

Manitoba

Education, Citizenship and Youth

SENIOR 3 BIOLOGY 30S A Foundation for Implementation Unit 5 – Protection and Control

DRAFT / Unedited Version

March 2005

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Unit 5: Protection and Control

Immune System

S3B-5-01 Describe the body's defence mechanisms for protection from foreign agents.

Include: nonspecific and specific defences.

S3B-5-02 Describe the body's response to allergens, vaccines, viruses/bacteria.

Include: inflammatory response, immune response.

Suggestions for Instruction

Entry Level Knowledge: In Grade 8 students examined the human body's defence mechanisms and technologies related to defence mechanisms, such as vaccines and antibiotics.

ACTIVATE

Mapping Out Protection

Have groups of students create a concept map that outlines all the systems they think are involved in protecting the body.

Acquire/Apply

Direct Instruction – Three Lines of Defense

Using multimedia software or overheads describe the body's nonspecific and specific responses to foreign agents (skin and mucous membranes; the inflammatory response; the immune system). Students then refer to their original concept map and describe in a paragraph how they would change their initial concept map to reflect the information in their notes.

Suggestions for Assessment:

Have students create a Concept Overview Frame on the body's defence mechanisms (SYSTH, 11.36).

Poster presentation

Divide students in groups of two or three. Assign the inflammatory response to half the groups and the immune response to the others. With the help of textbooks or other resources, groups must construct posters to represent the response mechanism assigned to them. All posters should include:

- The steps involved in the body's response

- Illustrations representing the body's response to enhance the written component

Suggestions for Assessment:

1. The following chart can be used to assess the posters.

	3	2	1-0
Organization	The information in chart is clear and well organized.	The information is sometimes confusing and/or disorganized.	The information is confusing and disorganized.
	5-4	3-2	1-0
Required information	The steps of the body's response are well developed and contain the required details.	The description of the body's response contains most of the required details.	The description of the body's response lacks required details.
	8-7	6-5-4-3	2-1-0
Quality of the illustrations	The illustrations are visually appealing and enhance the comprehension of the written information.	The illustrations are adequate and somewhat complement the written information.	The illustrations are confusing and don't enhance the comprehension of the written information.
	4	3-2	1-0
Presentation	There are no spelling or grammatical errors.	There are a few spelling or grammatical errors.	There are numerous spelling or grammatical errors that detract from the message.

2. Once the posters are assessed, have students use them to construct a chain concept map (see SYSTH, p. 11.14) or some other note-taking method to illustrate each response.

Allergens, vaccines, viruses and bacteria

Have students complete Concept frames to illustrate the similarities and differences between allergens, vaccines, viruses and bacteria (see **Appendix 1**)

Suggestions for Assessment: The Concept frames can be used as a formative assessment to determine the level of students' understanding of the body's reaction to allergens, vaccines, viruses and bacteria. If needed, review and/or re-teaching may be carried out (formative assessment).

Summative assessment: Have students complete a compare and contrast frame (see SYSTH, p. XX) to compare allergens, vaccines, viruses and bacteria.

To Vaccinate or Not to Vaccinate-Case Study

Have students examine the case study "To Vaccinate or Not to vaccinate" and answer the questions associated with the case study (**See Appendix 2**)

Suggestions for Assessment: Brainstorm with students to determine what criteria should be used to evaluate their responses to the questions.

Personal Records

Students research their personal vaccinations and immunization records and assess their own immunity. Students research additional immunizations they would need to travel to a different part of the world (e.g. typhoid, cholera, Hepatitis A, malaria pills). Students may include these records in Wellness portfolio.

Cumulative Assessments

The following activities can be used as cumulative assessments.

Write a Story

Have students write an adventure story about a foreign substance trying to invade the body. Develop assessment criteria with students. The criteria should address scientific content as well as creative writing components. Each criterion could be assigned a point value, or a simple rating scale can be used (e.g. excellent, good, fair, poor) for each.

Defense Analogies

Have students develop analogies for the three lines of defence in the body. E.g. Castle-1st: the outer wall, 2nd-guards rushing to a scene inside the castle, 3rd-head of the guards coordinating a search for other infiltrators. Other examples of possible analogies are computers, homes, countries. Students must include the following in their analogy:

- ✓ Description of the structure (biological concept)
- ✓ Identification of a familiar object (analog) that shares some similar characteristics
- ✓ Identification of the shared characteristics of the structure (biological concept) and the analogy
- ✓ Indication of where the analogy breaks down

(Teaching with Analogies Model, Glynn 1989; Glynn, Duit, and Thiele 1995)

Defense analogies can be shared with the classroom and discussed in order to arrive at a consensus as to whether the analogy is helpful or not. The following criteria can help determine the effectiveness of an analogy:

- a familiar analog is selected
- similarities between the analog and the structure are clear and help understand the structure and/or function of the structure
- differences between the analog and the structure are clear

S3B-5-03 Explain the role of the lymphatic system in protecting the human body.

Include: lymph nodes, lymph vessels, lymph...

Suggestions for Instruction

ACTIVATE

Diagnosing Infections

Ask students to explain why a doctor may feel under their jaw when they complain of a sore throat.

ACQUIRE/APPLY

Direct instruction – The lymphatic system and immunity

Discuss how the lymphatic system contributes to immunity. Then have students locate and label the lymph nodes and organs on a diagram of the human body. Have students complete a Concept Overview Frame about the lymphatic system's role in immunity. (SYSTH, p. 11.23)

Suggestions for Assessment: The chain concept frame can be used as a formative assessment to determine the level of students' understanding of the lymphatic system's role in immunity. If needed, review and/or re-teaching may be carried out (formative assessment).

S3B-5-04 Investigate issues related to the immune system and the protection of public health.

Examples: immunization, travel bans and advisories, epidemics...

ACTIVATE

Current Events

Discuss a current event related to the topic, such as the West Nile Virus Outbreak and actions taken to prevent its spread. Have students develop and then answer questions such as:

- What is the West Nile virus and why is it a problem in Manitoba?
- Who is susceptible to this virus?
- Have there been any regulations put in place to prevent its spread?
- What can be done to prevent the spread of the West Nile virus?

Acquire/Apply

Outbreak Scenario

Have students participate in a simulation such as Dreaded Red (National Microbiology Laboratory) to investigate an issue related to the immune system and the protection of public health.

Suggestions for assessment:

There are a variety of ways to assess this type of activity. Student participation in the role-playing activity could be assessed according to criteria such as:

- decision is clearly stated
- evidence is presented to support the decision
- students stayed in their roles for the duration of the activity
- language and attitude are appropriate

Students could also reflect on the activity by completing a self-assessment.

The following questions could be used for the self-assessment:

- Did you help your group arrive at a decision?
- Was it difficult for your group to arrive at a decision? Why or why not?
- Did your group feel it had enough information to make an informed decision?
- Did you agree or disagree with your group's decision?

Case Study

Have students use a case study to investigate an issue related to the immune system and the protection of public health. Examples of case studies can be found at the following websites:

<http://www.actionbioscience.org/education/lewis.html>

<http://ublib.buffalo.edu/libraries/projects/cases/ubcase.htm>

<http://ublib.buffalo.edu/libraries/projects/cases/ideas.htm>

http://www.mhhe.com/biosci/genbio/olc_linkedcontent/bioethics_cases/

Nervous System

S3B-5-05 Describe the major organization of the nervous system. Include: central nervous system and peripheral nervous system (autonomic and somatic).

S3B-5-06 Identify the functional regions of the brain on a diagram. Examples: general anatomy such as cerebrum, specific regions responsible for speech and other functions, left-brain/right-brain concept...

Suggestions for Instruction

ACTIVATE

Nervous System Functions

Have students brainstorm as many components and functions of the nervous system.

Fooling your senses

Conduct demonstrations with students that illustrate the importance of our 5 senses and how they can be fooled, for example:

- Have students smell mint and eat something else. Ask them what they taste.
- Have students close their eyes, cross their middle and index fingers and move them along the edge of a table. Students should feel two parallel edges instead of one.
- Have students close their eyes, cross their middle and index fingers and rub a pencil in the space between the two fingers. Students should feel two pencils instead of one. If they open their eyes, they will only feel one pencil.
- Have students read the following colours as fast as they can: YELLOW BROWN GREEN RED BLUE BLACK. Show the same words, but each of them written in a colour other than the word (i.e. YELLOW written in red). Have students state the colour in which the words are written as quickly as possible.

ACQUIRE/APPLY

Organizing the Nervous System

With the use of their text or another resource, have students create flowchart or functional hierarchy to show the organization of the central and peripheral nervous system.

Suggestions for Assessment: Review the chart with students to verify their comprehension and review or re-teach if necessary (formative assessment).

Have students complete an Exit slip (SYSTH, p. 13.9) at the end of the lesson. The following questions can help get them started:

- What do you know now that you didn't know when you walked in today?
- What did you already know?
- What further questions(s) do you still have?

The parts of the brain

Have students create and label their own models of the brain using plasticine, toothpicks and paper labels. With students, develop criteria for the model such as:

- All the required parts of the brain are clearly identified
- Relative sizes of the parts of the brain are appropriate

Suggestions for Assessment: Assess the models using the criteria developed with students.

Case Study – Split my Brain: A Case Study of Seizure Disorder and Brain Function

The case study “Split my Brain” developed by Julia Omarzu incorporates the effects of seizures on brain function (see **Appendix 3** for the full case study).

Suggestions for assessment: There are questions associated with both parts of the case study which teachers could assess using criteria such as:

- Response clearly answers the question.
- Response uses evidence to identify issues referred to in the question.
- Response justifies suggested diagnosis or course of action using evidence.

Student Presentation

Have students carry out a performance task to demonstrate concepts related to the functional regions of the brain, such as the cerebellum, the medulla oblongata, the different lobes, left brain vs. right brain, the effects that strokes can have on different parts of the brain, etc. This performance task can take on a variety of forms and students should be given the opportunity to select which form they wish to use to share their understanding. For example, students could prepare a skit or a multimedia presentation.

Suggestion for Assessment: Develop assessment criteria with students. The criteria should include both content and presentation components and may be similar, regardless of which presentation form students choose. Each criterion could be assigned a point value, or a simple rating scale can be used (e.g. excellent, good, fair, poor) for each.

S3B-5-07 Identify possible implications of concussions on brain function.

Examples: multiple concussions in sport, second impact syndrome...

Suggestions for Instruction

Background information

Sports injuries that affect the central and peripheral nervous systems are responsible for thousands of deaths or permanent peripheral damage in Canadian youth. A concussion is caused by the brain being subjected to a trauma where it may be twisted. Often both brain cells and blood vessels that feed the brain are affected and the injury could disrupt the chemicals responsible for brain functions. Blood flow to the brain is restricted by the increase in pressure due to swelling and an insurgence of free calcium ions that constricts blood vessels. The result is an “energy crisis” in the brain that can last for weeks. If a second concussion occurs before the brain recovers from the first one, the energy starved cells in the brain are likely to die and individuals may experience a life-threatening swelling of the brain, referred to as “second impact syndrome” (SIS). Half of the individuals with SIS die and it is most common in male adolescents and young adults. The long-term effects of concussions vary from negligible to cognitive and behavioural impairments and may depend on the number of concussions.

ACTIVATE

Anticipation Guide

Have students complete an anticipation guide (see SYSTH, p. 9.20). Here are some possible statements:

1. Bodychecking should be banned in youth hockey.
2. In order to decrease concussions, coaches should train players to bodycheck properly.
3. Helmets should be mandatory on all skating rinks.
4. Better equipment would reduce the amount of concussions in hockey.
5. After having suffered a concussion, a hockey player should be sidelined for the rest of the season.

Should you wear a helmet?

Ask students whether they wear a helmet during sporting or recreational activities such as skateboarding, hockey, bike-riding, scootering, or roller-blading. Initiating a discussion about wearing helmets can be a starting point to get students interested in initial and after effects of head trauma.

ACQUIRE/APPLY

Analyze an article

Have students read the article in **Appendix 4**, "*Bodychecking and concussions in ice hockey: Should our youth pay the price?*" and complete an article analysis frame (see **Appendix 5**).

Suggestions for assessment: Assess the analysis frame with criteria such as:

- The issue is clearly stated.
- The author's opinion is presented with evidence to support it.
- The student's opinion is clearly stated and supported with evidence.
- Questions about the article are included.
- The main ideas in the article are summarized.

Anticipation guide

Have students complete the *after* responses of the Anticipation Guide. Students can pair up and discuss their responses with their partner. They can then share their responses with the whole class.

S3B-5-08 Explain how a nerve impulse travels a particular pathway using chemical and electrical signals.

Include: synapse

Suggestions for Instruction

ACTIVATE

Comparing Nerves

Have students write a paragraph that compares and contrasts a wire that connects a light switch to a light bulb to a nerve. Students can use a Compare/Contrast Frame (SYSTH, p. 11.35).

ACQUIRE/APPLY

Demonstrating Impulse Transmission

Use the Impulse Transmission Demonstration (see **Appendix 6**) to describe how a nervous impulse travels through a neuron and how neurotransmitters carry this impulse to the next neuron.

Suggestions for Assessment: Have students use a Three-Point Approach (SYSTH, p. 10.9) to represent impulse transmission in a neuron and impulse transmission through a synapse.

Chemicals and Synaptic transmission

Have students research and present on the effects various chemicals have on synaptic transmission and use the demonstration device to explain what is happening. Possible discussion could include chemicals that impede transmission such as cyanide which prevents neurotransmitters from forming at the synapse or the cocaine/dopamine relationship. Develop criteria with students, such as:

- Effect of the chemical on synaptic transmission is clearly explained
- Appropriate vocabulary is used
- Presentation follows a logical pattern
- Demonstration device is used to enhance explanations

Suggestions for Assessment: Assess presentations using the criteria developed with students.

S3B-5-09 Compare the general roles of nervous and hormonal controls recognizing that nervous and endocrine systems interact to maintain homeostasis.

Include: communication, speed, duration, target pathway, action.

Suggestions for Instruction

ACTIVATE

Brainstorm

Have students discuss questions such as:

- Has your stomach ever felt queasy before an exam? Why?

- Why would your heart beat faster if you stepped off a curb and a car rushing toward you blared its horn?
- You are driving along a road and a car pulls into the road directly in front of you. What happens?
- Why do you get goose bumps?
- You accidentally place your hand on a hot stove. What happens?

Acquire/Apply

Concept Map

Have students watch a video on the topic (Osmosis Jones, Fantastic Voyage) and create a concept map of how the endocrine and nervous system maintain homeostasis.

Reflexes and homeostasis

With the help of a text or other resources, have students create a flowchart describing what happens when a hand is placed on a hot surface. Students must use the following terms in their flowchart: *receptor*, *control centre* and *effector*. Have them indicate which part or parts of the nervous system are involved in reflexes.

Suggestions for assessment: Have students create a flowchart for another situation, such as an object being thrown toward their face.

Have students answer the following question in their scientific journals:

- How do reflexes help maintain homeostasis?

Direct instruction - Interaction between the nervous and endocrine systems

Explain to students that many of our homeostatic responses involve the nervous system and the endocrine system. Have students revisit the concept of thermoregulation that they have studied in unit 1. The autonomic nervous system and the endocrine system are both involved in the body's response to a change in temperature. Receptors in the skin detect external temperature and receptors in the hypothalamus detect the temperature of the blood. When the body is exposed to heat, receptors send a nervous message to the hypothalamus. The hypothalamus sends messages to muscles in arterioles, which constrict to decrease blood flow to extremities and therefore decrease heat loss. Nervous messages are sent to muscles in the skin, which cause goose bumps. This erects the tiny hairs on our skin to trap heat. Messages are also sent to our skeletal muscles, which contract and relax quickly to cause shivering. The endocrine system also gets involved in thermoregulation. The hypothalamus sends a message to the pituitary gland in the brain. The pituitary releases a hormone called TSH in the blood, which causes the release of the hormone thyroxine by the thyroid gland. Thyroxine increases the body's metabolic rate.

Suggestions for assessment: Have students complete a negative feedback BLM (see appendix 8 in unit 1) with additional information about the body's response to a change in temperature.

The fight or flight response

Another type of response can also be presented to students in order to illustrate the role of the nervous system in maintaining homeostasis. The fight or flight response is the autonomic nervous system's swift reaction to stress or danger. It causes our pupils to dilate and increases our respiratory rate and heart rate. It causes the liver to release glucose into the bloodstream, and the adrenal glands to secrete adrenaline. The parasympathetic division of the autonomic nervous system brings the body back to a state of relaxation.

Suggestions for Assessment: Have students create a narrative story that uses descriptive language to describe the biological occurrences during the "Fight or Flight" case.

Why do we need two systems to coordinate homeostasis?

With the help of text or other resources, have students compare the nervous and endocrine systems by completing the chart in **Appendix 7**. Students should understand that both these systems are essential in the maintenance of homeostasis. The nervous system acts very quickly, but its effects are short-lived. The endocrine system reacts more slowly to a change in the body, but its effects last longer.

Suggestions for Assessment: Review the chart with students to verify their comprehension and review or re-teach if necessary (formative assessment). The chart should contain the following:

Comparing two systems		
	Nervous	Endocrine
Communication	<i>Impulses across synapses</i>	<i>Hormones in the blood</i>
Response speed	<i>Very rapid (within a few milliseconds)</i>	<i>Relatively slow (Over minutes, hours, or longer)</i>
Duration	<i>Short term and reversible</i>	<i>Longer lasting effects</i>
Target Pathway	<i>Specific (through nerves) to specific cells</i>	<i>Hormones broadcast to target cells everywhere</i>
Action	<i>Causes glands to secrete or muscles to contract</i>	<i>Causes changes in metabolic activity</i>

Wellness

S3B-5-10 Describe how personal lifestyle can influence well-functioning protection and/or control systems.

Examples: impact of drugs, anabolic steroids, lack of sleep, inadequate diet...

Suggestions for Instruction

ACTIVATE

Influence of lifestyle and environmental factors on protection/and or control systems

Activate students' prior knowledge about the kinds of things that can have a negative effect on protection and control systems using a brainstorming strategy.

ACQUIRE/APPLY

Microtheme – Should you cram before an exam?

Your sister is in her first year of university and is writing exams all week. She is staying up very late every night to study and is drinking a lot of coffee to stay awake. She is also eating a lot of junk food because she says she has no time to cook. With what you know about the impact of factors such as lack of sleep and diet on protection and control systems, convince her that a good night's sleep and a balanced diet are just as important as studying in order to perform well on her exams.

Suggestions for Assessment: Refer to Appendix 3b and 3c in unit 1 for assessment tools.

Teacher note: This microtheme deals with several key factors (lack of sleep, caffeine, poor diet) that can affect protection and control systems. Students' microthemes should address all of these factors.

Personal Reflection

Have students answer the following questions in their science journal:

- What aspects of my lifestyle could have negative effects on my protection and/or control systems?
- What things could I change to positively influence my protection and/or control systems?

S3B-5-11 Investigate and describe conditions/disorders that affect protection and/or control in the human body.

ACTIVATE

Brainstorm

Have students brainstorm a list of diseases that affect protection and/or control systems.

ACQUIRE/APPLY

Student Research/ Report

Have students choose a condition or disorders associated with protection or control in the human body. Student may be given the option of sharing this information in the mode of their choice (e.g. oral presentation, informational brochure, essay). Regardless of the format, student work must contain the following information:

- ✓ Causes
- ✓ Symptoms
- ✓ Treatment (include a range of treatments, including non-Western, if possible)
- ✓ Prevention

Here are a some disorders that students could choose to study: Allergies, AIDS, Lupus, Diabetes, Arthritis, West Nile Virus, Alzheimer's Disease, Parkinson's Disease, Huntington Disease, Cerebral Palsy, Epilepsy, Stroke, Kreutzfeld Jacob Disease, Encephalitis...

Develop assessment criteria with students. The criteria should include both content and presentation components. The list above can form the basis of the "content" section of the evaluation.

Suggestions for Assessment: Student products can be self and peer-assessed with the help of criteria developed by the class.

Case Study – A Need for Needles: Acupuncture – Does it really work?

The case study "A Need for Needles: Acupuncture – Does it really work?" in **Appendix 8** looks at the effectiveness of alternative treatments to treat a protection disorder. Students are expected to gather evidence for or against acupuncture and then reach a consensus within a small group about the use of this treatment.

Suggestions for Assessment:

1. See **Appendix 9** for a peer-assessment of the group process.

2. Observe students using a checklist such as:

The student

- Presents evidence to support arguments
- Uses appropriate language
- clarifies and summarizes his or her ideas
- gives reasons for not agreeing with opposing claims
- listens actively

Appendix 1: Concept Frame BLM

CONCEPT	EXPLANATION
EXAMPLES	
LIKE	UNLIKE

Appendix 2: To Vaccinate, or Not to Vaccinate: That is the Question

By: Caren Shapiro

Paula Highsmith was quite distraught. She had returned from a routine checkup for her four-week-old daughter Jennifer. The pediatrician, Dr. Feiller, had informed Paula that he would begin giving Jennifer her DTP shots at her next appointment in a month.

Paula phoned her mother, Marion Johnson. "Oh, Mother, I don't know what to do."

"You were vaccinated as a child and you didn't have any problems," replied Mrs. Johnson.

"You know my friend Julie? Her oldest son Sam had a seizure after getting the DTP shot when he was Jennifer's age. And what about that couple on television that said the rubella vaccine was responsible for their son's autism?"

"I don't know about that couple," replied Mrs. Johnson, "but Sam was vaccinated ten years ago. If the vaccine was really the problem, I'm sure they would have a different vaccine now."

"But now there are so many shots and, besides, the diseases they prevent have practically disappeared, so why do I have to have Jennifer vaccinated?"

"Jennifer will be required to show evidence of vaccination before she'll be allowed to go to school and perhaps even some daycare centers. Don't you remember the article in the *Buffalo News* about the couple whose son wasn't allowed to register for school because he hadn't had his vaccinations? His parents said they had refused to have him vaccinated for religious reasons."

This case presents many of the issues facing parents when they need to begin the vaccination series for their child. Paula wants to do what is best for her child and she wants to make her decision based on scientific fact not emotional rhetoric.

What are the issues raised about vaccination by this case study and what kind of information will help Paula make an informed decision about vaccinating her daughter?

1. Is vaccination necessary? What are the consequences of natural infection?
 - o Do microorganisms cause asymptomatic infections or disease?
 - o What are the symptoms of the major vaccine preventable diseases?
 - o What are the possible sequelae of the infections?
 - o What groups of individuals are particularly susceptible to serious disease consequences?
 - o How are infections transmitted?
2. What kinds of vaccines are available?
3. (a) What are the advantages (e.g., efficacy and duration of immunity) of the different kinds of vaccines?
(b) What are the disadvantages (e.g., side-effects) of the different kinds of vaccines?
4. What is the purpose of vaccination (i.e., prevent infection and/or disease)?
5. Are there reasons for not being vaccinated?

- Are there beneficial effects of acquiring an infection naturally?
- Are religious concerns justifiable?

ASSIGNMENT

In order to address the general questions posed by this case study, you will individually research information on the disease(s) caused by a particular microbe and the vaccine that is used for it. Address the following questions for the microbe and vaccine that you have been assigned:

1. (a) Describe the typical symptoms of the disease(s) caused by the agent.
 (b) What are the serious sequelae (complications) caused by the agent and how common are they?
 (c) Is serious disease primarily a problem only in certain individuals? Explain.
2. (a) What kind of vaccine preparation is used (live attenuated; killed or inactivated; toxoid)?
 (b) Are there different kinds vaccine preparations available?
 (c) How long has the current vaccine been available?
3. (a) What side-effects are associated with the vaccine and what is the reported frequency for these side-effects?
 (b) What is the reported efficacy of the vaccine?
 - What proportion of vaccinated persons are protected from infection (or disease)?
 - What proportion of vaccinated persons are protected from serious disease?
 (c) What is the duration of immunity? Are booster shots necessary?
 (d) How does the latest number of reported cases compare with the number before the vaccine was available?
4. (a) Does the vaccine prevent infection?
 (b) Does the vaccine prevent the usual symptoms of disease or primarily the more serious complications of infection?

Image Credit: *Polio Vaccine Developed*, U.S. stamp (3187a) from "Celebrate the Century," a series of fifteen 33¢ commemorative stamps for the years 1950-59 issued in 1999.

Date Posted: 08/07/01 nas

Originally published at <http://www.sciencecases.org/vaccination/vaccination.asp>

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Appendix 3: Split my Brain – A Case Study of Seizure Disorder and Brain Function

Part I—Jerrod and Jump

Jerrod Hamilton is seven years old. He is an only child and much loved by his parents, Karen and Jeff, and by his extended family of grandparents, aunts, uncles, and cousins. Jerrod has always been a very active boy. He loves hockey, baseball, swimming at the local pool, climbing trees, and playing with his golden retriever, Jump. Making friends has never been a problem for Jerrod. He has several good friends he plays ball with whenever he can. He also does fairly well in school, although he is not as interested in the classroom as he is in recess.

Shortly before Jerrod's seventh birthday, he had a small seizure. He was out playing with his dad and Jump in the yard, when suddenly he stopped, his right arm twitched a little and he seemed disoriented for a few seconds. Afterward he said he was fine, but his mother Karen thought he was quieter than usual. Both his parents watched him more closely in the following days. Soon he had another couple of episodes of muscle twitching and weakness. During these seizures, Jerrod also stared blankly, moving his head slightly back and forth, and for a minute or two could not respond to his parents. When the seizures ended, Jerrod had no memory of them.

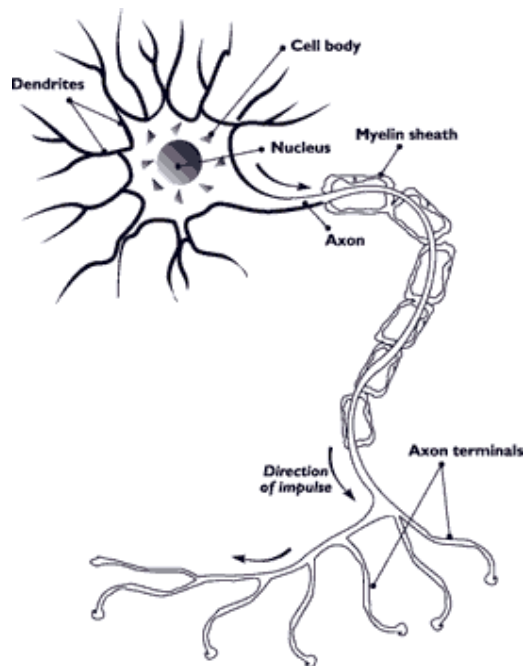
Jerrod's parents took him to their pediatrician, Dr. Madeline Sierra, who listened as Jerrod's parents described his symptoms.

"Before I try to conclude anything, I'd like to order several tests for Jerrod, including an EEG and an MRI scan. I know that sounds a little scary, but the tests are painless and noninvasive. We should get the results back very quickly. Once I see those, I'll know more about what's going on."

"A friend of mine said it sounds like Jerrod might have epilepsy," said Karen. "Is that what you think? How serious would that be?"

"Epilepsy is one possibility," replied the doctor. "It is a relatively common problem and there are some very good treatments for it."

Dr. Sierra went on to explain: "The brain uses electrical energy. The cells of the brain, called neurons, emit a small electrical charge when they send messages to other cells. This is how the brain communicates and runs your mind and body." Dr. Sierra interrupted her explanation for a moment to show them a diagram of a neuron.



"In epilepsy, the neurons somehow get out of control," Dr. Sierra continued. "The electrical activity increases to a level that the brain can not manage. That produces what we call seizures, where people lose control of their voluntary behaviors for a brief time. Sometimes seizures are nothing more than short lapses of consciousness. Other times they involve convulsions or involuntary movements."

Jeff and Karen looked at each other. "That sounds sort of like what's happening to Jerrod," Jeff said.

"Yes, it does. But let's not jump to any conclusions. I'd rather wait for the tests." Dr. Sierra paused. "I would also recommend something else," she said. "This is something that many families find helpful. Starting today, I suggest that you keep a journal or record of Jerrod's illness. Include his symptoms, tests, information from doctors, any treatments or therapies. Document everything. I will help you, but ultimately, you and Jerrod are the ones who will have to make the decisions, and there will be lots to think about along the way. I think you will be grateful later to have a record of what you learn and observe."

That evening Karen and Jeff called a family meeting to share the results of the doctor's visit.

You will help Jerrod's family by keeping the record Dr. Sierra suggested. Begin creating Jerrod's records by including the following information in a way that Jerrod's family can use and understand. You are encouraged to do further research, but you must synthesize the information you get from the research into a new form that suits Jerrod's situation. Do not just cut and paste from the Internet.

Jerrod's Records

- Why is there electrical activity in the brain? Describe how it is used by neurons.
- What happens in the brain during a seizure?
- What is epilepsy? How is it diagnosed?
- What are the procedures for doing an EEG test and MRI scan? What type of information does each of these tests provide? (See http://www.epilepsy.com/articles/ar_1066258237.html and http://www.epilepsy.com/articles/ar_1066257900.html.)
- What are some possible causes of seizures other than epilepsy?
- Based on the information in the case, what type of seizures does Jerrod appear to be having?
- What should you do during a seizure to help Jerrod?
- What are some treatments for epilepsy?

Part II—A Difficult Decision

Jerrod's tests were done right away, and his parents met again with Dr. Sierra. Jerrod's symptoms were escalating. He had daily seizures, and they included disorientation as well as uncontrollable repetitive movements on the right side of his body. He often felt tired and weak after the seizures.

"Why is this happening to Jerrod?" his mother asked. "Did he get hit in the head or something?"

Dr. Sierra shook her head. "Jerrod's test results show no evidence of an injury like that. The other good news is that there is nothing to indicate a brain tumor. I am more confident that we are dealing with a form of epilepsy, which is probably very treatable. It's also unlikely to be caused by anything he did or you did. However, given the rapid change in Jerrod's symptoms, I would like to refer you to a specialist in neurological disorders. Our office will help set up an appointment."

"Now, I want you to know I'm not abandoning you on this. I'll be following Jerrod carefully, too. But I don't think we should take any chances with this little guy." She smiled and ruffled Jerrod's hair.

Dr. Sierra's referral sent Jerrod and his parents to a neurologist who specialized in seizure disorders. Dr. Benjamin Singh questioned Jerrod and his parents carefully about the seizures. He then opened up the folder with Jerrod's test results and discussed them with Karen and Jeff.

"Here is the output from Jerrod's EEG exam." Dr. Singh showed them a printout. "This test shows us the level of electrical activity in Jerrod's brain. There is a particular pattern of spikes here that shows his seizure activity. Based on these tests and some other indications, I believe Jerrod's seizures are what we call 'partial' seizures. This means that they only involve part of the brain. And right now, his MRI scan is okay."

Jerrod's parents looked at each other with some relief.

"However," the doctor added, "if we do not find a way to reduce or control the current level of seizure activity I am afraid that Jerrod's brain will begin to show some damage, regardless of how much of it is now involved. Fortunately, there are several treatment options available to us. Let's start with a seizure medication."

Dr. Singh prescribed medication to help treat Jerrod's disorder. The first medication didn't succeed, so Dr. Singh and Dr. Sierra conferred and then tried another. After some time and other combinations of medications, it became clear that this type of treatment would be problematic for Jerrod. His seizures were becoming more severe and more frequent. The doctors ordered more tests and then Dr. Singh met with Jeff and Karen.

Dr. Singh pulled out Jerrod's records. "Here is a picture from Jerrod's new MRI scan. Look at this area in the left side of the brain. We are beginning to see some slight abnormalities here that indicate Jerrod's brain is starting to be damaged by the seizures."

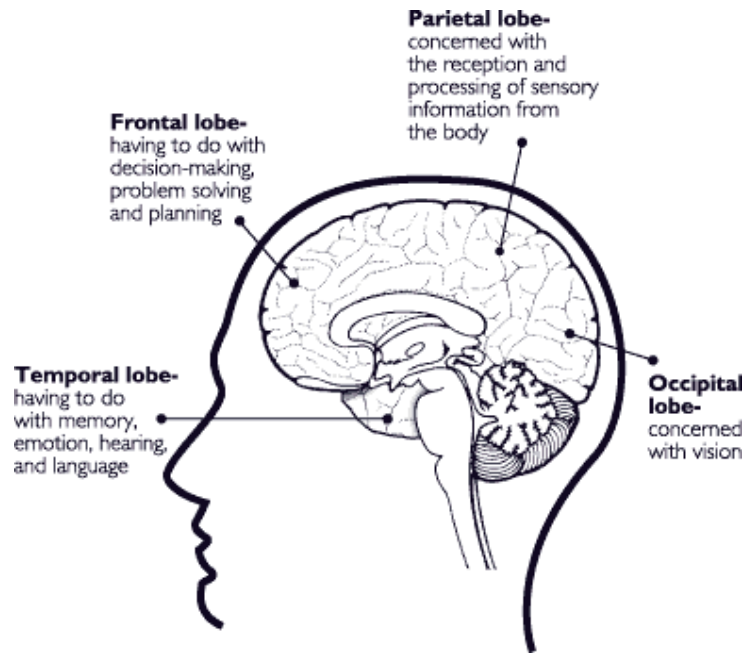
Jeff asked, "What is going on? Why don't the medicines work? You've said there's no injury or tumor. So, is this a condition he inherited from us somehow? Or is it an allergic reaction to something?"

"No," Dr. Singh reassured them. "Most likely none of those things are causing Jerrod's problem. This is also not your fault or Jerrod's fault. I believe that Jerrod has a disorder called Rasmussen Syndrome. Unfortunately, we don't know what causes it. Some people suspect it may be some type of viral infection, but we don't know for sure. So, likely there is nothing you could have done to prevent it. It involves the type and frequency of seizures we are seeing in Jerrod and usually occurs in children of about Jerrod's age. I must warn you that it is a progressive and potentially serious illness that often does not respond to medication."

Dr. Singh went on to describe another type of more drastic treatment that might work in Jerrod's case.

"The upper part of the brain, the cerebrum, is divided into two halves, or two hemispheres," Dr. Singh explained. "In some cases of severe seizure disorders, seizure activity seems to be concentrated in one half or hemisphere of the brain. This is the case in Jerrod's illness."

Dr. Singh showed them a diagram of the brain.



“In Jerrod’s case, his seizure activity is located primarily in the left hemisphere of his brain. Sometimes, we can control or even eliminate seizure activity by removing the portion of the brain which is suffering. We call this a functional hemispherectomy.”

“What do you mean, ‘removing’? You take out his brain?” Karen was horrified.

“Not his entire brain, just the parts that show abnormal activity. In Jerrod’s brain, that would mean a large part of his left hemisphere. We would remove Jerrod’s left temporal lobe, part of his left frontal lobe, and perhaps some areas in his parietal and occipital lobes. We would also sever the corpus collosum, the band of tissue that connects the two hemispheres and allows them to communicate. We would leave intact Jerrod’s thalamus, amygdala, hippocampus, and other deep structures of the brain.”

Dr. Singh looked at their worried faces. “It sounds terrible, but there have been quite a number of these surgeries performed. We have an excellent team of specialists with a great deal of experience performing this type of surgery and with the rehabilitation that would follow. In cases like Jerrod’s, where medications are not working, it can lead to a significantly better quality of life for the patient. Believe it or not, and I know it is difficult to believe, this may be our best option.”

Dr. Singh took out a sheet of paper from a folder. “I have the name of a support group that can put you in contact with people who have had to make this same decision for their children. You may want to talk with some of them before you decide.”

Jerrod's Record—continued

Add to the family records information about the following:

- What is Rasmussen Syndrome (what are its history, symptoms, prognosis, etc.)?
- What structures or abilities of the brain are concentrated in the areas of the left hemisphere that would be removed in the hemispherectomy?
- Other than reducing his seizures, how else might Jerrod's thinking or behavior be affected by losing these parts of his brain?
- What types of abilities would he still retain, because the brain structures would remain intact?
- What might the family do to help Jerrod recover after such a surgery?
- If Jerrod had the surgery, would his level of functioning get better, worse, or stay the same over time?
- What other kinds of questions would you have about the surgery? Can you find the answers?
- What decision do you recommend to the family? Why or why not go ahead with surgery?

Image Credit: Diagram showing lobes of the cerebral cortex courtesy of [National Institute on Drug Abuse \(NIDA\)](#).

Appendix 4: Bodychecking and concussions in ice hockey: Should our youth pay the price?

Anthony Marchie and Michael D. Cusimano

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Ice hockey, considered Canada's national sport, has more than 500 000 registered players,¹ many of whom aspire to play in the National Hockey League (NHL). With the drive to win at any cost permeating the game, it is not surprising that aggression is a commonly used tactic and has helped to turn hockey into a collision sport.² Nor is it surprising that youth often idolize and emulate the professional enforcers who protect their team's leading scorers.³

Bodychecking, thought by some a useful skill for winning games, is a major risk factor for injury.^{2,4,5,6,7} With the rising incidence of traumatic brain injury in hockey,^{8,9} too many Canadian youth are exposed to the lasting effects of such injuries, some of which are not fully realized until the brain completes its maturation.

Before the start of the 2002–2003 season, Hockey Canada (previously known as the Canadian Hockey Association), reversed its 20-year stance and decided to permit players as young as 9 years old to bodycheck in games.^{10,11} Although the research¹² that was used to justify this policy was later deemed flawed by its author and others,¹³ the policy stood. This ignited a debate that resounded throughout arenas, homes and league boardrooms across the country. Previously, only those aged 12–13 years and older could bodycheck, although some provinces such as British Columbia had a threshold of 14–15 years. Hockey Canada reversed its decision in May 2003 and decided to raise the starting age to 11; however, it continues to allow bodychecking starting at age 9 in an "experimental" fashion in 4 of some of the largest hockey associations in Canada.^{14,15,16} The meaning of "experimental" does not appear in Hockey Canada news releases.

Those in favour of bodychecking claim that the game of hockey demands it; youth exposed to bodychecking at only a later age will be ill equipped to avoid injury. They believe that injuries result from improperly delivered or taken bodychecks and that poor technique should not deter leagues from permitting checking. They argue that the focus should be on educating coaches and teaching bodychecking skills at all levels of hockey.

Physicians are often called upon to assess youth with hockey-associated traumatic brain injury and to counsel players and their parents about subsequent return to play. Although recommendations about return to play are numerous,^{17,18,19,20,21,22} none has been extensively validated.^{18,23} A considerable number of youth who return to play on the goodwill of these

recommendations sustain repeated traumatic brain injuries.^{18,24,25,26,27} None of the recommendations emphasizes the importance of counselling children and their families about the risks of returning to play or the option of not playing in a body-contact league. In our opinion, too much emphasis is placed on *when* to return to play and not enough on *whether* to return after an initial traumatic brain injury. To properly counsel players and inform the debate on allowing bodychecking in hockey, physicians must fully appreciate the medical risks associated with bodychecking in hockey.

What is the relation between bodychecking, injury and concussions?

Bodychecking, the most common cause of trauma in hockey,^{2,28,29,30} accounts for 86% of all injuries among players 9–15 years old.³¹ Players in contact leagues are 4 times as likely to be injured (among those 9–15 years old) and 12 times as likely to receive a fracture (among those 12–13 years old) as players in non-contact leagues.^{2,32,33,34} Of reported injuries among players 9–15 years old, 45% are caused by legal bodychecks and 8% by illegal checks, without a significant difference in the injury profiles between the 2 types of checking.³⁵ Stricter enforcement of rules would not, therefore, have much impact on injury rates.

A comparison with football injuries helps highlight the issue of serious injury in hockey. Direct fatality and injury rates for football are half those for hockey: 1.8 per 100 000 football players in high school and 7.0 per 100 000 in college.³⁶ Nonfatal catastrophic spinal cord and brain injury rates are 2.6 per 100 000 hockey players and 0.7 per 100 000 football players among high school athletes.³⁷

Among the serious injuries caused by bodychecking, concussions are of particular concern because of the risk of permanent sequelae. In studies involving youth and adults, concussions have ranged from a brief period of neural dysfunction to loss of consciousness and amnesia.^{38,39,40,41} There may be headache, cognitive, memory and executive-function disturbances, visual abnormalities, motor and sensory changes,^{38,39,40,41,42} and seizures.⁴³ Permanent electrophysiological changes in brain function have been observed in injured junior hockey players 16–20 years old who had recovered and returned to play.⁴⁴ Some reported concussions are shown to be contusions on CT scanning.

Repeated mild brain injuries in youth and adults occurring over months or years can result in cumulative deficits.^{24,25,26} High school athletes with a history of 3 concussions are 9 times more likely than those with no history of concussion to have changes in their mental status.²⁵ These patients have "long-lasting alterations in neurological motor functions,"²⁷ and some have had to relearn how to stand.⁴⁵

The younger developing brain is at an even higher risk of injury. Repeated concussions may lead to permanent learning disabilities and other neurological and psychiatric problems.^{46,47,48,49} Pre-adolescent youth with a traumatic brain injury may never fully develop the social and cognitive skills

characteristic of adults and may be more violent than those without such an injury.^{50,51}

Each season, 10%–12% of minor league hockey players 9–17 years old who are injured report a head injury,⁴⁵ most commonly a concussion.^{38,39,52} Concussions are most often caused by bodychecking^{38,39,40,53} and rarely by being struck with a puck.³⁸ A review of the literature published between 1966 and 1997 revealed that youth aged 5–17 years had about 2.8 concussions per 1000 player-hours of ice hockey; the number per 1000 player-hours was about the same among high school players, as high as 4.2 among university hockey players and 6.6 among elite amateurs.³⁸ Among Canadian amateur hockey players over 18 years old, the rate is 4.6–6.0 concussions per 1000 player-hours.³⁹ When 14 years was the age at which bodychecking was first allowed in British Columbia, 15 years was the average age at which players had their first concussion.³⁹ Undoubtedly, this threshold age will decline as the new rules about bodychecking are implemented across the country.

Reports of injuries involving youth and adult hockey players show that, despite advances in equipment design, the number of concussions is increasing.^{8,9,29,52} Based on these findings and Hill's criteria for causal association,⁵⁴ the link between bodychecking and injury and concussion is convincing. It makes sense, given our knowledge of the disease process. The link is analogous to the association between smoking and lung cancer.⁵⁴ Findings from meta-analyses^{28,38} and prospective^{29,39,40} and retrospective^{39,40,52} studies support the association between bodychecking and concussion. In addition, the incidence rates of concussion and other hockey-related injuries increase with increasing age, when more bodychecking is expected, and with higher levels of play, which suggests a dose–response effect. Learning to bodycheck when young does not reduce a player's rate of injury as he or she ages, and it prolongs the risk exposure.^{38,40,55,56}

Return to play?

Even minor concussions are serious injuries^{42,57} because they can lead to second-impact syndrome or cumulative effects in the event of another concussion. Second-impact syndrome is often the main reason for delaying a sports player's return to play after a concussion. The syndrome is caused when players who remain symptomatic sustain a second blow to the head. Even if this second blow is minor, the brain may swell rapidly, resulting in extensive further injury, or uncal herniation and death, probably because of the loss of autoregulation of the cerebral vasculature.^{58,59,60}

There are expert guidelines^{17,19,22,24,25,26,61} on *when* players can return to play, without specific reference to age, but no mention of *if* players should return to play. Our experience indicates that players who have had a second concussion, or their parents, often wished they had been given the option of whether to return to play at all. Physicians should counsel patients and their families about the risks and benefits of continued play⁶² and should explain the importance of being realistic about ambitions for a future in hockey — only 1 of every 4000 minor league hockey players will ever play in the NHL,⁶³

and only 1.3 of every 1000 will earn an athletic scholarship to an American university.⁶⁴ Because symptoms often worsen with exercise and because the length of time the brain is vulnerable after a concussion is unknown,^{65,66,67} prudence dictates erring on the side of caution when deciding on when or whether athletes should return to play.

Should bodychecking be allowed in youth hockey?

Many proponents of bodychecking argue that it is an important skill that allows players to take control of the puck, creates scoring opportunities and helps with defensive positioning and coverage, making it valuable to overall team play.¹⁸ Teams often have a checking line of 3 players who play against an opposing team's top scoring line to minimize their scoring opportunities and tire them out. As is evident in any playoff series, this checking is often used as physical and mental intimidation to gain control of the game.^{31,68}

However, the relation between aggressive play and winning is much weaker than the proponents of bodychecking believe. In a study of 1462 recorded penalties in all 18 Stanley Cup final series from 1980 to 1997, teams playing with less violence were more likely to win.⁶⁹ Compared with more violent teams, they had on average over 7 more shots on goal per game and 53 more shots on goal over a 7-game series. Losing teams engaged in more violence early in the game, which suggests that their motivation was not frustration of defeat but, rather, the mistaken belief that violence contributes to winning.⁶⁹

Although the contribution of bodychecking to a team's success is questionable, it is such an integral part of the game at the professional level that it is unlikely to be eliminated soon. However, players should not be introduced to bodychecking until they can make a mature, informed choice regarding the issue. Enforced league policies that disallow bodychecking are still the best hope for reducing young players' injuries.⁷⁰

The risks of bodychecking make it clear that checking is not necessary for play at the Canadian minor league hockey level⁵⁵ — a position supported by the Canadian Academy of Sport Medicine.⁴ The American Academy of Pediatrics recommends limiting bodychecking among players 15 years of age and less.² Variations in body size and strength³⁴ occur in all age groups, but they are most pronounced from 13 to 15 years; differences of 53 kg in body mass and 55 cm in height between the smallest and largest players have been reported in this age group.³¹ Since most physical growth is not complete before a person is 17 or 18 years old, bodychecking and hitting should be banned until at least that age. Leagues with players old enough to give consent should obtain informed consent from players before they join the body-contact league. The standard waiver that players are asked to sign to release leagues of all responsibility in the event of injury does not reach the standard of consent expected in activities with more than minimal potential harm. Also, it is unclear how informed consent will be obtained from the 9-year-old players in the 4 hockey associations who will be participating in Hockey Canada's "experiment"¹⁵ and whether the process conforms to Tri-Council Policy.⁷¹

Awareness of injury prevention is fortunately being raised through programs such as the recently implemented Fair Play in minor hockey leagues.⁷² Such programs have been shown to reduce injury rates.³² Another strategy for maximizing player safety is education.^{73,74,75} Hockey Canada has recognized this need and has launched 2 programs to help coaches improve their skills: the Competency Based Educational Program and the Coaches Mentorship Program.⁵⁵

Although coaches have a responsibility to teach safety techniques and coaches and parents should act as role models for good sportsmanship, these actions rarely happen consistently.⁶⁹ Recently, 22 of 34 minor league coaches refused to participate in a video about concussion prevention because they thought that watching the video would make their players less aggressive and successful as a team.^{45,73} In one community, players 14–15 years old were less likely than younger players to believe that sportsmanship was "real important."^{31,70} Moreover, 26% of players 12–15 years old who understood that bodychecking from behind could cause serious injury or death reported that they would be willing to do so if they were angry or wanted "to get even."³¹

In addition, parents may be encouraging their children to win at all costs in the hope of their pursuing scholarships and professional contracts.⁷⁶ In one study, 32% of injured players said that they would continue to bodycheck to ensure a win; an additional 6% said they would do so in order to injure another player.⁷⁷ Since aggression may be a learned behaviour rewarded in sport,⁷⁸ youth and the public in general must be educated about its dangers and social unacceptability. Ideally, as role models for youth,⁷⁹ professional players and media personnel should emphasize nonviolence.

Moreover, although the use of protective equipment may prevent some injuries, it may foster the attitude that it can prevent all injuries, it may lead to more lenient enforcement of the rules and, paradoxically, it may increase the number of serious injuries.^{74,75,80,81,82,83}

Education and the elimination of bodychecking remain the most effective strategies for preventing concussions and other hockey-related injuries. Eliminating bodychecking could refocus the game on fun and skill — on skating, shooting, passing and team play. Physicians must play their roles as socially responsible citizens: the future of our youth and the game depend on it.

Footnotes

This article has been peer reviewed.

Contributors: Both authors contributed substantially to the writing of the manuscript and approved the final version.

Acknowledgements: Dr. Cusimano is supported by research grants from the Ontario Neurotrauma Foundation. The opinions expressed in this article are those of the authors and do not necessarily reflect those of the foundation.

Competing interests: None declared.

References

See the following website for references used in this article:

<http://www.cmaj.ca/cgi/content/full/169/2/124>

Appendix 5 : Article Analysis Frame

ISSUE

AUTHOR'S OPINION (EVIDENCE)

SUMMARY

YOUR OPINION

QUESTIONS

RELEVANCE TODAY

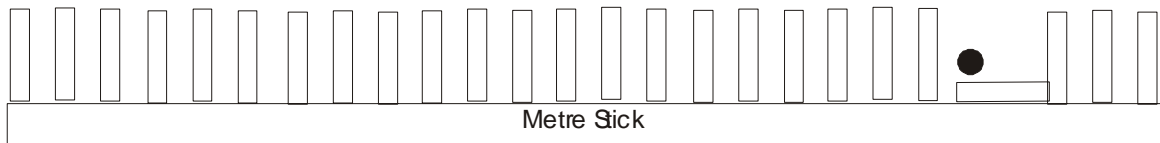
Appendix 6: Impulse Transmission Demonstration

The following apparatus is designed to demonstrate the transmission of a nerve impulse along the axon of a neuron and at the point of a synapse.

Materials

1 pkg. of dominoes 1 pencil
1 metre stick 1 marble
tape

Set up apparatus as indicated in the diagram below



The dominoes are spaced along the length of the metre stick and secured in place with tape along one side. A gap is left in the space of the dominoes to serve as a synapse. A pencil can be cut in half and secured in place on either side of the meter stick to serve as rails for the marble.

At the start of the demonstration the neuron is polarized or resting and not actively carrying an impulse. However, a light tap which nerves as neural stimulation is applied one the first domino starts the impulse. If the threshold is met then the impulse will be transmitted. Similarly, is the threshold is not met than no impulse is transmitted according to the all-or-none response. The last domino before the synapse pushes the marble which acts as a neurotransmitter in the synapse to carry the impulse to the next neuron. After the impulse is transmitted the neuron is unable to be stimulated again, this is the refractory period. By tilting the apparatus the dominoes are once again standing and ready to carry the next impulse.

Appendix 7: Comparing Two Systems

Compare the way these two systems protect the human body.

	Nervous System	Endocrine System
Communication		
Response Speed		
Duration		
Target Pathway		
Action		

Appendix 8: A Need for Needles Acupuncture—Does it Really Work?

by

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Janet sat in her car in the driveway of her mother's house and eyed the front yard, which was completely taken over by a vegetable garden. It was possible that somewhere in there her mother was hidden, picking over her prized vegetables. Her mother was a bit eccentric. Actually, the word crazy sometimes came to Janet's mind when considering her mother. But she never said it out loud. This was her mother after all.

Janet took a deep breath and then grabbed the door handle. It was time for another lunch with her mother, a meal that would inevitably turn into an argument, as they always did.

Audrey greeted her daughter at the door even before Janet had a chance to knock.

"Why, hello, darling."

Janet was carefully unhooking a tomato vine from her foot before her mother noticed. She looked up and greeted her with a sense of apprehension.

"Hello, Mother."

"Oh, Janet, it's so nice to see you. Isn't it just a gorgeous day today?" Her mother was bubbling over with her usual happiness and high spirits.

"It's hot," Janet grumbled, "too hot."

"Well, come on in. I've just put together a delicious salad for lunch."

Salad again, Janet thought to herself. She was glad she had stopped at McDonalds on the way over. She forced a smile and followed her mother into the house.

Lunch went well, until Audrey decided she couldn't hold her idea back any longer. "I was reading that magazine you got me the other day."

“Oh, really,” replied Janet, pleased. She had gotten her mother a subscription to *Time* magazine for Christmas. It was her attempt to get her mother on the same track as the rest of the world, or at least aware of what was happening. She knew her mother used them as coasters on the coffee table more than anything else.

“Yes, and I came across this really interesting article. It was on acupuncture.” Janet sighed. Her hopes evaporated. Of course, the only thing to interest her mother was an article on some sort of nonsense.

“As I was reading it, it began to make a lot of sense. It mentioned that arthritis was one of the things that it helped. And seeing how you’re always telling me that arthritis is why my wrists bother me, I thought it might be helpful. My wrists have been acting up a little. I couldn’t garden the other day. My poor tomato plants are going to wither away in the sun if I don’t get to them soon.”

“Mom, you don’t want acupuncture. The whole thing is ridiculous. It’s a big scam. There is no way that putting needles in your body is going to stop your pain. What you need is to see a doctor.” Janet’s frustration level was quickly rising.

“I had a feeling you would say that,” Audrey sighed. “So I think you should read the article.” She handed her daughter the magazine.

“No, Mom,” Janet said pushing it away.

Janet knew she had the final say in this situation. After all, she worked for her mother’s insurance agency and had pulled some strings to get her mother covered. She felt strongly that she had a say in what treatment her mother had. Audrey had reluctantly accepted the insurance, knowing that Janet would have some control over her life. She solved the problem simply. She avoided going to doctors.

“Mom, I really think you should go to a doctor about your arthritis. If you don’t, it will just get worse. This could become serious. I’m sure there are tons of different medicines you could choose from to help the pain,” Janet preached. It was a speech she had given many times before, yet as before it got nowhere with her mother.

“Janet—don’t start that again. You know that I’m not putting any drugs into my body, especially when there’s no good reason.”

“No good reason? Mom you’re in pain,” Janet responded with a touch of sympathy entering her voice.

Audrey sighed. She looked down and realized she had been massaging her wrist the whole time. She knew she was being difficult. Her daughter was right, at least about the pain.

“Ok—what if we compromise,” Audrey began. “What if we talk to a doctor about acupuncture. Will you be convinced to let me try the treatment if you hear from a doctor that it is beneficial?”

“Fine,” Janet replied. She knew no sensible doctor would agree to sticking needles in her mother to get rid of her pain. The whole thing was ludicrous.



It was two weeks later and Janet and her mother were on their way to see a doctor. Audrey had already jumped out of the car and had headed into the doctor’s office. Janet dragged herself out and followed.

They sat in the waiting room for what seemed like hours. Janet, in her business suit, was hiding behind the *New York Times* trying not to imagine what people were thinking of her mother. At least her mother had taken off her apron, but she was still in gardening clothes, straw hat resting in her lap. The nurse had seemed amused when she collected the initial data. She now reappeared.

“Audrey Baker, you can come in now.”

Janet was glad to escape the eyes of everyone in the waiting room and followed her mother into the doctor’s office. Moments later, Dr. Ramirez walked in as they were getting settled.

“Hello, how are you two doing today?” Dr. Ramirez asked.

“Great, thank...” Janet began.

“Just wonderful,” Audrey interrupted. “The reason why we’re here today is that my daughter can’t seem to grasp the concept of acupuncture. I have some

pain in my wrists, and I understand it can help that. So, I was wondering if you could just take a couple minutes to explain it to her.”

Janet scowled, but before she could say anything, the doctor answered.

“What kind of pain do you have?”

“Oh, nothing serious,” Audrey said. “I’m just getting old and my bones aren’t what they used to be. When I’m pulling weeds they tend to get a little sore.”

“Oh, you’re a gardener,” Dr. Ramirez said, pleased. “You know, I have a garden of my own.”

“Really!” said Audrey. “Flowers or vegetables?”

“Both, actually.”

“OK,” Janet interrupted. “I’m sorry to be rude, but I am on a tight schedule. Can you just tell my mother that acupuncture will not work on her pain, so that we can set up a suitable treatment.”

“I see,” Dr. Ramirez said.

He could see how this was going. He looked at Audrey’s chart and paused as he thought how to most effectively approach this case.



Your task is to assist Dr. Ramirez in reaching his goal. There is a recent trend in medicine termed “evidence-based medicine,” in which physicians search the literature to determine effective approaches to treatment, rather than just doing what one of their teachers taught them to do in medical school. Your task is to approach the case in this manner, to scientifically investigate the pros and cons of acupuncture treatment, consult with Dr. Ramirez on what you find, and offer suggestions on how to best proceed with Audrey and Janet.

You will be divided into groups of four; two will search for the “pro” literature (that which supports acupuncture) and two for the “con” literature. Be sure you understand the theory behind acupuncture, the different treatments that acupuncturists might use, and *the evidence or lack of it* that suggests that

acupuncture may work, including the argument that any positive results are due to the placebo effect.

When you return to class armed with evidence, your job will be to work out a consensus consultative opinion to Dr. Ramirez in your group of four students, and to share that opinion with the rest of the class. Part of that sharing will involve the soundness of the evidence. Then, you will need to work out among yourselves what you think Dr. Ramirez should do.

A good place to start your research would be the Acupuncture Information and Resources,” National Center for Complimentary and Alternative Medicines. National Institutes of Health website at <http://nccam.nih.gov/health/acupuncture/>.

Appendix 9: Assessment – Collaborative process

Assessment of Collaborative Group Work

Assess your collaborative processes, using the following rating scale.

Rating Scale

4 We were consistently strong in this area.

3 We were usually effective in this area.

2 We were sometimes effective in this area.

1 We were not effective in this area. We experienced problems that we did not attempt to resolve.

Group Process

Rating

- We were respectful of individual groups members' approaches and strengths.
- We encouraged and supported each person in contributing to group discussion and decision making.
- We questioned and challenged each other's ideas, but did not make personal attacks.
- We tried to explore a wide range of ideas and perspectives prior to making decisions.
- We shared work and responsibility equitably.
- We dealt successfully with the problem of absent or disengaged members.
- We made our decision through consensus.
- We used our time productively.