



Demystifying Biosimilars

Science Writers' Guide



Forward

When you consider our ancestors harnessed living organisms to bake bread, brew beer, and make wine and cheese, “biotechnology” is in some ways as old as human history. But the field of biologic medicine – which provides treatments for many serious conditions – has harnessed yet another benefit from living organisms.

The term biotechnology came into use in the early 20th century. Initially directed towards improving food production, biotechnology soon expanded into medical uses, led by the 1940s introduction of penicillin, which was made through a deep fermentation process. In the same way penicillin greatly impacted countless lives over a half-century ago, today’s biologic medicines are significant to patients with serious illnesses. In this exciting field, scientists and engineers focus their skills on harnessing the natural process of cells, viruses, and other microscopic living organisms and alter the genetic make-up of the organisms to bring about specific results.

As patents on biologic medicines expire, new manufacturers are able to enter the marketplace with their versions of the originator biologics. These versions are known as biosimilars (or subsequent entry biologics). While generic drugs are being introduced when small molecule (synthetic) medicines go off patent, biosimilars are not exact copies of the originator product and therefore they cannot be considered as being generic biologic medicines. Biologic medications are manufactured through living cells. Just like wine or bread, the production conditions can result in products with different characteristics when administered to patients. Since biosimilars are not identical to the original biologic, biosimilars should not be deemed interchangeable with the original biologic medicines. The choice of which product works best for each patient must be left to the physicians responsible for establishing the regime of care required for their patient.

This guide attempts to “demystify biosimilars”. We hope to provide up to date information regarding the field of biologic medicine and the role the newest entrant—biosimilar medicines—plays.

BIOTECanada

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The advent of biologic medicines

The biotechnology revolution has brought about a new class of drug: the biologic. Biologic medicines are made by using living cells to produce proteins used to treat disease. Insulin is an example of a biologic. Before 1982, diabetic patients had to use insulin extracted and purified from the pancreas of cows or pigs. Scientists subsequently discovered how to modify cells to cause them to express insulin in the laboratory, allowing the manufacture of insulin using that method.¹

Over the past 30 years, biologic medicines have provided treatment options for people who suffer from some of the most serious medical conditions. Diseases such as rheumatoid arthritis, cancer, rare blood disorders, multiple sclerosis, diabetes and HIV/AIDS can now be treated effectively, thereby providing new quality of life for the patients. Today, there are over 200 biologics and vaccines on the market worldwide.² The majority of these products are therapeutic proteins.

The outcomes for patients have been remarkable. In the field of oncology, treatment with a biologic has cut deaths in half for those with non-Hodgkin's lymphoma.³ The use of biologics has successfully addressed the progression of rheumatoid arthritis in patients by slowing or halting joint erosion.⁴ Even employers benefit thanks to the effective treatment of rheumatoid arthritis with biologic medicines, resulting in fewer lost work days and increased productivity.⁵

Today there are more than 900 biotechnology medicines and vaccines in development.⁶ Biologic medicines may be the best hope for producing effective treatments for many diseases where currently none exist.

Biologics are different from synthesized drugs

Drugs can be categorized as synthetically or biologically produced. Synthetic drugs like the familiar Aspirin[®] (acetylsalicylic acid) are created with simple chemical ingredients and are characterized as "small molecules." Biologic drugs are large, complex proteins. Unlike small molecule synthetic drugs, biologics do not easily penetrate cell membranes and are not very stable in the stomach and intestines (the gastrointestinal system). As a result biologics are most often injected or delivered intravenously.

Biologics are more complicated to make than small molecule drugs. They are produced by living cells (animal, bacteria and yeast) and are sensitive to minor changes in the manufacturing process. Just as wine grapes that are grown in different regions can result in different tastes, small manufacturing differences can significantly affect the nature of a finished biologic and the way it functions in the body.

Before a biologic can be considered for approval for sale to the public by Health Canada, sufficient scientific evidence must be collected to show that it is safe, efficacious and of suitable quality.⁷ Biologics differ from other drugs for human use in that they must—in addition to the information required for other drugs—include more detailed chemistry and manufacturing information. This is necessary to help ensure the purity and quality of the product, including safeguarding against contamination from an undesired microorganism or another biologic.

If there is sufficient evidence to support safety, efficacy or quality claims for a New Drug Submission (NDS) or a Supplement to a New Drug Submission(S/NDS), the product is issued a Notice of Compliance (NOC) and a Drug Identification Number (DIN) indicating that the biologic is approved for sale in Canada. Health Canada also monitors biologic adverse events, investigates complaints and problem reports, maintains post approval surveillance, and manages recalls, as required.

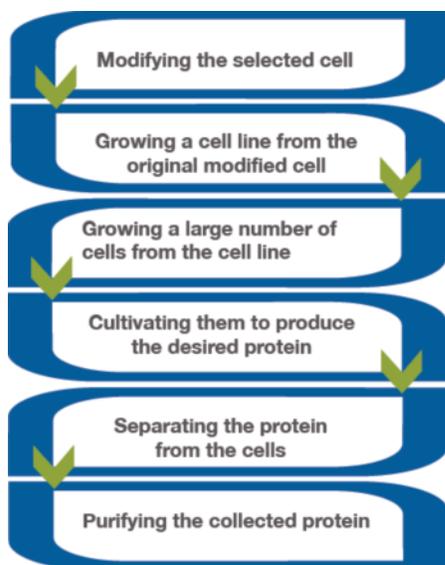
Today there are more than 900 biotechnology medicines and vaccines in development. Biologic medicines may be the best hope for producing effective treatments for many diseases where currently none exist.



Manufacturing of biologics is more complex

Manufacturing biologics is generally more complex than the production of traditional synthetic drugs. There are a number of reasons for this, most notably, the sensitivity of the living organisms from which biologic medicines are made and the multitude of factors that influence the behavior of those living organisms.

A high level of precision is required in the manufacturing process to produce a consistent product time after time. The starting materials for most biological medicines are genetically modified cells. Once scientists design and select a cell that produces a medically valuable protein, they replicate it to create a unique cell line. The major steps involved with the manufacture of biologic medicines include:



Even very small changes in production, such as minor equipment or environmental variations, can alter efficacy, safety or availability of the resulting medicine. A particular safety concern with biologics is the potential for the body to generate an unwanted immune response. The manufacturing process, in particular, can influence the active substance and the quality and quantity of impurities, all of which can be triggers for an immune response.

In order to assure the quality and consistency in the final product, the production of biologic medicines requires a high level of monitoring and testing throughout the process. A biologic medicine typically has around 250 in-process tests during manufacturing, compared with around 50 tests for a chemical medicine.⁸

This attention to manufacturing detail carries through to Health Canada approval. As part of the New Drug Submission (NDS) process, biologic manufacturers must also supply Product Specific Facility Information that outlines the method of manufacture of the biologic in significant detail. Further, an inspection of the manufacturing facility, known as an On-Site Evaluation (OSE), is completed to assess the production process and facility.

Some major biotechnology-derived medicines have lost or will soon lose patent protection in Canada and will become open to manufacture and marketing by other companies. These products are referred to as biosimilars.

Biosimilars enter the market

Some major biotechnology-derived medicines have lost or will soon lose patent protection in Canada and will become open to manufacture and marketing by other companies. These products are referred to as biosimilars or subsequent entry biologics (SEB). While Health Canada uses the term “subsequent entry biologic”, the term “biosimilar” is commonly used worldwide, including Canada. Other terms such as “follow on biologics” have also been used.

A biosimilar is a copy of a biologic medicine that is similar, but not identical, to the original medicine. Health Canada defines a biosimilar as “a biologic drug that enters the market subsequent to a version previously authorized in Canada, and with demonstrated similarity to a reference biologic drug.”⁹

Biosimilar medicines have been available in the European Union (EU) for several years. The necessary legal framework for biosimilar medicines was adopted in the EU in 2005¹⁰ and the first biosimilar medicines (human growth factor) were approved by the European Commission in April 2006.¹¹

Health Canada’s guidance on biosimilars was developed in 2010.¹² Of note, Health Canada states that SEBs (biosimilars) are not considered “generic” biologics and that Health Canada approval of a biosimilar does not mean that the agency has declared it is equivalent to the original.¹³ To date, there is only one biosimilar approved for use in Canada. Health Canada issued an NOC to Sandoz Canada Inc. for the product Omnitrope™ in 2009.¹⁴ Omnitrope contains the medicinal ingredient somatropin which is a recombinant human growth hormone.

Biosimilars are not "generic biologics"

As biologics are made from living cells, small variations may have an impact on patient safety and efficacy. These may only be detected through the conduct of human clinical trials. Unlike generic drugs (see sidebar), biosimilars, by definition, are unlikely to be identical to the originator biologic. They are 'similar' but not identical.

If a company submits appropriate clinical data that supports that its product is both effective and safe, the product should be approved for sale; however, marketing approval does not mean that a biosimilar is interchangeable with the originator product.

Understanding Synthetic Molecules and their Generics Interchangeability and Substitution:

Theoretically, any generic drug that is bioequivalent to its trade-name counterpart may be interchanged with it.

Bioequivalence: Manufacturers must conduct studies to determine whether their version is bioequivalent to the original drug—that is, that the generic version releases its active ingredient (the drug) into the bloodstream at virtually the same speed and in virtually the same amounts as the original drug.

Biosimilars are similar.....but not identical to the original medicine



Potential for product substitution may impact patients

Substitution of brand-name small molecule (synthetic) drugs with their generic versions is commonplace once the patents on the innovative medicines have expired. This same practice cannot be followed when considering biosimilars—biosimilars are not generic biologics. They are not considered interchangeable. As noted earlier, substituting biologics (or substituting a biologic with a biosimilar) risks altering a patient's response to a medication. The impact of substitution on patient outcomes must be considered and biosimilars prescribed only by physicians who deem such actions appropriate.

Regulatory policies around the world consistently highlight the need to involve the physician in the decision-making process. The European Medicines Agency (EMA), the European regulatory body, has stated that "since biosimilars and biological reference products are not identical, the decision to treat a patient with a reference product or biosimilar medicine should be taken following the opinion of a qualified health professional". The U.S. Federal Drug Agency (FDA) has stated "the agency will develop standards to ensure that products not deemed interchangeable are not inadvertently substituted for a reference product without the prescriber's consent." Although Health Canada does not support substituting a biosimilar for the original biologic, each province has the authority to decide whether it will allow substitution.

Biologics are complex drugs and even small differences between products may have the potential to cause unexpected outcomes if a patient is switched from drug to drug.

Substituting one biologic for another could impact a patient's response to a medication. In rare cases, unwanted immune reactions can have detrimental effects on the health of a patient.

In some cases this may require increasing the patient's drug dose, resulting in higher treatment costs. Another risk is that the body may begin to identify both the biologic protein and the endogenous (human made) protein as foreign substances and, as a result, all these proteins are destroyed by the immune system. This is a very significant patient safety concern and supports the reason why physicians must be notified if a substitution is being considered.

As noted above, switching patients between biosimilars and originator products presents special, as yet not fully understood challenges such as potential immunogenic reactions. In general, immunogenic responses to biologics are complex and may vary widely with regard to timing and mode of expression following initiation of treatment. For these reasons, pharmacists should not make substitution decisions without the consent of the prescribing physician.¹⁶

Pharmacovigilance and traceability

Effective pharmacovigilance is particularly important in biologics. These products are complex and manufacturers' and regulators' knowledge of the product's safety profile continues to grow as experience with the product increases. As such, post-market surveillance and sometimes even further studies are critical to enhance the body of knowledge on the safety profile of the product. For example, with biologic medicines, rare but significant immunologic effects may not be detected in conventionally-sized premarket clinical trials.

The European experience with Eprex[®] (epoetin alfa) illustrates these challenges and highlights the importance of an effective pharmacovigilance system. In that case, an unexpected number of cases of a severe immunogenic effect known as pure red cell aplasia (PRCA) were reported. Even with only three erythropoiesis-stimulating agents approved in Europe at the time, traceability to the responsible product took months of forensic research. The increased rate of PRCA was eventually attributed to a formulation change for that product (i.e., changing the stabilizer).¹⁷ With the arrival of biosimilars, there will be more products per class on the market and more challenge in assuring accurate attribution of events.

As biosimilars are an evolving field, there is still much discussion concerning the naming conventions for biosimilars. In Europe, the originator and biosimilar sometimes share the same International Nonproprietary Name (INN). This could lead to confusion in attributing adverse events to the correct drug and in ensuring that patients are correctly dispensed the drug that was prescribed for them. Health Canada is in dialogue with the World Health Organization and other country regulators to develop potential solutions that ensure traceability and safety.

Manufacturing and supply of biosimilars

Every biologic is manufactured using a unique set of processes involving living cells, requiring several stages of production. A single change in the manufacturing process can alter the drug and the precise effect it has on the human body. Even small variations can alter efficacy, safety or availability of the resulting biologic medicine. Knowing which variations matter requires extensive manufacturing experience. The example of Eprex cited above illustrates the impact small manufacturing variations can have on patient outcomes.

Manufacturing process, quality control and variances are proprietary to the originator company. Expiry of patents does not mean this information becomes public, so these processes will need to be independently developed by companies manufacturing biosimilars. As a result the process to manufacture a biosimilar likely will not be exactly the same as the biologic drug and could result in a similar but still different final product.

Maintaining a reliable product supply is critical. Manufacturers have a responsibility to ensure strategies are in place to minimise incidences and possible disruption of product supply. This is true for all drugs, but is especially critical when those drugs are biologics and biosimilars. Biosimilars will inevitably differ from their reference products, and these differences may lead to differences with regard to dose, pharmacokinetics, immunogenicity and adverse events.

Patient-physician choice

Biosimilar manufacturers have to appropriately invest in clinical development, complex manufacturing and post-approval safety monitoring programs similar to that of originator drugs, which can be expensive. While there is little experience in Canada, studies based on other country experiences suggest that the price differential between originator biologics and biosimilars is likely to be smaller than that between brand name synthetic drugs and their generic versions. While differences in acquisition prices between originator and conventional generic drugs of up to 80 % have been observed, differences between originator biologics and biosimilars are more likely to be in the region of 15 to 30 per cent.¹⁸

Cost should not be the primary driver for decision making in choosing the right biologic medicine for a patient – **science and patient safety should lead decisions.**



Biosimilars extend therapeutic options, but do not create new therapies. These products must be subjected to a diligent regulatory process to ensure they are safe and effective to be used in an appropriate and well-monitored setting.

Quick Reference Guide

Key facts about biologics and biosimilars

- A biologic is a medicine made from living organisms or cells.
- Over the past 30 years, biologic medicines have provided treatment options for people who suffer from some of the most serious medical conditions. Diseases such as rheumatoid arthritis, cancer, rare blood disorders, multiple sclerosis, diabetes and HIV/AIDS can now be treated where no effective therapies were previously available.
- The manufacturing process for a biologic is more variable than it is for a small molecule (synthetic) drug and the finished product is structurally complex.
- Manufacturing a biologic is a complex process and even small changes in the process can affect the final product and how it could react in the human body.
- A biosimilar is a copy of a biologic medicine that is similar, but not identical, to the original medicine. Although Health Canada uses the term “subsequent entry biologic” (SEB), the term “biosimilar” is more common. Other terms such as “follow on biologics” have also been used.
- The Health Canada definition: “A SEB is a biologic drug that enters the market subsequent to a version previously authorized in Canada, and with demonstrated similarity to a reference biologic drug.”
- Unlike generic drugs, which are copies of small molecule (synthetic) drugs, biosimilar medicines are not identical to the original biologic drugs.¹⁹

Website references

- Health Canada Guidance for Sponsors: Information and Submission Requirements for Subsequent Entry Biologics (SEBs)
http://www.hc-sc.gc.ca/dhp-mps/brgtherap/applic-de-mande/guides/seb-pbu/seb-pbu_2010-eng.php
- BIOTECCanada is the national voice for Canada’s biotechnology sector and is dedicated to the sustainable commercial development of biotechnology in Canada.
<http://www.biotech.ca>

A biosimilar is a copy of a biologic medicine that is similar, but not identical, to the original medicine.



Questions & Answers

What patients should know about biologics

Q. What is a biologic?

A. Biologics are medicinal products created using biologic processes in living cells. The more common small molecule drugs, typically delivered in oral form, are chemically synthesized. Biologics are complex, large molecule drugs manufactured using live cells and are generally administered as an injectable. Biologics provide new treatment options for serious illnesses, such as cancer, multiple sclerosis, and rheumatoid arthritis, and have enabled treatment where no effective therapies were previously available.

Q. How do biologic drugs work?

A. Chemical drugs generally treat symptoms of disease (for example, Aspirin for pain) while biologic drugs target the underlying cause. For example, some biologics replace proteins that are missing or not functional. Examples are insulin for diabetes, replacement factor for growth hormone deficiency, clotting factor for hemophilia and replacement proteins for Gaucher's, Fabry's and other rare lysosomal storage disorders. Some biologics are antibodies that target very specific disease-causing cells, such as those causing rheumatoid arthritis and some types of cancer. Finally, a bioengineered interferon can help the body's own immune system work more effectively against a number of diseases, including cancer, hepatitis B and C, and multiple sclerosis.

Q. How are biologic drugs made?

A. Biologic drugs are made from cloned (genetically identical) copies of a master cell. The process starts by isolating the "genetic sequence" of DNA code responsible for the desired protein (factor, antibody, cytokine or other biological substance), which is the active ingredient in the biologic drug. This gene is inserted into a host cell, usually from a hamster or mouse. The cell produces the desired protein from the genetic code, and this cell is placed into a culture where it multiplies. These cells are then transferred to large vats where they are processed and monitored at exacting conditions until the desired quantity of protein has been produced. The protein is then extracted from the cellular culture and purified and stabilized.

Biologic drugs are structurally much larger and more complex than chemical drugs. To make a biologic drug requires a living organism as an agent. In the case of wine, it is yeast and for biologic drugs, the agent may be yeast or bacteria but most often a hamster or mouse cell. Both must be processed using exact ingredients and

conditions to achieve the desired outcomes. For both, slight changes in the starting materials and/or the process may lead to very different results. And finally, for both, the outcomes may still vary from "batch to batch" and therefore it is very important to test to assure the product meets quality standards.

Q. What are the benefits of biologic drugs? Why might a patient be prescribed a biologic?

A. Biologics are targeted to work in highly specific ways, so they are not only potentially more effective against the disease but also lead to fewer side effects. For example, chemotherapy (chemical drug) works by targeting actively dividing cells but because its action is "nonspecific", chemotherapy interferes with normally dividing cells as well as cancerous ones. Biologic drugs, such as monoclonal antibodies, regulate the function of specific, defective cells that cause cancer growth without interfering with normal cells.

Q. What are the risks related to biologic drugs? What should patients be aware of when taking a biologic?

A. Because proteins are digested, most cannot be taken orally. Biologic drugs are typically injected into a vein or infused under the skin. Patients typically experience some reactions, such as redness, swelling or soreness, at the site of injection. These may vary in severity and frequency.

Because biologic drugs are larger and more complex than chemical drugs, they are also more likely to be recognized by the body as "foreign" and cause an "immune reaction." Often, these reactions are mild and will subside over time.

However, a very rare but serious reaction that may occur is the production of "neutralizing" antibodies, whereby the body produces antibodies that destroy not only the biologic drug (bioengineered protein) but also any amounts of the naturally produced protein that the drug replicates. This can be a life-threatening situation since the body does not have access to any form of this protein.

Q. How can patients be sure that their biologic drug therapy is safe and effective?

A. All biologic drugs are reviewed for safety and efficacy by Health Canada before they can be sold. Because they are different from the chemical drugs, they are approved by a separate agency (the Biologics and Genetic Therapies Directorate). Any and all adverse reactions to a medicine should be reported to the manufacturer and Health Canada (by the patient and the physician). These are analyzed and reported to Health Canada by the manufacturer. In some cases, patients may be treated for side effects and remain on the biologic drug; in some cases, the reactions may be serious enough to discontinue treatment, either temporarily or permanently.

In all cases, the decision should be made by the physician in consultation with the patient based on the risks, benefits and alternatives.

Q. Are biologics as safe as chemical drugs?

A. All drugs sold must be approved by Health Canada as meeting strict standards of safety, efficacy, and quality. In addition, the manufacturing facilities for biologics are inspected to ensure they meet quality standards. Finally, biologics are inspected by the regulatory agency on a “lot by lot” basis to ensure each batch conforms to standards of quality, including purity and potency.

What patients should know about biosimilars

Q. What are biosimilars?

A. When the period of patent protection expires on a biologic drug, other manufacturers may market copies of the compound. To be approved for sale, a biosimilar must demonstrate that it is a “similar biological medicinal product” to an already approved biologic drug, known as the originator drug. The determination of “similarity” is made by Health Canada on a product-by-product basis. While Health Canada uses the term “subsequent entry biologic” (SEB), the term “biosimilar” is commonly used worldwide, including Canada. Other terms such as “follow on biologics” have also been used.

Q. Why are biosimilars not considered generic copies of the original biologic drug?

A. When the patent has expired on a small molecule (synthetic) drug, other companies may make generic copies using the same drug formula. A generic drug is made from the same ingredients and has the same chemical structure as the original drug. To be approved, generics do not need to have undergone clinical trials (testing in patients to demonstrate efficacy and safety). The generic only needs to show that the active ingredient is available to the body at the same rate and to the same extent as it is with the original drug. A generic is generally considered to be bioequivalent (works in the body in the same way) as the original drug.

A biosimilar is NOT a generic copy of the original biologic. It is not considered to be bioequivalent. There are several reasons for this. A biologic drug is much bigger and more complex than a chemical drug. For biologics, it is not only the chemical structure of the protein but also the way this structure is folded that determines how it works. The manufacturing process for biologics is so complex that it is virtually impossible for a biosimilar manufacturer to generate an identical medicine to the originator biologic.

Q. Are biosimilars interchangeable with the original biologic drug? Can a biosimilar be substituted for an original biologic?

A. Interchangeability means that one drug can be exchanged for another with the expectation that it will have the same effect (health benefit) and no difference in safety (adverse effects or long-term negative outcomes). Many generic versions of chemical drugs are deemed to be interchangeable with the original patented drug, though this is not always true for all generics and all patients.

Substitution is the practice of providing one drug for an other, often because of cost or supply issues. Generic substitution may be done by the physician, the pharmacist, or at the direction of the drug plan (payer of the medication).

Unlike generic chemical drugs, biosimilars are not considered to be the bioequivalent of the original drug. The regulatory agencies in Europe (European Medicines Agency) and Canada (Health Canada) do not assess and do not designate interchangeability or substitutability of the biosimilar with the original biologic.

Q. What factors should be considered in deciding between a biosimilar and the original biologic?

A. A biosimilar receives regulatory approval based on clinical and nonclinical similarity to the original (reference) drug. However, a biosimilar is not an exact copy of the original biologic drug, so the decision to take a biosimilar or the original biologic should be made by prescriber and patient based on individualized factors. These factors may include cause, status, and responsiveness of the disease as well as the person’s perception of tolerability, manageability of the therapy, and impact on functioning and quality of life.

A biologic may cause an immune reaction to the active ingredient, to a stabilizer or another ingredient, or to an impurity from the manufacturing process. The safety profile of the original drug, including immunogenicity, may not extend to the biosimilar. Even minor changes in the process can lead to significant changes in the final product, and this may alter the risk of immunogenicity of the biosimilar relative to the original biologic.

Q. Are biosimilars cheaper than biologic originators?

A. With only one biosimilar launched in Canada, it is difficult to speculate how biosimilar companies will price their products. Having said that, the production of a biosimilar is much more complicated than a small molecule generic and therefore the development costs are higher suggesting it is unlikely similar cost savings as those seen with small molecule generics will be found.

Glossary of Terms

Adverse event: The occurrence of an undesirable, unpleasant or life-threatening reaction to a medicinal product.

Amino acid: One of several molecules that join together to form proteins. There are 20 common amino acids found in proteins.

Antibody (pl: antibodies): Antibodies (also known as immunoglobulins, abbreviated to Ig) are proteins that are found in blood or other bodily fluids. Antibodies are used by the immune system to identify and neutralize foreign objects, such as bacteria and viruses.

Bioequivalence: Manufacturers of synthetic (small molecule) drugs must conduct studies to determine whether their version is bioequivalent to the original drug—that is, that the generic version releases its active ingredient (the drug) into the bloodstream at virtually the same speed and in virtually the same amounts as the original drug.²⁰

Biologic: A product derived from a living organism (from animal products or other biological sources) that is used in the diagnosis, prevention or treatment of disease. Examples of biologics include recombinant proteins, allergy shots, vaccines, and hematopoietic growth factors.

Biologics and Genetic Therapies Directorate (BGTD): The Canadian federal authority within Health Canada that regulates biological drugs (products derived from living sources) and radiopharmaceuticals for human use in Canada, whether manufactured in Canada or elsewhere.

Biosimilar: A term for attempted copies of innovator biologics approved through a regulatory pathway that allows an abbreviated data package. The full name established by the European Union is “similar biological medicinal products.”

Biotechnology: Technology based on biology, especially when used in agriculture, food science, and medicine. The United Nations Convention on Biological Diversity defines biotechnology as “any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use.”

Chemical drug or chemical medicine: Refers to medicines that are manufactured without the involvement of living organisms.

Clinical trial: A test in which a drug or biologic is given to humans to establish how it works in the body and measure the nature and extent of any intended or unintended consequences.

Data exclusivity: Data exclusivity is the period of time after approval of the innovator medicine when the innovator’s clinical data may not be relied upon to help approve a copy of the innovator medicine.

DNA (Deoxyribonucleic Acid): DNA is a nucleic acid that

contains the genetic information used in the development and functioning of all cellular organisms. Molecular systems interpret the sequence of these nucleic acids to produce proteins.

Efficacy: The desired impact that a medicine or treatment has when administered to a human.

EMA: European Medicines Agency. The EMA is responsible for evaluating marketing applications for medicinal products to be approved in the European Union.

Guidance: A document issued by a regulatory agency to provide interpretation of a law that the regulatory agency is responsible for administering and/or enforcing and recommendations as to how to proceed with particular issues.

Health Canada: The Federal department responsible for helping Canadians maintain and improve their health, while respecting individual choices and circumstances.

Immune system: The collection of mechanisms within the body that protect against disease by identifying and attacking foreign substances in the body. An immune response is how the body recognizes and defends itself against bacteria, viruses and substances that appear foreign and harmful.

Interchangeability: Interchangeability means that one drug can be exchanged for another with the expectation that it will have the same effect (health benefit) and no difference in safety (adverse effects or long-term negative outcomes). Many generic versions of chemical drugs are deemed to be interchangeable with the original patented drug, though this is not always true for all generics and all patients.

International Nonproprietary Name (INN): The official nonproprietary or generic name given to a pharmaceutical substance, as designated by the World Health Organization (WHO).

New Drug Submission (NDS): An application submitted to Health Canada seeking approval to market a novel drug in Canada. The application contains a description of the trials and results, formulation, dosage, drug shelf life, manufacturing protocols, packaging information, etc.

Notice of Compliance (NOC): A notification indicating that a manufacturer has complied with relevant sections of the Food and Drug Regulations to obtain marketing approval for a drug in Canada. Notices of Compliance are issued to a manufacturer following the satisfactory review of a submission. A medicine cannot be sold in Canada without an NOC.

Pharmacovigilance: The pharmacological science relating to the detection, assessment, understanding and prevention of adverse effects, particularly long term and short term side effects of medicines.

RNA: Ribonucleic acid is a nucleic acid which is central to the synthesis of proteins.

Small molecule drugs: Chemical compounds that have a defined structure and characteristics.

Substitution: When a pharmacist decides to switch a patient's treatment from a branded or innovator medicine to a generic or biosimilar medicine without the prescribing physician's approval.

Vaccine: A biological preparation which is used to establish or improve immunity to a particular disease.

Acronym Guide

BGTD - Biologics and Genetic Therapies Directorate (Health Canada)

DIN – Drug Identification Number

DNA – Deoxyribonucleic Acid

EMA – European Medicines Agency

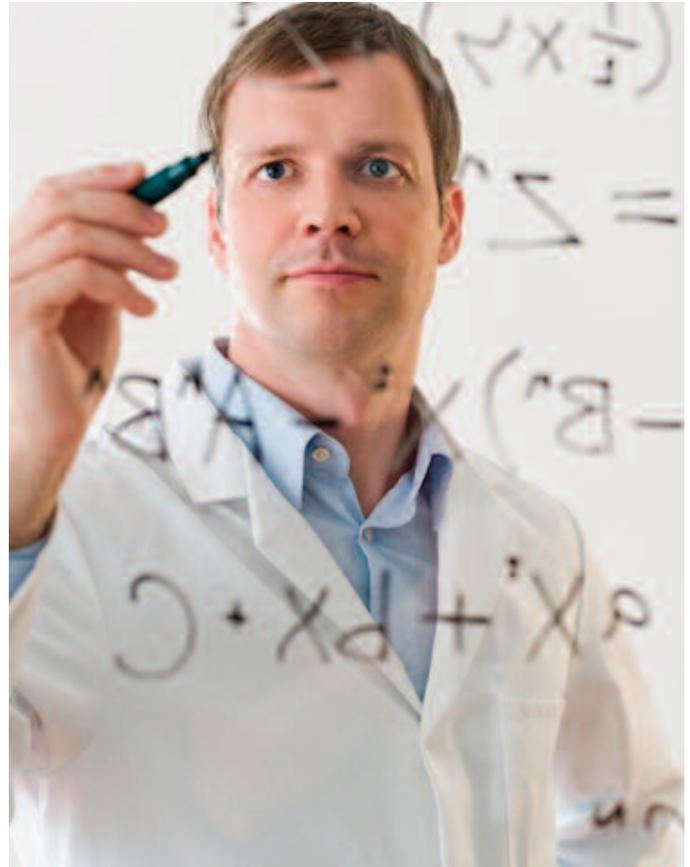
NDS – New Drug Submission

NOC – Notice of Compliance

R&D – Research and Development

RNA – Ribonucleic Acid

WHO – World Health Organization



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