

Introduction and Acknowledgements

The idea for a study guide for *The Hot Zone* began at a chance meeting at the Woodrow Wilson Foundation's summer institute for biology teachers in 1998. A team from the Federal Centers for Disease Control and Prevention (the CDC) had arrived at our institute at Princeton University to conduct a series of lessons and an extended case study of a Legionnaire's disease outbreak in Louisiana. The opportunity to apply concepts and skills of "disease detectives" across curriculum areas led to lively discussions of books that excited and motivated us and our students.

The next day, while introducing one of the CDC lecturers, I was using the "black vomit" passage from *The Hot Zone* as an example of engaging junior high and high school students in a vivid scene. Little did I know that our guests had brought along a guest of their own—Richard Preston, the book's author. Richard graciously entertained the group with some stories, and mentioned that he regularly received emails and letters from students and teachers asking for ideas applicable to the classroom. He and I began a correspondence which ultimately spanned many meetings and visits and led to this joint venture.

Of all the conversations and collaborations which went into this project, the most memorable involved Dr. Barry Fields of the CDC's National Center for Infectious Diseases, who came close to clearing out an elegant restaurant in the summer of 1999 with an innocent dinner table question about how much anthrax it would take sprayed from a helicopter to "take out" the city of Philadelphia. Sadly prescient, I fear that such a question asked today would lead to a quick visit from our friends in the Department of Homeland Security.

I am indebted to the following people in preparation of this guide: Richard Preston and his family for their friendship and support; Dr. Richard A. Goodman and Donna F. Stroup, Ph.D., both of the CDC, and Dr. Ruth L. Berkelman of Emory University for their inspiration and leadership; Dr. Mike Lemke from the University of Illinois-Springfield for our countless hours of all night planning and learning; Nancy Anderson, for her intuitive grasp of the science/literature connection; my colleagues in the science and English departments at Aptos High School, for encouraging me to turn my biology lab into a laboratory of curricular ideas; and Kathy, Suzy, and Max, who continue to tolerate and encourage me to think differently.

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About the Authors



Andrew Goldenkranz is a nationally recognized teacher and staff development leader. From 1998 until 2002 he directed the annual summer residential biology institute for the Woodrow Wilson Foundation, which brings some of the best teachers in the country together for a month-long think tank. Mr. Goldenkranz has lectured widely on classroom applications of bioethics and biotechnology topics, and he wrote a study guide for Jurassic Park in 1994. Before becoming a teacher, he worked at the Linus Pauling Institute for Science and Medicine and, as an undergraduate, sat on the first institutional biohazard review committee at Stanford University, which evaluated safety procedures related to the early days of recombinant DNA research. He is currently developing [working on?] two curriculum projects on the evolution of life on Earth, in addition to his full time duties as a teacher and administrator at Aptos High School, in Aptos, California. He lives in Aptos with his wife and two children.

[photo TK] **Richard Preston** is regarded as one of the leading authors writing about science in our time. The Hot Zone was a New York Times bestseller for 42 weeks, has been translated into more than 30 languages, and is now widely used as a teaching text in biology, English, and humanities courses at both high school and college levels. Preston's two other books about viruses are The Cobra Event and The Demon in the Freezer. Together with The Hot Zone, the three books are Preston's Dark Biology Triad. Preston has also written First Light (about astronomy), American Steel (about the building of a steel mill) and The Boat of Dreams. He lives outside New York City with his wife and three children.

Curricular Mapping for THZ

Science

- Virology
- Anatomy And Physiology
- Ecology And Environmental Science
- Epidemiology
- Cell Biology
- Immunology And Infection
- Pathology
- Careers In Science
- Public Health And Demographics
- Model Building

English

- Interviewing Techniques In Journalism
- Narrative Voice, Point Of View (Objective, Subjective, First Person, Third Person, Etc.)
- Settings
- Presentation Of Character
- Plot And Action - Narrative Suspense
- The Expository "Set Piece" In Journalism (Explaining Facts)
- Imagery And Visualization
- Process Writing/Follow Up And Rewrites
- Checking Facts
- Writing Format: Letters, Press Releases, Descriptions
- Persuasive Essays
- Controversial Issues Essays

Social Studies

- Government Agencies
- Regulation Of Import And Export
- Animal Rights Vs. Human Health
- Privacy Vs. Public Health Considerations
- Civilian Vs. Military Control
- Population Growth And Territory
- Geography
- Scenarios And Role Plays For Crisis Management
- Economics/Business And Government Working Together Or Apart
- Global Development
- Technology, Transportation, And Global Connectedness
- Timeline Of Major Events In The Hot Zone
- Timeline of major disease outbreaks in history
- Interplay of infection and human migration
- Mapmaking and interpretation
- Timeline generation

Into, Through, and Beyond *The Hot Zone*

Into:

1. Look at maps of central Africa, the greater Washington DC metro area, and a Reston municipal map for reference during the readings.
2. Perform the "Dread Red Disease" activity to quickly and vividly model the transmission of infectious disease in a closed population.
3. Ask students to interview their families about their family medical history.
4. Describe the four components of human/vertebrate blood.
5. What is the origin of the word *quarantine*?
6. Video scenes to access and have ready:
 - a. *12 Monkeys*—the airport scene at the end, involving the real saboteur and the vials containing the virus
 - b. *Close Encounters of the Third Kind*—the scene in which the officials decide which cover story they will use to evacuate the area.
 - c. *ET*- as the house is quarantined.
 - d. *Outbreak*—scenes involving crowd control and lab procedure.
 - e. The 2003 series of *24*, concerning a bioterrorist scenario.
 - f. NOVA episodes on the influenza epidemic of 1918 and the history of Ebola, both available at www.pbs.org

Through:

Along with using the enclosed Study Guide:

1. Create illustrations or download pictures from the Internet to bring the book to life; especially Kitum Cave
2. Create a desktop or classroom model representing the four biohazard/biosafety levels. Here are some examples:
 - a. **Biosafety level zero.** The normal world, no biocontainment. For example, the classrooms of a school (or the ordinary offices and corridors of a bioresearch lab).
 - b. **Biosafety level 2** (bsl-2 or level 2; there's no "level 1" in bioresearch labs). Entry and exit to level 2 is controlled with electronic security locks. The entry passage into level 2 contains a water shower and sometimes the use of uv light in the entry. Laminar flow safety hoods are used in level 2 for the handling of biological materials.
 - c. **Biosafety level 3** (bsl-3 or level 3). Is divided into 2 sublevels: level 3 and level 3+.
 - i. Level 3 biocontainment is used for pathogens that cause serious or fatal human disease. Level 3 pathogens are typically highly infectious. (HIV is normally handled at level 2 because it not highly infectious.)

- ii. Entry and exit between level 2 and level 3 are controlled with doors and electronic security locks. Level 3 requires people to wear protective gowns, head covers, shoe covers, and surgical gloves. There is a bleach wash or chem wash sink, biohazard disposal containers. Laminar flow safety hoods mandatory for handling biological materials.
 - d. **Biosafety level 3+** (bsl 3+ or level 3 plus). Workers in level 3+ must additionally wear HEPA filter respirator over mouth and nose and safety goggles over eyes. Certain special vaccinations are mandatory for workers in level 3 plus.
 - e. **Biosafety level 4** (bsl-4 or level 4; the hot zone). For lethal, highly infectious, and typically airborne pathogens for which there is no vaccine or cure, or which are considered to be a major threat to human health.
 - i. Stainless-steel airlock door; warning signs; chemical airlock shower; use of full-body biohazard space suit mandatory; exotic vaccinations mandatory; negative air pressure maintained 24/7 to prevent escape of infectious hot agents; use of airlock autoclave sterilizers (ovens) mandatory; all materials leaving level 4 must be sterilized in autoclaves; use of "crash doors" in level 4 – in the event of fire or emergency, space-suited researchers can break open a crash door and exit from level 4 directly to level zero (ordinary corridor) without going through an airlock chemical shower. When a crash door is opened, it instantly renders the level zero corridor into a level 4 hot zone. A "crash door emergency" requires bio-isolation of the affected wing of the building and of any unprotected persons who are exposed to contaminated air flowing through the opened crash door.
 - f. **Biosafety level 4 hospital suite ("the slammer.")** has all the biosafety features of level 4, and additionally has: hospital bed or beds, each surrounded by a transparent plastic biocontainment tent kept at negative air pressure; fully equipped operating room; medical supplies and patient monitoring equipment; airlock pass-through door connecting the level 4 hospital room to the outdoors, so that an infected patient can be transferred from a biocontainment stretcher into the slammer's hospital room.
3. Storyboard on paper or using Inspiration mind mapping software all the scenes you would need to act out or tell this story.
 4. Diagram (**on paper or using Inspiration**) all the local, regional, and federal agencies as well as the private agencies (companies, etc) involved in this story.
 5. Keep a first person reflective journal about reactions to the book or role playing one of the characters in the book
 6. Create a timeline of large scale infectious disease outbreaks

7. Make sure you complete the ASM scale activity on the relative sizes of viruses and bacteria
8. Hold "Giant Cell Day" at your school, dressing up your room as a cell and creating or drawing models of organelles and pathogens to scale
9. describe the lytic/ lysogenic cycle of a virus inside a host cell
10. Check out the links to lessons, projects, and games in this guide and also the Only in America section for humorous items and connections.

Beyond:

1. Interview your county epidemiologist, public health officer, or school nurse about what an outbreak in your neighborhood or school might involve.
2. Set up a group role play involving a local outbreak. Determine the psychology and command authority of the case, including:
 - a. Lab director/principal investigator
 - b. Law enforcement: include local and army or other national level agencies
 - c. Mayor or county supervisor
 - d. News reporter
 - e. Electronic media (TV or radio) reporter
 - f. County health official and CDC other national official
 - g. School principal
3. Set up your class for a press conference, bringing each expert role forward and allowing the class to serve as the reporting pool
4. Research local or other high profile outbreaks taken place since the period of the story
5. Read:
 - a. the other two books in **the DARK BIOLOGY triad, namely THE COBRA EVENT** and **THE DEMON IN THE FREEZER** by Richard Preston
 - b. **FLU** by Gina Kolata
 - c. **DISEASE DETECTIVES** by Berton Roueche, former columnist for New Yorker covering public and community health issues
6. The author consistently uses THE AIDS VIRUS as a metaphor virus, PARALLEL TO EBOLA VIRUS, with many unknowns and from similar origins. Write a new last chapter using a different pathogen (SARS, anthrax, BSE/mad cow, or other) as a metaphor
7. Use the DNA Learning Center's Monte Carlo simulator to consider the changing gene frequencies and resistance process in a situation in which two populations are 98% similar.
8. **What if:** Write the news report IF the virus **had escaped** from the RESTON MONKEY HOUSE and caused a large scale emergency IN WASHINGTON, D.C.
9. Using the CDC's style and format, write a case definition for this outbreak.

10. You have optioned the book *The Hot Zone* for a movie. Write a 2-page development memo to the movie studio with suggestions about casting the key characters in the movie, and how to stage the major scenes.

Chapter Outline for The Hot Zone

Use this outline to pace lessons and guide questions. Page numbers refer to the Mass Market Paperback Edition (ISBN 0-385-47956-5). Many bookstores offer discounts if you're interested in buying a class set.

Part 1: The Shadow of Mt. Elgon	1
Something In the Forest	3-24
Jumper	25-32
Diagnosis	33-47
A Woman and a Soldier	48-55
Project Ebola	56-75
Total Immersion	76-94
Ebola River	95-130
Cardinal	131-140
Going Deep	141-153
Part 2: The Monkey House	155
Reston	157-172
Into Level 3	173-179
Exposure	180-186
Thanksgiving	187-190
Medusa	191-198
The First Angel	199-210
The Second Angel	211-217
Chain of Command	218-237
Garbage Bags	238-250
Space Walk	251-256
Shoot Out	257-265
The Mission	266-271
Reconnaissance	272-282
Part 3: Smashdown	283
A Man Down	285-303
91 Tangos	304-311
Insertion	312-326
A Bad Day	327-333
Decon	334-346
Inside	347-356
The Most Dangerous Strain	357-371
Part 4: Kitum Cave	373
Highway	375-383
Camp	384-411
Main Characters	412-413
Glossary	414-418
Credits	419-422

Questions to ask a local school or health official

1. What are the procedures for dealing with a conventional infectious disease outbreak [like] during flu season? What about something more exotic like West Nile Virus?
2. How often are walls, carpets, hvac, and water systems tested? What are they tested for?
3. Are there any symptoms of infectious disease that you see in students after a heavy rain?
4. What type of plan is in place if there is an outbreak of a dangerous infectious disease on campus? (examples: bacterial meningitis, measles virus, or even a terrorist-caused outbreak of smallpox.)
5. What kinds of situations would lead you to call local or state public officials for help?
6. Who would you call? What about federal public health officials?
7. Do you know who you would call and how you would bring them in?
8. What kind of help would you expect from local, state, and public health officials?
9. Where would we stay?
10. Would you call the bus drivers so they could take us home? Who else would you [have to] call?
11. Would you close up the building where you think the virus is located or would you close up all the buildings?
12. Do you have a different plan for an infectious disease than you have for a non-infectious type of disease?
13. Will there be any type of security just in case any one tries to get out of a quarantine area?
14. What if a student's religious beliefs don't allow the student to receive medical assistance for the disease - what will you do?
15. At what point will you call the parents?
16. Who will you call first if you see that you need outside help?
17. Do the fire department, hospitals, and the police know about the plan?
18. What if someone on campus died - what will you do with the body?
19. What if one person in the whole classroom is infected? What will you do with him or her - will you take the person to another room or will they stay in the same room?
20. How would you find out the origin or source of the infectious disease?
21. What if an infected person was just running around on campus?
22. What if school officials were the only ones who knew about the plan, and the hospital, police, and fire department didn't know anything about the plan?
23. What if the persons that was in charge of the plan got sick?

24. What if the disease had no obvious symptoms, especially at first?
How would potential carriers of the disease be handled?
25. How would you deal with any sort of panic or fear among students and staff?
26. What are your plans for dealing with the news media?
27. How would you handle parents who want to come to campus and take their potentially infective children home? [what if there was no way of telling the parents what was going on and they started to get on campus to get some answers and they wanted to take their sons and daughters out of the school?