

Canada: Province Specific Curriculum, Framework and Codes for Classroom Use of Immune Attack

Ontario

<http://www.edu.gov.on.ca/eng/curriculum/secondary/science.html>

Course: SBI3U

Provincial Code/Description

- explain the relevance of current studies of viruses and bacteria to the field of biotechnology (e.g., give examples of how viruses and bacteria are used in biotechnology);

Course: SBI3C

Provincial Code/Description

(Microbiology unit)

- evaluate the impact of viral, bacterial, and fungal infections on the health of host organisms, and on humans in particular (e.g., examine the relationship between the emergence of new species of bacteria and viruses and the use of antibiotics, and determine the health implications for human populations);
- describe some ways in which viruses, bacteria, and fungi are used in biotechnology (e.g., describe the use of viruses as vectors and as restriction enzymes);

Course: SBI4U

Provincial Code/Description

(Microorganisms unit)

- describe the mammalian immunological response to a viral or bacterial infection;

Course: SNC3E

Description:

The Immune System and Human Health

Overall Expectations

By the end of this course, students will:

- demonstrate an understanding of the human immune system and its capacity to combat disease;
- carry out laboratory studies of micro-organisms that cause disease;
- describe and explain how vaccines and antibiotics are used to assist the immune system in preventing and overcoming disease, and analyse the impact of social and environmental factors on human health.

Specific Expectations

Understanding Basic Concepts

By the end of this course, students will:

- explain, in general terms, the cellular and chemical components of the human immune system (e.g., describe how the cell membrane of white blood cells deals with infection; explain how chemicals in the immune system attack foreign or abnormal proteins to protect the body);
- distinguish between communicable and non-communicable diseases;
- describe the role of blood components in controlling pathogens (e.g., clotting factors, white blood cells, antibodies);
- identify the causes, effects, and treatments of common diseases associated with the immune system (e.g., AIDS).

Developing Skills of Inquiry and Communication

By the end of this course, students will:

- carry out standard laboratory tests safely to identify substances related to the immune system (e.g., collect and culture different bacteria to measure the effectiveness of antibacterial agents);

- collect data on the immune system, using instruments appropriately and safely (e.g., observe with a microscope prepared slides of various disease-causing microbial organisms, or slides of cellular components of human blood);

Course: SNC4M**Description***Pathogens and Disease**Overall Expectations*

By the end of this course, students will:

- demonstrate an understanding of micro-organisms, their biological effects, the diseases they cause, and the metabolic and environmental barriers to the spread of disease;
- investigate the nature and growth of representative pathogens, the response of the immune system to them, and the effect on them of various drug therapies and sterilization techniques,
- using appropriate laboratory procedures and equipment safely and accurately, and gathering and integrating information from print and electronic sources;
- evaluate the measures available for the control of disease, including the role of public policy and the use of health-related technologies and scientific knowledge.

*Specific Expectations**Understanding Basic Concepts*

By the end of this course, students will:

- define, with examples when appropriate, such terms as: *micro-organism, pathogen, parasite, disease, epidemiology, pathogenesis, vector*;
- describe the characteristics and reproductive cycles of representative pathogens (e.g., lysogenic cycle, lytic cycle, infectious cycle of malaria);
- describe the modes of transmission of diseases, including those that are insectborne (e.g., malaria, encephalitis), airborne (e.g., influenza, tuberculosis), water-borne (e.g., cholera, poliomyelitis), sexually transmitted (STDs; e.g., AIDS), and food-borne (e.g., mad cow disease, trichinosis, food poisoning);
- describe and explain the immune response of the body as a natural defence against infection (e.g., the immune response to salmonella food poisoning, or trichinosis);
- describe the use of vaccines, antibiotics, antiseptics, and other drug therapies in the control of pathogenesis;
- describe non-medicinal ways to protect oneself from contracting pathogenic diseases (e.g., aseptic techniques, personal hygiene).

Quebec

http://www.mels.gouv.qc.ca/DGFJ/dp/programmes_etudes/secondaire/genbio.htm

http://www.mels.gouv.qc.ca/DGFJ/dp/programmes_etudes/secondaire/pdf/biohuma.pdf

Immunology not taught

Newfoundland & Labrador

<http://www.ed.gov.nl.ca/edu/sp/sh/sci/bio2201/Bio%202201%20Outcomes.pdf>

Course: Biology 2201

Description:

- predict the impact of environmental factors such as allergens on homeostasis within an organism (317-6)
- explain the meaning of the terms antigen (allergen), antibody, and their role in an allergic reaction explain how the immune system helps to maintain homeostasis (317-1)
- explain the complete immune response
 - (i) 1st line of defense (physical and chemical barriers)
 - (ii) 2nd line of defense (inflammatory response)
 - (iii) 3rd line of defense (immune response)
- compare the role of the various white blood cells in the defense process including phagocytes and lymphocytes

- compare the mechanism of various forms of acquired immunity including passive (breast milk) and active (actual exposure, vaccines)
- identify how autoimmune disorders determine diseases such as rheumatoid arthritis (317-4)
- analyze why and how a particular technology was developed and improved over time (115-5)
- analyze and describe examples where technologies were developed based on scientific understanding (116-4)
- debate the merits of funding specific scientific or technological endeavors and not others (117-4)
- identify in general terms the impact of viral, bacterial, genetic, and environmental diseases on the homeostasis of an organism (317-4)

New Brunswick

<http://www.gnb.ca/0000/publications/curric/Biology112&122.pdf>

Course: Biology 112

Description:

Students will be able to demonstrate understanding of the following' and their importance/significance:

- blood cellular components and the role of the immune system in protecting the human organism and maintaining internal equilibrium.
- awareness of the complexity of the immune *system* and its sensitivity to factors like stress and infection
- describing, in general, how the immune system recognizes and destroys pathogenic organisms that penetrate the organism's first line of defense.

Prince Edward Island

<http://www.gov.pe.ca/educ/index.php3?number=76770&lang=E>

Immunology not taught

Nova Scotia

<https://sapps.ednet.ns.ca/Cart/items.php?CA=15&UID=2007102823551969.11.98.66>

Course: Grade 11 biology

Description:

- Immune systems act to maintain homeostasis
- describe disorders linked to the immune system and their effect on the homeostasis of the system and the organism as a whole (317-4)
- predict the impact of environmental factors such as allergens on homeostasis within an organism linking this to the immune system (317-6)
- explain, using the immune system, how different plant and animal systems, including the vascular and nervous systems, help maintain homeostasis (317-1)
- analyse natural and technological systems related to the immune system, to interpret and explain their structure and dynamics (116-7)

Saskatchewan

<http://www.learning.gov.sk.ca/adx/adxgetmedia.aspx?DocID=&MediaID=1788&Filename=biology2030.pdf>

Course: Biology 20

Provincial Code/Description:

Unit #3- 2. *Recognize the role of monera, protists, and fungi in the ecosystem.*

- 2.1 Describe viral structure and activity.
- 2.2 Identify some viral diseases prevalent in plants, animals, and humans in Saskatchewan.
- 2.3 Discuss the various ways bacteria are classified.

- 2.4 Describe some diseases caused by bacteria which affect organisms living in Saskatchewan.
- Note: Saskatchewan allows for 'extra classroom hours' which would allow for an expansion of the unit to include some immunology

Course: Biology 30

Provincial Code/Description:

Unit #4 – Animal Systems

- 2.3 Consider the role of the blood in the immune system and the effect of the human immunodeficiency virus on the T4 cells of the blood.
- Note: Saskatchewan allows for 'extra classroom hours' which would allow for an expansion of the unit to include some immunology

Alberta

http://www.education.gov.ab.ca/k_12/curriculum/bySubject/science/default.asp

Course: Biology 20-30

Description:

General Outcome 2

Students will explain the role of the circulatory and defense systems in maintaining an internal equilibrium.

- research and design a simulation or model of the functioning of the main components of the human immune system **(PR–NS1, PR–ST2) [ICT C6–4.4]**

Manitoba

<http://www.edu.gov.mb.ca/k12/cur/science/scicurr.html>

Course: Biology 30

Provincial Code/Description

S3B-5-02

- Describe physical and chemical barriers that protect the body from foreign agents. Examples: skin, melaonin, mucous membranes, cilia, pH (stomach, vagina) tears, sneezing, coughing, lymphatic filtering (tonsils, adenoids)...

S3B-5-03

- Describe the body's response to allergens, vaccines, viruses/bacteria. Include: inflammatory response, immune response.

S3B-5-04

- Explain the role of the lymphatic system in protecting the human body. Include: lymph vessels, lymph nodes, lymph.

S3B-5-05

- Describe examples that illustrate the critical role of the immune system in maintaining personal and societal health and investigate related issues. Examples: introduction of new diseases to a population, epidemics, organ transplant and rejection...

British Columbia

http://www.bced.gov.bc.ca/irp/bio1112_06.pdf

Course: Biology 11

Description:

E2

- evaluate the effects of viruses on human health
- define and give examples of viral specificity
- describe the body's basic lines of defence against a viral attack, including primary line of defence (e.g., skin, mucous membranes, tears) secondary line of defence (e.g., phagocytic white blood cells engulf viruses) tertiary line of defence (e.g., white blood cells called lymphocytes produce antibodies)
- give examples of ways to reduce the spread of viral diseases

Yukon

<http://www.education.gov.yk.ca/psb/curriculum.html>

The Government of Yukon is a full partner in the Western and Northern Canadian Protocol (WNCP). This protocol supports the development of common curriculum frameworks for Western and Northern Canada.

Within these frameworks, the British Columbia program of studies forms the basis of the Yukon curriculum

North West Territories

http://www.ece.gov.nt.ca/Divisions/kindergarten_g12/indexK12.htm

*the link to biology 20/30 is incorrect...it displays 'science 10' which is not relevant however, it is based on the Alberta curriculum which is above

Nunavut

http://www.gov.nu.ca/edu/eng/css/progstudies7_12.htm

The files on this site are the programs of study and curricula approved for use in Nunavut schools from grades 7 to 12. These programs and curricula are the ones that were approved for use in Nunavut schools at the time of division from the Northwest Territories. New programs and curricula are currently being developed for our schools, and this information will be updated on an annual basis