to focus on the last question from the previous day’s statistics: How many people in the world speak English? Decide if it is necessary to have one common language in a global village. Is English that language? Should it be? If so, predict some of the changes that may occur to the English language as we know it. (It will grow to include even more expressions from other languages. There will be more English dialects.)
SLO 4.2 Communicate effectively to work with others... | b) Ask students to focus for this lesson by beginning to think personally about why they are studying English. Have them free-write on the topic for two or three minutes.
SLO 4.5 Experience and consider academic texts... | c) Distribute **Handout 5-2: “Anticipation Guide: Using and Learning English.”** Students complete the anticipation guide as they have in previous lessons, with appropriate introductory and ensuing class discussion.
SLO 6.1.2 Use organizational planning... | d) **“Is English the Universal Language?” Learning Activity**
SLO 6.1.6 Use self-monitoring to check... | **Step 1.** Start with the premise that English is considered the universal language. Look at the statistics in **Handout 5-3: “How Many People in the World Speak English?”** Ask: Why is English considered the universal language even though Mandarin Chinese is spoken as a first language by more people? (It’s the language of international business, of the Internet, the most popular second language, etcetera).
SLO 6.1.8 Use self-evaluation to check... | **Step 2.** Have students working in quads create a “pros and cons” graphic organizer and list the positive and negative aspects of having English as a universal language. What are the benefits? What could be lost? Record ideas in groups, and then share as a class.
SLO 6.2.4 Use note taking... | **Step 3.** Ask students to read different articles about English as a universal language. Divide students into quads and assign a different article to each group. (Several Internet resources for this activity are listed. The teacher may want to replace or add to these articles.) In groups of four, students should take point-form notes about the main ideas and supporting details of their articles.

Each member of these groups of four should pair with a student from another group. One member of this pair should explain his or her information to the other, without using notes. (Speakers should use appropriate discourse markers as they move from point to point to help their listeners.) The listening student should not take notes but should listen carefully. When the speaker is finished, the listener should quickly jot down everything he or she can remember.

Repeat the activity, changing speaker and listener. Continue until each person has jotted notes about each article that has been used. Students from the original quads can then compare notes.

**Note:** Language Features appears on page 16.
Teacher Notes and References

![Handout 5-2: “Anticipation Guide: Learning and Using English”]

**Handout 5-2: “Anticipation Guide: Learning and Using English”**

**Handout 5-3: “How Many People in the World Speak English?”**

**Internet Resources: **See page 17

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**Student Learning Tasks**

a) Student pairs focus on the last question from the previous day’s statistics: How many people in the world speak English? (P)

b) Free-write, for two or three minutes, about why you are studying English. (I)

c) Complete the anticipation guide (Handout 5-2: “Anticipation Guide: Using and Learning English”). (I)

Discuss the statistics in Handout 5-3: “How Many People in the World Speak English?”. (C)

Working in groups of four (quads), create a “pros and cons” graphic organizer and list the positive and negative aspects of having English as a universal language. (G)

Read an article that the teacher has assigned your group. Take point-form notes about the main ideas and supporting details. (G)

Each member of the group of four, pairs up with a student from another group. One member of this pair should explain his or her information to the other, without using notes. The listener should not take notes as the speaker is speaking, but jot down notes once the speaker is finished. (P)

Repeat the activity until each student has made notes about each article. (I)
### Outcomes

### Instructional and Learning Sequence

<table>
<thead>
<tr>
<th>Language Features</th>
<th>Vocabulary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher-chosen language: Read over the articles and choose language features you want to emphasize or review with your class. Also, you may want to give some specific language objectives for the writing task.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Discourse Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>discussion expressions to use with the anticipation guide (review) and with the Pros/Cons graphic</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Academic Language Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>explaining, describing, agreeing, disagreeing, summarizing</td>
</tr>
</tbody>
</table>

Note: Step 4 appears on page 18.
Internet Resources:


“If You Speak English, You’re a Master of Many Tongues” at: <http://search.csmonitor.com/durable/2001/01/02/p18s1.htm>

“Strand 2 English as a Global Language” at: <www.ifte.net/2003/program/egl.htm>


“Universal Declaration of Linguistic Rights” at: <www.linguistic-declaration.org/right-gb.cfm>

### Outcomes

### Instructional and Learning Sequence

(Continued)

**Step 4.** Have students review their notes and make sure they understand what they have been told. They may have to question other students for clarification on some points.

**Preparation for Writing Activity**

Ask students to review their notes and decide upon a topic they would like to write about, based on some aspect of English as a universal language. It should be a topic on which they can write an argumentative or persuasive essay. Students confirm the topic with the teacher and prepare an outline for writing, taking into consideration all the aspects of good essay writing they have learned. The essay should be 500 to 600 words.

**Timed Writing**

Students will write their essay in a class period, approximately 70 to 75 minutes. This writing activity is practice for exam writing. At the end of the set time, they will hand in their work for marking. They can use their outline during their writing. They should use at least three quotations from the readings.

<table>
<thead>
<tr>
<th>Language Features</th>
<th>Discourse Features</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>organizational connectors—transition markers</td>
</tr>
<tr>
<td></td>
<td>point-form notes—note-taking symbols</td>
</tr>
<tr>
<td></td>
<td>outline format</td>
</tr>
<tr>
<td></td>
<td>quotation integration</td>
</tr>
<tr>
<td></td>
<td>format of a persuasive/argumentative essay</td>
</tr>
</tbody>
</table>

| Sequence 4 |

**Roundup**

Give out **Handout 5-4**: “English, the Universal Language?” Read as a class, with individual students reading a sentence each out loud. Let them have fun with the reading and see who can pronounce their words correctly by using context clues. If there is time, discuss the different meanings of words understood by a listener just by where the stress is placed. Have students try to think of one sentence of their own, using words spelled the same way but with different pronunciation and different meanings.

<table>
<thead>
<tr>
<th>Language Features</th>
<th>Pronunciation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>sounds, syllabic stress, intonation, rhythm (linkage, reduction, thought groups)</td>
</tr>
</tbody>
</table>
Student Learning Tasks

Review and make sure you understand your notes; ask questions for clarification. (I)

Decide on a topic for a 500- to 600-word argumentative or persuasive essay on an aspect of English as a universal language. Confirm your topic with the teacher and prepare an outline. (I)

In class, write your essay using the outline you prepared. (I)

Read Handout 4 as a class, with individuals reading a sentence each out loud. (I) (C)

Think of one sentence of your own, using words spelled the same way but with different pronunciation and different meanings. (I)

Teacher Notes and References

Give students constructive anecdotal comments for improvement on the next timed writing assignment.

Handout 5-4: “English, the Universal Language?”

There are errors in this article (bandage is capitalized; Guinea is not capitalized, etc.). Correct these or have students try to find and correct them. Also discuss the problem of using the Internet as a source; there are often various types of errors.
Statistics for Index Card Activity

Statistics are written on one side of the card and the statistical percentage on the other.

1. What percentage of the world’s people live in each world region:
   - Africa: 12%
   - Asia (including the Pacific Islands): 55%
   - North America: 5%
   - Latin America (including Mexico): 8%
   - Europe: 10%
   - Middle East: 4%
   - Former USSR: 5%

2. What percentage of the world’s people has drinking water at home? 30%

3. What percentage of the world’s people knows how to read? 35%

4. What percentage of the world’s people goes to bed hungry? 20%

5. What percentage of the world’s people uses 80% of the world’s energy? 7%

6. What percentage of the world’s people uses 80% of the world’s farmland? 4%

7. What percentage of the world’s people is under 15 years of age? 33%

8. What percentage of the world’s people is over 64 years of age? 6%

9. What percentage of the world’s people has a college education? 1%

10. What percentage of the world’s people speaks English? 8%

Adapted from <http://www.abc-ogh.org/group_activities.htm>.
Anticipation Guide: Learning and Using English

Directions: Rate each statement according to the strongly agree/strongly disagree continuum and explain your choices. (You may be asked to write about them on a separate piece of paper.) Then, in your group, discuss each statement; you must reach consensus on your ratings. (Optional: Ask two people outside your high school and over 19 to rate these statements. How do their answers compare with yours?)

1. It is crucial to have one common language for business.
   - [ ] strongly disagree
   - [ ] disagree
   - [ ] depends
   - [ ] agree
   - [ ] strongly agree

2. One can become fluent in a second language without compromising the first.
   - [ ] strongly disagree
   - [ ] disagree
   - [ ] depends
   - [ ] agree
   - [ ] strongly agree

3. In the future, if there is one universal language for business, it will be English.
   - [ ] strongly disagree
   - [ ] disagree
   - [ ] depends
   - [ ] agree
   - [ ] strongly agree

4. If English becomes the global language of the future, other languages will die out.
   - [ ] strongly disagree
   - [ ] disagree
   - [ ] depends
   - [ ] agree
   - [ ] strongly agree

5. When I study in Canada, I will adopt English and not use my first language as much.
   - [ ] strongly disagree
   - [ ] disagree
   - [ ] depends
   - [ ] agree
   - [ ] strongly agree

6. I am studying English because I need it in order to be successful in my chosen profession.
   - [ ] strongly disagree
   - [ ] disagree
   - [ ] depends
   - [ ] agree
   - [ ] strongly agree
How Many People in the World Speak English?

Q. How many people in the world speak English?

A. About one and a half billion (1,500,000,000) people spoke English at the start of the 21st century. That is one quarter (¼) of all people on earth. More than 400 million (400,000,000) speak English as their first language. The rest speak English as a second or third language for their professional and personal lives. But English is not the world’s top first language, as you can see from the following chart:

<table>
<thead>
<tr>
<th></th>
<th>Language</th>
<th>Spoken as a first language by</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Mandarin Chinese</td>
<td>726,000,000</td>
</tr>
<tr>
<td>2nd</td>
<td>English</td>
<td>427,000,000</td>
</tr>
<tr>
<td>3rd</td>
<td>Spanish</td>
<td>266,000,000</td>
</tr>
<tr>
<td>4th</td>
<td>Hindi</td>
<td>182,000,000</td>
</tr>
<tr>
<td>5th</td>
<td>Arabic</td>
<td>181,000,000</td>
</tr>
<tr>
<td>6th</td>
<td>Portuguese</td>
<td>165,000,000</td>
</tr>
<tr>
<td>7th</td>
<td>Bengali</td>
<td>162,000,000</td>
</tr>
<tr>
<td>8th</td>
<td>Russian</td>
<td>158,000,000</td>
</tr>
<tr>
<td>9th</td>
<td>Japanese</td>
<td>124,000,000</td>
</tr>
<tr>
<td>10th</td>
<td>German</td>
<td>121,000,000</td>
</tr>
</tbody>
</table>

The English language may be universal but it can definitely be hard to learn. Ponder these lines...

- The bandage was wound around the wound.
- The farm used to produce produce.
- We must polish the Polish furniture.
- He could lead if he would get the lead out.
- The soldier decided to desert his dessert in the desert.
- A bass was painted on the head of the bass drum.
- When shot at, the dove dove into the bushes.
- I did not object to the object.
- The insurance was invalid for the invalid.
- They were too close to the door to close it.
- A seamstress and a sewer fell down into a sewer line.
- I had to subject the subject to a series of tests.

Let's face it, the English language is crazy. There is no egg in eggplant, nor ham in hamburger, neither apple nor pine in pineapple. English muffins weren't invented in England or french fries in France. Sweetmeats are candies while sweetbreads, which aren't sweet, are meat. We also wonder why quicksand works slowly, boxing rings are square and a guinea pig is neither from guinea nor is it a pig. And why is it that writers write but fingers don't fing, grocers don't groce and hammers don't ham? One goose, two geese—why not one moose, two meese? If we say teachers have taught, why don't we say preachers have praught? If a vegetarian eats vegetables, what does a humanitarian eat?

Source: <www.titus2menandwomen.org/Humor/EnglishLanguage.shtml>. Author unknown.
In this lesson, students will look at the way we obtain information about serious diseases and will discuss the differences between fact, opinion, and sensationalism. They will read an article about certain serious and deadly diseases, past and present; their connection to animals, and a new and frightening speculation about the cause and spread of these diseases. They will focus on SARS, West Nile virus, mad cow disease, and monkey pox; and, using a Jigsaw activity, they will extract and share information about all four diseases with classmates. Their writing assignment will be to describe one of the diseases by paraphrasing or summarizing the notes they have made. Some of the other main academic tasks are: finding relevant information; describing, explaining, and giving examples; comparing and contrasting; making notes; speaking intelligibly; stating and supporting a point of view; recognizing indicators in discourse; asking for clarification; distinguishing fact from opinion; skimming to obtain gist; and listening critically.
Sequence 1

Activation

Have students examine the editorial cartoon (Handout 5-5: “Canada’s Worst Nightmare”), and analyze and interpret it using Appendix 11. What diseases are the foci of the cartoon? (SARS, mad cow disease, West Nile virus). Discuss what the impacts, especially on Canada, have been.

Direct students’ attention to Handout 5-6: “Graphic Organizer: Exploring through Background Knowledge.” Activate prior knowledge about these three serious diseases, as well as monkey pox, by using this graphic organizer. Divide students into four equal groups and assign one disease to one member of each group. Discuss the headings on the five sides of the cube. Students will respond individually to the headings by jotting down notes based on prior knowledge and experience. They will then share their responses with the others in the group.

As a class, students will share information about the four diseases and add to their graphics. They will also discuss how hysteria and sensationalism impact on attitudes. Is scientific information always believed? Does the media always tell the truth and base its stories on pure fact? What is the effect of personal stories? Have students discuss epidemics of the past and make connections between those diseases and the ones presented in the cartoon.

Vocabulary

epidemic, pandemic, plague; names of present and past diseases, especially mad cow disease, West Nile virus, monkey pox, SARS, Black Death, influenza of 1918, etc.
vocabulary associated with the activation questions

Structures

past, present, and future tenses
hypothetical “if” adverbial clauses
punctuation for introductory and parenthetical phrases

Discourse Features

extpressions for discussion; patterns of cause/effect: e.g., If then; ~ occurred. As a result; Because happened; etc.

Patterns of compare/contrast: ~ is similar to ~ because;
Similarly, ~; In the same way, ~; On the other hand, ~;
However, ~; In contrast, ~; etc.

Academic Language Functions

describing, explaining, summarizing
Student Learning Tasks

Examine the editorial cartoon (Handout 5-5: “Canada’s Worst Nightmare”), and analyze and interpret it using Appendix 11. Discuss the impacts on Canada. (I) (C)

Working in four equal groups, assign one disease to one member of each group. Respond individually to the headings by jotting down notes. Share your responses with the others in the group. (I) (G)

As a class, share information about the four diseases, add information to your graphics, and discuss teacher’s questions. (C)

Teacher Notes and References

Handout 5-5: “Canada’s Worst Nightmare” political cartoon, or teacher-selected

Appendix 11: How to Analyze Editorial Cartoons

Handout 5-6: “Graphic Organizer: Exploring through Background Knowledge”

Look at causes/sources, spread of the disease, people affected, businesses affected, et cetera.

This is an opportunity to look at fact versus fiction, sensational reporting versus factual reporting, spread of information through hysteria, et cetera.
### Outcomes

<table>
<thead>
<tr>
<th>SLO 1.1</th>
<th>Engage with increasingly difficult oral and/or visual texts…</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLO 2.1.3</td>
<td>Use developing control of grammatical features…</td>
</tr>
<tr>
<td>SLO 4.2</td>
<td>Communicate effectively to work with others…</td>
</tr>
<tr>
<td>SLO 6.1.1</td>
<td>Use advanced organization…</td>
</tr>
<tr>
<td>SLO 6.1.2</td>
<td>Use organizational planning…</td>
</tr>
<tr>
<td>SLO 6.1.6</td>
<td>Use self-monitoring to check…</td>
</tr>
<tr>
<td>SLO 6.1.8</td>
<td>Use self-evaluation to check…</td>
</tr>
<tr>
<td>SLO 6.2.4</td>
<td>Use note taking…</td>
</tr>
<tr>
<td>SLO 6.2.9</td>
<td>Use summarization…</td>
</tr>
<tr>
<td>SLO 6.3.1</td>
<td>Use questioning for clarification…</td>
</tr>
<tr>
<td>SLO 6.3.2</td>
<td>Use co-operation…</td>
</tr>
</tbody>
</table>

### Instructional and Learning Sequence

**Activity 1**

Ask students to read about present-day diseases spread in a similar way to those of the past: from animals to humans and through travel. They will learn a new theory about the spread of the Black Plague and the spread of disease today.

Have all students skim **Handout 5-7: “The Return of the Plagues?”** individually. Then, assign students to groups of five (or an appropriate number for the way you have broken up the assigned reading).

**Jigsaw:** Each student in each group does an in-depth reading of a determined number of paragraphs of the whole reading, making point-form notes.

These students meet with students from other groups assigned to the same paragraphs and discuss their paragraphs and the notes, readjusting their notes if necessary.

Students then meet with their original groups and present the material from their section WITHOUT the use of their notes. All students make notes on the whole reading. If you want to assess the discussions, give each group a tape recorder and have them hand in their recorded tape once the discussion is complete.

**Timed Reading:** Once they are done, students are given a set time to read the complete article. This time is set by the teacher and should challenge the students. Once finished, they may add to their notes, if necessary.

Discuss the article in terms of tone and content. Ask students to describe their reactions after reading it.

### Language Features

#### Vocabulary

- strains, viral diseases, mutation, domesticated, lethal, transmissible, exacts, complications, carnage, mass vaccination, sanitation, mutate, contain, virulent, endemic, culprit, quarantine, haemorrhagic, immune, onslaught, lethality, effusion, dormant

**Word meanings:** Note the meanings of “contain” and “exact” in this article.

#### Structures

**Focus on word families and affixes:** influenza~flu; mutate~mutation(s); lethal~lethality; transmit~transmission~transmissible; virus~viral~anti-viral; pandemic~endemic~epidemic

look at essential and non-essential clauses and punctuation

#### Discourse Features

discourse markers used in the article (e.g., despite, so, therefore)

#### Academic Language Functions

explaining, evaluating, describing
Skim **Handout 5-7: “The Return of the Plagues?”**. (I)

In Jigsaw Home Groups, each member does an in-depth reading of a determined number of paragraphs of the whole reading, making point-form notes. (G)

In Expert Groups, discuss assigned paragraphs, compare notes made and come to consensus. (G)

In Jigsaw Home Groups, each member presents his/her information. All students make notes on the whole reading. (G)

Read the complete article in the allotted time and add to your notes. (I)

Discuss the article’s tone and content and describe your reaction. (C) (I)

**Handout 5-7:** “The Return of the Plagues?” or a similar article from a textbook, magazine, or other source

Highlight key vocabulary that students should know and share. A list of potential words is in the Language Features column.

Try to include timed reading where you can, as it is essential practice for students wishing to improve reading time and comprehension.
**Outcomes**

<table>
<thead>
<tr>
<th>SLO 1.2</th>
<th>Respond to texts with increasing independence…</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLO 2.2</td>
<td>Use several visual techniques…</td>
</tr>
<tr>
<td>SLO 4.2</td>
<td>Communicate effectively to work with others…</td>
</tr>
<tr>
<td>SLO 6.1.1</td>
<td>Use advanced organization…</td>
</tr>
<tr>
<td>SLO 6.1.2</td>
<td>Use organizational planning…</td>
</tr>
<tr>
<td>SLO 6.1.3</td>
<td>Use directed attention…</td>
</tr>
<tr>
<td>SLO 6.1.5</td>
<td>Use selective attention…</td>
</tr>
<tr>
<td>SLO 6.2.4</td>
<td>Use note taking…</td>
</tr>
<tr>
<td>SLO 6.2.7</td>
<td>Use elaboration…</td>
</tr>
<tr>
<td>SLO 6.2.8</td>
<td>Use imagery in the form of mental or actual pictures…</td>
</tr>
<tr>
<td>SLO 6.3.1</td>
<td>Use questioning for clarification…</td>
</tr>
</tbody>
</table>

**Instructional and Learning Sequence**

**Activity 2**

Assign students to quad groups (Jigsaw, Home Group) in which each person will have a different reading. Before students read, they should skim their articles for main topics covered, practising skimming techniques.

Then, as a group, students create a common graphic organizer to be used when taking individual notes. The graphic organizer should contain subsections for each disease (see example below). As they read, they fill in their portion with point-form notes about the disease they were assigned.

**Jigsaw**: After the reading, students complete the whole graphic organizer by sharing information from all the readings. First, students review their notes; then, trying to use them as little as possible, they give the basic information about their diseases to the other group members. Do this one disease at a time. Instead of taking notes as others share information, students should listen actively and carefully; then, at the end of the presentation, they quickly try to write down everything they remember. The presenter will repeat the information again so that students can complete this section of the organizer. Follow the same procedure for each disease.

**Note**: Depending on time, students may compare their graphic organizers and the information they collected with other groups.

**Language Features**

<table>
<thead>
<tr>
<th>Academic Language Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>explaining, describing, comparing</td>
</tr>
</tbody>
</table>

**Sample graphic organizer**

[Diagram of a sample graphic organizer showing West Nile Virus, Monkey Pox, Mad Cow (BSE), and SARS as categories.]
In Home Groups of four, skim assigned articles for main topics covered, practising the skimming techniques you have learned. (I) (G)

In Home Groups, create a common graphic organizer to be used when taking individual notes. Read the assigned article and fill in your portion of the graphic organizer. (G)

**Jigsaw:** Review your notes then give the basic information about the disease you studied to the other group members. (I) (G)

Listen carefully to group members as they present their information. Afterwards, quickly try to write down everything you remember. (I) (G)

---

### Teacher Notes and References

- Readings on SARS, monkey pox, West Nile virus, mad cow disease, or other diseases of your choice (e.g., Lyme disease)—teacher-provided. Examples of readings are included below, but you may want to choose your own.

#### Suggested Readings:
- SARS at: [www.cdc.gov/ncidod/sars/factsheet.htm](http://www.cdc.gov/ncidod/sars/factsheet.htm) and [www.guardian.co.uk/sars/story/0,13036,962744,00.html](http://www.guardian.co.uk/sars/story/0,13036,962744,00.html)
- Mad cow disease (BSE) at: [www.cfsan.fda.gov/~comm/bsefaq/html](http://www.cfsan.fda.gov/~comm/bsefaq/html)
- West Nile virus at: [www.cdc.gov/ncidod/dvbid/westnile/wnv_factSheet.htm](http://www.cdc.gov/ncidod/dvbid/westnile/wnv_factSheet.htm)
- Monkey pox at: [www.cdc.gov/ncidod/monkeypox/](http://www.cdc.gov/ncidod/monkeypox/)

#### Additional Reading:
- Lyme disease at: [www.medical-library.org/journals2a/lime_disease3.htm](http://www.medical-library.org/journals2a/lime_disease3.htm)

You may want to add bird flu or other diseases.
Outcomes

- SLO 2.1.1 Analyze and edit texts...
- SLO 2.1.2 Use standard Canadian spelling...
- SLO 2.1.3 Use developing control of grammatical features...
- SLO 2.3.1 Use the structures and language features...
- SLO 6.1.2 Use organizational planning...
- SLO 6.1.5 Use selective attention...
- SLO 6.1.6 Use self-monitoring to check...
- SLO 6.1.8 Use self-evaluation to check...
- SLO 6.2.9 Use summarization...

Instructional and Learning Sequence

Writing Assignment

In about 250 words, students paraphrase or summarize the information about one of the diseases, using techniques and rules of writing practised in earlier lessons.

<table>
<thead>
<tr>
<th>Language Features</th>
<th>Vocabulary</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>recycled from articles</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>use of present tenses to summarize information: simple present, present perfect, present progressive, as necessary</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Discourse Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>transition markers</td>
</tr>
<tr>
<td>structure of a summary</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Academic Language Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>paraphrasing, summarizing</td>
</tr>
<tr>
<td>Student Learning Tasks</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>In about 250 words, paraphrase or summarize the information about one of the diseases, using appropriate techniques and rules of writing. (I)</td>
</tr>
</tbody>
</table>
Graphic Organizer:
Exploring through Background Knowledge

- sensational reports and photographs
- personal experience
- scientific explanation
- news events
- television and literature

Module 5: Global Village
Topic 2A
The Return of the Plagues?

by Gwynne Dyer
21 February 2003

On 28 January an eight-year-old girl from Hong Kong visiting relatives in southern China fell ill with influenza and was admitted to hospital. A week later she died, and since then her father has died of the same flu, while her nine-year-old brother lies gravely ill in an isolation ward in Hong Kong. The virus is outwardly similar to the A (H5N1) strain, also known as “bird flu,” that killed six of the eighteen people who were infected in the last outbreak in Hong Kong in 1997.

New strains of viral diseases that can kill human beings generally emerge by mutation as they hop back and forth between people and their domesticated animals. This exchange of viruses goes on all the time in farming areas—but it’s only when a lethal new virus crosses the species barrier AND THEN STARTS TO PASS FROM ONE PERSON TO ANOTHER that the alarm bells start to ring. They are ringing now.

“If this virus is transmissible from human to human then it is far more serious,” said a spokesperson for the World Health Organization in Geneva on 19 February. The 1997 flu virus was stopped by slaughtering the 1.4 million chickens, ducks and geese in Hong Kong, but if the new one is already loose all over southern China that solution will not really work. Even the normal wave of flu that circles the world every year, slightly changed genetically each time, exacts a serious toll in lives, but once in a while something really lethal comes along. This could be one of those times.

The “Spanish flu” pandemic of 1918 infected between 20 and 40 percent of the world’s population and killed 20 million people in four months, twice as many as died in the First World War—and the majority of the victims were young, healthy people who died of complications like bronchitis and pneumonia. If a flu virus like that appeared now, could it do as much damage?

Certainly the two subsequent flu pandemics, occurring after the development of anti-viral medicines, did not cause the same carnage. The impact of the 1957 “Asian flu” pandemic was greatly reduced by mass vaccination: only one human being in six caught it, and it killed an estimated two million people worldwide. The 1968 “Hong Kong flu” pandemic killed only a million people, and as in 1957 most of the victims were elderly. But viruses are not impressed by medical technology.

Despite the far higher standards of sanitation and medical care in the developed world, influenza death rates there have not been significantly lower than in poorer countries. Viral diseases mutate fast, antibiotics are no use against them, and good hygiene is no protection either. Bacterial diseases like cholera, anthrax and malaria have complex life cycles and mutate only slowly, so they are easy to contain—but if the latest version of “bird flu” is transmissible between people, we could be looking at millions of deaths over the next year. Nor is that the worst that could happen.

The true nature of the “Black Death” was long a mystery, but early in the 20th century, after doctors had found and described bubonic plague in India, experts jumped to the conclusion that a more virulent form of that disease, endemic in rats and transmitted to humans by their fleas, was the real culprit. This was a comforting conclusion, because it meant that it was a bacterial disease with a complicated life cycle, easily contained by hygiene and antibiotics, that would never come back to trouble modern human beings.

But it never actually made sense, because the standard treatment for the Black Death, tried and tested over three hundred years, was to quarantine affected families and villages for forty days. That could not have worked if it were carried by rats, which do not respect quarantines. So two years ago professors Christopher Duncan and Susan Scott of Liverpool University suggested in their book, “Biology of Plagues,” that the Black Death was really an Ebola-like virus, a haemorrhagic fever transmitted directly from person to person. It is frighteningly plausible.

(continued)
There were actually two Great Pandemics, and the first hit Europe and the Middle East in 541 AD. The Roman empire had been relatively unharmed by great plagues, apart from bouts of smallpox in 170 and measles in 250, which killed mostly children and left survivors immune, but the new plague was different. It returned about every 10 years for the next two centuries, and reduced the population of the Mediterranean area by between 30 and 50 percent. Large parts of the Middle East and North Africa did not recover their pre-540 populations until about 100 years ago.

The plague called the Black Death appeared in Mongolia in the 1320s, and killed two-thirds of China's population between 1330-50. It reached Europe in 1347, and killed between 30 and 40 percent of the population in the first onslaught. It returned at intervals of about a decade, with gradually diminishing lethality, until it disappeared at the end of the 17th century. The aching, the bleeding from internal organs, the red blotches on the skin caused by the effusion of blood under the skin, were all typical of Ebola-style fevers. Besides, bubonic plague, unlike the Black Death, did not disappear. There was an outbreak of bubonic plague in Glasgow as recently as the 1890s.

If Duncan and Scott are right, therefore, there is a virus out there somewhere, dormant for the moment while it tries out mutations that might break through the genetic defenses that human beings evolved to defeat it last time, which could kill a significant portion of the human race in a year. The Black Death is not dead, it's only sleeping. And in the meantime, the “bird flu” may be coming.
This lesson focuses on the topic of viruses and their characteristics. It also introduces students to Winnipeg’s International Centre for Infectious Diseases (ICID). Students will read a challenging scientific article about viruses, looking at definitions, examples, and attributes. They will then read and report about the virology lab in Winnipeg. Some of the main academic tasks are: defining, exemplifying, explaining, understanding complex relations within sentences, understanding conceptual meaning, understanding relationships between parts of a text through grammatical and lexical cohesion devices and through indicators in discourse, extracting salient points to summarize a text, making notes, making suggestions, questioning for clarification, reading critically, skimming, laying out and presenting a written report, and using an academic writing style.
### Outcomes

| SLO 1.3 | Develop and express a personal position in a variety of ways… |
| SLO 2.1.3 | Use developing control of grammatical features… |
| SLO 4.2 | Communicate effectively to work with others… |
| SLO 4.6 | Respond to and critique a variety of individual perspectives… |
| SLO 5.6 | Evaluate texts… |
| SLO 6.1.5 | Use selective attention… |
| SLO 6.2.4 | Use note taking… |
| SLO 6.2.7 | Use elaboration… |
| SLO 6.2.9 | Use summarization… |
| SLO 6.2.12 | Use inferencing to guess the meanings… |
| SLO 6.3.2 | Use co-operation… |

### Instructional and Learning Sequence

#### Sequence 1

**Activation**

Review the deadly diseases introduced in the last lesson, noting the fact that they are viruses. Ask the students to speculate on what happens in a virology lab.

Look at the definitions of “viruses” and “organism” in **Handout 5-8: “What Is a Virus?”**. Identify the definition patterns discussed in previous lessons. Note discourse markers used for exemplification. Brainstorm for others.

After looking up difficult terms, have students pair up to discuss the meanings of the definitions and the terms. They may jot down notes as they work through these difficult terms, and they should try to express them verbally in their own words to show their understanding.

#### Language Features

<table>
<thead>
<tr>
<th>Vocabulary</th>
</tr>
</thead>
<tbody>
<tr>
<td>virus, acellular organisms, genomes, nucleic acid, obligate, replicate, host cells, host metabolic machinery, ribosomes, pool of components, virions, virus-like agents, viroids, plasmids, prions, respire, irritability, reproduce, molechisms, organules, inadequate, essential attributes, criterion, phenomenon, lineage, unit element, evolutionary, denotes, mitochondria, chloroplasts, nuclei, chromosomes, constitute, symbiotic associations. (You may want to have students add to this vocabulary and classify words and collocations into appropriate groups, for example, science terms.)</td>
</tr>
</tbody>
</table>

**Idioms:** top-down, bottom-up

<table>
<thead>
<tr>
<th>Structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>use of dashes</td>
</tr>
</tbody>
</table>

**Suffixes:** virus~virology~virions~viroids; organ~organic~organism

<table>
<thead>
<tr>
<th>Discourse Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>definition patterns (review)</td>
</tr>
<tr>
<td>markers to show exemplification: such as</td>
</tr>
</tbody>
</table>

**Important markers:** that is to say, then, however, that is, at least, now, thus

<table>
<thead>
<tr>
<th>Academic Language Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>defining</td>
</tr>
</tbody>
</table>
Review deadly diseases from the previous lesson.
Speculate on what happens in a virology lab. (C)

Look at the definitions of “viruses” and “organism” in Handout 5-8: “What Is a Virus?”. Identify the definition patterns. Brainstorm for others. (C)

With a partner, discuss the meaning of definitions and terms in Handout 5-8: “What Is a Virus?”. (P)

Handout 5-8: “What Is a Virus?”

The vocabulary lends itself to a review and discussion of affixes, and also a discussion about plurals of words from Greek and other languages, like criterion~criteria, nucleus~nuclei, datum~data, et cetera, so common in science.

Ask students where they might find definitions of the difficult terms if they can’t find them in the dictionary. (Here’s an opportunity to look at the organization of a biology text, particularly the glossary.)

Note that a virus may adapt to a new host, just as the diseases covered in the previous lesson have.
Outcomes

| SLO 1.2 | Respond to texts with increasing independence… |
| SLO 1.6 | Interpret a range of texts… |
| SLO 1.7 | Evaluate a given text… |
| SLO 2.1.3 | Use developing control of grammatical features… |
| SLO 4.1 | Use language to encourage… |
| SLO 4.2 | Communicate effectively to work with others… |
| SLO 6.1.1 | Use advanced organization… |
| SLO 6.1.2 | Use organizational planning… |
| SLO 6.1.5 | Use selective attention… |
| SLO 6.1.6 | Use self-monitoring to check… |
| SLO 6.1.8 | Use self-evaluation to check… |
| SLO 6.2.4 | Use note taking… |
| SLO 6.3.2 | Use co-operation… |

Instructional and Learning Sequence

Activity

Direct students’ attention to Handout 5-9: “Winnipeg’s Fortress of Deadly Disease” and Handout 5-10: “Scientists Match Wits with Killers.” Group students in pairs to read the articles. First, they skim the articles by looking at the titles and headings, and by reading the introductions, conclusions, and the first and last sentences of each paragraph. (In which paragraph is reference first made to the term “virology lab”?) As they read, students should highlight the important sections and write marginal notes in their own words, synthesizing information as preparation for writing a report on the two documents.

Language Features

Vocabulary

Handout 2: flushed, Ebola virus, exotic, monolithic, epoxy, transmitted, lethal, strains, stringent, containment, impetus, authorize, contracted, sophisticated, Congolese, malaria, virology lab
Idioms/slang: turns out, stuff, no cinch, sign off/on, state-of-the-art, ass-covering, hot topics, shut down

Handout 3: bioterrorist attacks, integral, mishaps, antimicrobial resistance, bio-waste, sanitized, incinerate, redundancy, ER
Idioms/slang: at the helm, bells and whistles, cutting edge, marquée attraction, have no qualms, on the horizon

Structures
roots and affixes (e.g., transport~transported~transportation, pack~package~packaging)
In pairs, read **Handout 5-9:** “Winnipeg’s Fortress of Deadly Disease” and **Handout 5-10:** “Scientists Match Wits with Killers.” First, skim the articles by looking at the titles and headings, and by reading the introductions, conclusions, and the first and last sentences of each paragraph. Highlight the important sections and write marginal notes in your own words to prepare for writing a report based on the two articles. (P)

For more information about Winnipeg’s ICID, see:
<www.icid.ca/press/01_26_04.html>
<www.icid.ca/press/10_18_04_2.html>
<http://chealth.canoe.ca/health_news_detail.asp?news_id=13940>

After pointing out roots and affixes in the articles, you may want to have students look for a set number of words in the articles and record as many forms using the base word as they can think of. They may add prefixes to change the meaning or affixes to change the part of speech. Example: secure (adj. and v.), insecure (adj.), security (n.), insecurity (n).
### Outcomes

| SLO 1.4 | Show an awareness of organizational patterns… |
| SLO 1.6 | Interpret a range of texts… |
| SLO 2.1.2 | Use standard Canadian spelling… |
| SLO 2.1.3 | Use developing control of grammatical features… |
| SLO 2.3 | Produce a variety of short and extended text forms… |
| SLO 2.3.1 | Use the structures and language features… |
| SLO 2.4 | Use the steps of the writing process… |
| SLO 3.3 | Quote from or refer to sources… |
| SLO 6.1.2 | Use organizational planning… |
| SLO 6.1.5 | Use selective attention… |
| SLO 6.1.6 | Use self-monitoring to check… |
| SLO 6.1.8 | Use self-evaluation to check… |
| SLO 6.2.9 | Use summarization… |

### Instructional and Learning Sequence

#### Writing

Once they are finished, students synthesize the information from both articles in their own words to write a report of about 500 words to a specified audience. The purpose of this report is to inform. (See Teacher Notes and References.) Students should:

- decide on a title, organizational pattern, and subheadings
- use at least three direct quotations from the article with appropriate references
- find a follow-up article and refer it to their readers

The report will be graded on a teacher-created rubric. Use the writing process.

#### Language Features

<table>
<thead>
<tr>
<th>Structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>reporting verbs (review)</td>
</tr>
<tr>
<td>appropriate change of tense for reporting</td>
</tr>
</tbody>
</table>

#### Academic Language Functions

- reporting, defining, explaining, citing, informing, synthesizing
Student Learning Tasks

Assignment
Using your marginal notes, synthesize the important information from both articles to write a report of about 500 words.

• Decide on a title, organizational pattern, and subheadings.
• Use at least three direct quotations from the article with appropriate references.
• Find a follow-up article and refer it to your readers.

Use the writing process. (I)

Teacher Notes and References


The teacher can help prepare students using suggestions from “The Craft of Scientific Writing.”

In scientific writing, the idea is efficiency: to transmit the most information in the least amount of reading time. The students should ask themselves:

1. Who will read the document?
2. What would readers know about the subject?
3. Why will people read this report?
4. How will they read it?
Outcomes

SLO 2.1.3 Use developing control of grammatical features...
SLO 4.1 Use language to encourage...
SLO 5.3 Analyze ways in which languages and text affect...contemporary culture.
SLO 6.1.5 Use selective attention...
SLO 6.1.6 Use self-monitoring to check...
SLO 6.1.8 Use self-evaluation to check...
SLO 6.3.2 Use co-operation...

Instructional and Learning Sequence

Roundup

It may be helpful to divide the many new terms from Handout 5-8: “What Is a Virus?” evenly among students and have them write new definitions in their own words, using a variety of definition patterns from this or past lessons. A master copy should be made of all definitions for each member of the class.

Language Features

Vocabulary
- terms from Handout 5-8: “What Is a Virus?”

Discourse Features
- definition pattern (review)
- use of present tense in definitions

Academic Language Functions
- defining
<table>
<thead>
<tr>
<th>Student Learning Tasks</th>
<th>Teacher Notes and References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Write new definitions in your own words, using a variety of definition patterns. (I)</td>
<td></td>
</tr>
</tbody>
</table>
Viruses may be defined as acellular organisms whose genomes consist of nucleic acid, and which obligately replicate inside host cells using host metabolic machinery and ribosomes to form a pool of components which assemble into particles called virions, which serve to protect the genome and to transfer it to other cells.

They are distinct from other so-called virus-like agents such as viroids and plasmids and prions.

The concept of a virus as an organism challenges the way we define life:

- viruses do not respire
- nor do they display irritability
- they do not move
- nor do they grow
- however, they do most certainly reproduce, and may adapt to new hosts

By older, more zoologically and botanically biased criteria, then, viruses are not living. However, this sort of argument results from a “top-down” sort of definition, which has been modified over years to take account of smaller and smaller things (with fewer and fewer legs, or leaves), until it has met the ultimate “molechisms” or “organules”—that is to say, viruses—and has proved inadequate.

If one defines life from the bottom up—that is, from the simplest forms capable of displaying the most essential attributes of a living thing—one very quickly realizes that the only real criterion for life is the ability to replicate and that only systems that contain nucleic acids—in the natural world, at least—are capable of this phenomenon. This sort of reasoning has led to a new definition of organisms:

“An organism is the unit element of a continuous lineage with an individual evolutionary history.”

The key words here are unit element, and individual: the thing that you see, now, as an organism, is merely the current slice in a continuous lineage; the individual evolutionary history denotes the independence of the organism over time. Thus, mitochondria and chloroplasts and nuclei and chromosomes are not organisms, in that together they constitute a continuous lineage, but separately have no possibility of survival, despite their independence before they entered initially symbiotic, and then dependent, associations.

The concept of replication is contained within the concepts of individual viruses constituting continuous lineages, and having an evolutionary history.

Thus, given this sort of lateral thinking, viruses become quite respectable as organisms:

- they most definitely replicate
- their evolution can (within limits) be traced quite effectively
- they are independent in terms of not being limited to a single organism as host, or even necessarily to a single species, genus, or phylum of host

A Congolese woman lands at the airport in Toronto after a 21-hour flight that took her from Africa, via Rome and Newark, N.J., to Toronto. She couldn’t eat on the flight and was weak and flushed with high fever. Doctors thought she may have had malaria, which is scary. Then they considered she may be suffering from the dreaded Ebola virus.

Turns out she probably hasn’t been infected with Ebola; it’s likely some other exotic disease. The results came from the new Canadian Science Centre for Human and Animal Health in Winnipeg, which contains one of the world’s most secure laboratories for the testing of deadly diseases.

It is a Level 4 lab, one of 15 in the world, and the only one in Canada. The Congolese woman’s blood and fluids were sent to Winnipeg for testing, also to Atlanta’s Centers for Disease Control and Prevention.

Winnipeg’s new virology lab—administered by Health Canada—cost $172 million and took 10 years to design and build. It took two years to build the concrete box that encloses the Level 4 lab. They waited a year for the massive, monolithic concrete to dry, then covered it with 30 coats of special paint, then covered the walls and floor with a layer of epoxy 7.5 centimetres thick.

What distinguishes the Winnipeg lab is that it is set up for both human and animal diseases, which is of vital importance as scientists uncover more evidence of human diseases transmitted from animals. An example in the news recently is mad cow disease and its association with the human disease called Creutzfeldt-Jakob disease (CJD).

The first strains of lethal diseases arrived at the Winnipeg lab in the summer of 2000, a cargo of six of the most deadly viruses in the world. Small vials contained samples of Lassa, Marburg and Junin, with three strains of Ebola viruses, all flown in from the Centers for Disease Control in Atlanta.

But, if security requirements are so stringent, and the stuff so deadly, how is it so easily transported over great distances to the lab in Winnipeg? Dr. Ron St. John, Health Canada’s executive director of the Centre for Emergency Preparedness and Response, says the vials are transported in safety packs, then secured in a triple-container and sealed.

“I would stress that these packages are designed to withstand tremendous impact,” Dr. St. John explained. “In the famous Lockerbie crash the only package—the only thing to survive intact in that terrible airplane tragedy—was a safety pack that had an organism in it.”

The Canadian Science Centre for Human and Animal Health in Winnipeg is located in the city’s west end, on Arlington Street. Its laboratories are in four levels of containment, Level 1 being at the safety requirements of a high school lab, Level 4 considered secure enough to test the world’s deadliest viruses.

Much of the impetus for the Winnipeg lab—known locally as “the virology lab”—comes from a surge of new diseases in the 1980s, when two new strains of Ebola were discovered, and when the medical community took serious notice of the HIV-AIDS epidemic.

It is no cinch to build a Level 4 lab, and not just for design and construction challenges. A major problem is to get someone finally to sign off on the labs, which means to authorize them and guarantee that they are safe enough for the deadliest diseases in the world.

In 1976, a woman took sick at the Toronto airport and was taken to Etobicoke General Hospital where it was determined that she had contracted Lassa fever. This was enough of a scare to have the hospital shut down for a week.

(continued)

The Ontario government responded by spending $5.8 million to build a Level 4 lab in Etobicoke. But neighbours complained, the new facility was never opened, and the Ontario government decided these types of facilities are a federal responsibility.

Another high-security lab was built at Toronto General Hospital, on the 11th floor of the Norman Urquhart Wing. It was sealed off from the rest of the hospital, with its own air supply and electrical system, and a special state-of-the-art particulate filtering system. A special team was trained to work in the isolation unit, intended to handle diseases as lethal as Lassa and Ebola fevers. It was completed in 1984, at a cost of $2 million.

But it never opened.

Vickery Stoughton, then president of Toronto General Hospital blamed it on what he called “bureaucratic ass-covering.” Stoughton said government inspectors often arrived to check the new facility, but not one was willing to sign off on the guaranteed safety of a lab dealing with the deadliest diseases in the world.

“Instead, they’d recommend that another $100,000 or $200,000 be spent to make absolutely sure it’s safe,” Stoughton said.

One afternoon in his office, Stoughton seemed particularly upset at the sophisticated new lab lying idle for two years, at a time when the hot topics were health cutbacks and cost-cutting. I was with him that day.

“Sooner or later,” Stoughton told me, looking down at his telephone as if it would start ringing as he spoke, “someone’s going to ask, ‘Why’d you spend all that money and just let it sit there?’ I mean, The Toronto Sun would have a field day.”
Some fierce warfare is taking place in Winnipeg. The enemy: killer viruses, stubborn super-bugs and bacteria.

The battlefield is the Canadian Science Centre for Human and Animal Health, a complex on Arlington Street under 24-hour guard.

Commonly called “the virology lab” by most Winnipeggers, it will also become the hub of the new nationwide laboratory network for detecting and treating bioterrorist attacks.

The federal facility is a powerhouse of impressive technology, which includes more than the microscopes and sophisticated equipment used to sequence DNA. Technology is an integral part of the science, of course, but it’s also part of the safety and security processes of the building.

“It’s technology, partly, and it’s technique,” Dr. Frank Plummer, scientific director general of the National Microbiology Laboratories within the centre, said in an interview.

“People are trained in a certain way that allows them to do their job safely.”

Plummer, a leading HIV-AIDS researcher, has been at the helm of the microbiology labs since September 2000. He still works with graduate students at the University of Manitoba and delivers the occasional lecture.

“The main technology that’s important here is the safety,” Plummer said. “It’ll allow you to work on things you otherwise wouldn’t be able to.”

Every employee is vetted by the Canadian Security Intelligence Service. Drills with the city’s emergency services are routine. Security at the complex has always been tight, but since the terrorist attacks in the United States on September 11, 2001, it has become more visible. A security guard greets visitors at the front door.

The facility houses Health Canada and Canadian Food Inspection Agency labs. It’s the only one of its kind designed to house research for both human and animal health.

It costs about $11 million a year to operate the centre, an expense split between Health Canada and Agriculture Canada.

The lobby is the only area of the guarded facility—approved by the Treasury Board in 1987 and designed and built more than 10 years later—that is open to the public. The total building area covers the size of five football fields.

The High Efficient Particulate Air (HEPA) filtration system is used in Level 4 labs and is capable of removing particles 85 times smaller than the smallest known disease-causing agent.

The foundation of concrete pillars, embedded 30 metres into the second level of bedrock, cost $5 million and won’t shift. The building is backed by two power supplies.

It cost $35 million to equip the labs and about $2 million is spent annually in upgrades and additions. That amount will likely grow as programs grow, Plummer says.

“I think it’s the bells and whistles, the state of the art equipment that’s attracting people,” said centre spokesman Brian Koshul. “Everyone wants to be on the cutting edge.”

Plummer agrees: “It’s the fact that it’s big, it’s brand new. It’s got everything. People know about it.”

The labs are organized in an easily reconfigurable way, to suit changing needs of different programs and the preferences of the people who work in them. For instance, a big lab can be divided into four smaller labs overnight.

More than 90 per cent of utilities maintenance can be conducted from the hallways or above the labs where panels are located, so as not to disturb the integrity or routine of lab work. This also avoids any mishaps.

Coils, condensers and electric motors are not located in the containment area where scientists work, but in outside labs, leaving more workspace for scientists and technicians.

“Something as simple as changing light bulbs can stay relatively simple,” said Les Wittmeier, electrical technologist at the federal laboratories.

(continued)

Scientists Match Wits with Killers (continued)

This is a progressive bit of planning, because most high-end labs are not designed this efficiently.

The most sophisticated scientific work taking place in the building is connected to DNA testing. The centre has a DNA arrayer, a high-tech piece of equipment capable of placing 20,000 spots of DNA on a glass slide and reading it.

The slides are scanned for fluorescence, revealing the kind of DNA for which the scientists are looking. By studying DNA chips, researchers can test for the presence of certain genes, determine anti-microbial resistance, consider agents of bioterrorism and understand which genes are activated in particular conditions.

An experiment with a single DNA chip can provide researchers with information on thousands of genes simultaneously.

“It’s the sharp end of biotechnology,” Plummer said.

The “DNA court”—located within the Level 2 area—also has a robotic workstation for liquid handling. Up to 1,000 vials can be easily handled in the stacking system.

Scientists can actually make DNA here. Machines in this area of the building are capable of determining a DNA sequence automatically.

“These things are fairly common,” Plummer said. “We just have more of them than anyone else.”

Although the Level 4 labs, a series of pressure chambers, perform just one per cent of the centre’s area, they are the marquee attraction.

Most of the centre’s work takes place in the Level 2 and Level 3 labs where researchers study viruses and bacteria that make animals and humans sick. In those labs, scientists work with such things as sexually transmitted diseases, mad cow disease, salmonella, tuberculosis, flesh-eating bacteria and antibiotic-resistant organisms.

The Level 4 area is a box-within-a-box containment, sandwiched in the N-block of the complex, between the air filtering on the floor above and the bio-waste treatment system on the floor below.

In the Level 4 lab, the most sophisticated science taking place is the manipulation of deadly viruses, like Ebola. Plummer said scientists are able to change the genes around to see which ones are important in causing disease.

Bank-vault doors have key-punch locks and freezers keep specimens at -147°C, about 127 degrees colder than a home freezer. Samples are small, and kept frozen in liquid nitrogen.

When working in the Level 4 labs, scientists zip themselves into pale blue rubberized suits with sealed hoods, gloves and boots and press-lock folds. They communicate via an internal two-way radio system.

Just seven people are authorized to work in these labs and only four are permitted to work alone. Eight separate physical security checkpoints are required to gain entry. Cameras and motion detectors monitor the area.

Air coming in to the lab has already been filtered using High Efficiency Particulate Air (HEPA) filtration, removing particles 85 times smaller than the smallest known disease-causing agent. Air is HEPA filtered again, and then filtered a third time before it leaves. The breathing air that is piped into their suits is HEPA-filtered, too. A complete air change takes place every three minutes.

The HEPA air filters, which cost between $10,000 and $36,000 each, are not re-used. They are sanitized and destroyed after use. A crew of four people is dedicated solely to the HEPA filtration. Every air filter is backed up by at least one other filter.

“The advances in genomics and proteomics require expensive equipment that needs a lot of expertise to run and also sophisticated information handling,” Plummer said.

Primary treatment of any waste takes place first in the labs, before it even leaves for the bio-waste rendering system, where all liquid and solid waste is disinfected and sterilized before it enters the city’s sewer system.

Waste enters one of three 5,000-litre vessels, the kind seen in the meat-packing industry, although modified to suit the lab’s needs. Waste is heated to 121°C for a minimum of 30 minutes to sterilize it.

Nothing is incinerated. All liquid and solid waste is sanitized before it leaves the building. And even if a mishap occurs—in 1999, a step was missed, and disinfected shower and slide rinse water was released into the city sewer system before it had been re-sterilized—redundancy measures are in place.
The “redundant system,” which includes safety measures that go beyond international standards, in effect, doubles the safety process. People who work in the complex say they have no qualms about bio-safety.

Because waste is treated first at the lab and then rendered before finally going into sewage blending when it is cooled and released into the city sewers, it is considered cleaner than any waste from residences or even hospitals.

“Personally, I feel safer working here than sitting in any ER or doctor’s office,” Wittmeier said. “I have no problems working here at all. It’s a basic understanding of what goes on here and what needs to be done that gives me that comfort.”

The bio-waste treatment area is alarmed, and monitored 24 hours a day.

“It’s a critical part of the building,” Wittmeier said. “It’s a high maintenance system, but when you consider the alternative of incineration, it’s preferable.”

Wittmeier says the centre is now providing information on bio-safety systems and procedures to other organizations, such as NASA, Texas Tech University and the Center for Disease Control in Atlanta. The world is also looking to the centre for its research capabilities, Plummer says.

On the horizon, Plummer would like for the lab to build a proteomics technology platform, develop genome libraries to explore things like the susceptibility to infection, and build a program in molecular imaging.

One of the most high-tech aspects of the centre isn’t the gear, but the people who work there. At least 10 of the scientists have been recruited from around the world.

“It’s really the scientists that do the work,” Plummer said. “You can have all the machines you want, but you need the scientists.”