



National Occupational Standard for

Research and Development Vice President
in Bio-Industrial, Bio-Energy



BIOTALENT CANADA

BioTalent Canada supports the people behind life-changing science. Trusted as the go-to source for labour market intelligence, BioTalent Canada guides bio-economy stakeholders with evidence-based data and industry-driven standards. BioTalent Canada is focused on igniting the industry's brainpower bridging the gap between job-ready talent and employers and ensuring the long-term agility, resiliency, and sustainability of one of Canada's most vital sectors.

For more information visit biotalent.ca.

© 2022 BioTalent Canada™, The PetriDish™, BioSkills Match™ and BioReady™ are registered trademarks of BioTalent Canada. BioTalent™ is a trademark of BioTalent Canada.

CONTENTS

1	Acknowledgements.....	3
2	A competency framework for individuals working in the bio-economy	4
2.1	What is a National Occupational Standard?	4
2.2	How are we defining a competency?.....	4
2.3	Levels of complexity of work	5
2.4	Overview methodology for the development of national occupational standards	7
3	Research and Development Vice President in Bio-Industrial, Bio-Energy Competency framework.....	8
3.1	Competency diagram for Research and Development Vice President In Bio-industrial, Bio-energy.....	8
3.2	Definition of occupation	9
3.3	Level of education, training or designations requirements.....	10
3.4	Core competencies list for Vice President R&D In Bio-industrial/Bio-energy	11
3.4.1	Executive Leadership.....	11
3.4.2	Research Ethics	12
3.4.3	Collaboration.....	13
3.5	Technical competencies list for Research and Development Vice President In Bio-industrial, Bio-energy	14
3.5.1	Budget Management	14
3.5.2	Developing &/or Overseeing an R&D Program.....	15
3.5.3	Recruiting & Managing the R&D Team	16
3.5.4	Conducting a Feasibility Study	17
3.5.5	Liaising with Key Stakeholders and Influencers	18
3.5.6	Knowledge Transfer	18
3.5.7	Professional Writing for R&D	19

3.6	Industry regulatory competencies list for Research and Development Vice President In	20
	Bio-industrial, Bio-energy	20
3.6.1	Legal/Regulatory Compliance in R&D	20
3.6.2	Occupational Health & Safety in R&D	21
3.7	Personal and professional competencies list for Research and Development Vice President In Bio-industrial/Bio-energy	22
3.7.1	Continuous Learning	22
3.7.2	Creative Leadership.....	22
3.7.3	Critical Thinking/Decision-Making in R&D	23
3.7.4	Effective Interpersonal Communication	24
3.7.5	Professionalism/Emotional & Cultural Intelligence	25
3.8	Essential Skills for Research and Development Vice President (Bio-industrial, Bio-energy)	26
3.9	Canadian Language Benchmark for Vice President Research and Development (Bio-industrial/Bio-energy).....	27
4	References	34

1 ACKNOWLEDGEMENTS

Chris Walton	CEO	Centre for Research and Innovation in the Bio Economy
Denis Groleau	Chief Science Officer	Proventus Bioscience
Doug Cossar	VP R&D	PlantForm Corporation
Gabrielle Vanstraelen	Freedom Concepts Inc.	VP - Projects and Operations
Hamdy Khalil	Global R&D Director	Woodbridge Corporation
Heather Pikor	VP, Corporate Affairs	Iogen Corporation
Hyder Ali Khoja, Dr. PhD MSc	Chief Scientific Officer	My Fungi, Inc
Mingyang Sun	VP of Science Operation	The CanAscen Group
Mohammad Rahbari	EVP Corporate Strategy	BioLiNE Corp
Murray McLaughlin	President	McLaughlin Consultants
Niloofer Abdehagh, PhD, PEng, PMP, MBa	VP R&D	CH Four Biogas Inc.
Sandy Marshall	Executive Director	Bioindustrial Innovation Canada
Sheetal Raithatha, PhD	Director R&D	Enveric Biosciences Inc
Sheetal Raithatha	VP of R&D	Symvivo Corporation
Teaghan Wellman	VP of Research and Development	Cypher Environmental Ltd.

2 A COMPETENCY FRAMEWORK FOR INDIVIDUALS WORKING IN THE BIO-ECONOMY

2.1 What is a National Occupational Standard?

In Canada, National Occupational Standards are industry-developed and validated documents that identify and group tasks/competencies associated with a particular occupation. They also describe the knowledge and skills that a worker must demonstrate to be considered competent.

The former Alliance of Sector Councils (TASC) outlined 11 guiding principles for creating National Occupational Standards (NOS). NOS for the Canadian bio-economy meet all 11 principles and are developed to meet the current and future human capital management needs of the Canadian bio-economy.

2.2 How are we defining a competency?

We define a competency as *a set of related behaviors that describe successful performance in a designated area. It is a behavioural expression of how people integrate knowledge, skills, attributes, and attitudes to produce a value-adding result in a defined situation.*

The competency statement includes a description that integrates skills, knowledge, and actions into a sequence of activities that deliver a value-added product or service.

Performance Indicators is the term we use for the behaviours grouped under each competency that describe the level of mastery the incumbent role must demonstrate when executing a task.

For this project, we have organized the competencies into four categories.

Core Competencies are those competencies that describe the "essence of the role" — that is, they are the one to three most critical competencies that may be applicable across multiple roles in a function or job family. All levels of personnel in this function would typically share them. These competencies may also act as qualifiers that differentiate the function from other functions.

Technical Competencies are those competencies related to specific roles or professions that enable an individual to work, function, and succeed in that role. They address the various responsibilities that job incumbents encounter in a role. For example, a surgeon's technical competencies would encompass multiple surgical tools, techniques, and conditions that could be part of the position. Similarly, technical competencies for a lawyer would contain various legal situations that they encounter in the context of a particular field of practice.

Regulatory Competencies are those competencies that describe compliance with prescribed practices and mandated obligations under applicable laws, regulations, and industry standards. They ensure that critical work processes are implemented and integrated into all work activities. They are of absolute importance where economic behaviours can impact human conditions.

Personal/professional Competencies are those competencies that enable an individual to be successful working with others and fulfilling their responsibilities in a work context. Personal and professional competencies are not necessarily role specific.

2.3 Levels of complexity of work

It is important to recognize how the complexity of work varies along an organizational continuum. At one end of this continuum is low-complexity, clearly-defined, task-driven work. At the other end of the continuum is work that is higher in complexity, not as well-defined, and requires higher-level thinking and decision-making skills and a greater degree of autonomy. Results are recognised over a longer period of time and are more difficult to assess.

Figure 1: Demonstrates how the level of complexity changes with the role responsibilities

Complexity Level	Examples of Work at Different Complexity Levels	Typical Roles/Titles
Most Complex	Construct and pursue worldwide strategic plans in large corporations.	CEOs of the largest trans-global corporations
	Construct and pursue worldwide strategic plans.	C-suite executives at multi-national organizations
	Lead the accumulated impact of multiple business units.	C-suite executive at large, multi-location organizations
	Optimize the function of a single business unit or corporate support staff.	General manager; plant manager
	Manage multiple, interdependent projects; balance resources among departments.	Engineering manager
	Plan and carry out sequential projects while considering contingencies and alternatives.	Maintenance manager
	Accumulate information to diagnose and anticipate problems; proactive; notice trends.	Maintenance technician
Least Complex	Follow predefined procedures; seek help when encountering an obstacle. The ability to anticipate problems is not expected.	Maintenance labourer

We define the complexity levels within the profiles at four levels:

Foundational — performance focus is on the execution of procedures and tasks involving own job role.

Operational — performance focus includes some discretion in the planning and executing of work. The work typically includes assessing the quality of the work outcomes and taking corrective action to ensure quality.

Specialist — performance focus is on translating goals and standards to team members and ensuring that work done under the person's responsibility area complies with all corporate standards.

Strategic — performance focus is on leading work and the accumulated impact of work in an independent business unit or across a whole organization. The impact of work at this level is often not visible until the medium to longer term.

The following example illustrates the different complexity levels within a profile.

<p>Competency Name: Research Ethics</p> <p>Competency Definition: Exercises integrity and professionalism to ensure all research is performed responsibly in keeping with the ethical principles of beneficence and nonmaleficence.</p> <p>Competence at this level is demonstrated when the Research Manager:</p>			
Performance Indicators			
Foundational	Operational	Specialized	Strategic
Diligently follows research procedures and protocols mandated by legitimate authorities and professional organizations.	Regularly monitors own actions and decisions to ensure they align with professional and organizational values.	Holds self and staff accountable to the organization's values, ensuring compliance with the policies and procedures related to scientific ethics and rules of conduct.	Fosters an organizational culture of integrity and ethical business practices by unwavering personal example.

2.4 Overview methodology for the development of national occupational standards

National occupational standards were developed using a multi-step process.

Step	Description	Result/Output
1	Identify critical roles in the bio-economy through primary and secondary research.	List of 50 key roles
2	Create draft profiles with critical competencies for the roles, performance, and knowledge indicators.	Draft profiles
3	Review the draft profiles with industry subject matter experts to refine the competencies, performance, and knowledge indicators.	Reviewed profile with design inputs from industry experts
4	Further validation and review by industry via online focus group.	Validated profiles by industry experts
5	Broader validation of the draft profiles via national online surveys.	Occupational Standards validated on a national level by experts from the different sectors
6	Addition of the Essential Skills and Canadian Language Benchmark (ES/CLB) ratings.	Nationally validated NOS profiles with ES/CLB profile for each NOS

3 RESEARCH AND DEVELOPMENT VICE PRESIDENT IN BIO-INDUSTRIAL, BIO-ENERGY COMPETENCY FRAMEWORK

3.1 Competency diagram for Research and Development Vice President In Bio-industrial, Bio-energy

Competencies		Complexity Level				Complexity Level Legend	
		1	2	3	4		
Core Competency						1. Foundational 2. Operational 3. Specialist/Manager 4. Expert/Executive	
1	Executive Leadership						
2	Research Ethics						
3	Collaboration						
Technical Competencies						4. Expert/Executive	
4	Budget Management						
5	Developing &/or Overseeing an R&D Program						
6	Recruiting & Managing the R&D Team						
7	Conducting a Feasibility Study						
8	Liaising with Key Stakeholders and Influencers						
9	Knowledge Transfer						
10	Professional Writing for R&D						
Industry Regulatory Competencies							
11	Legal/Regulatory Compliance in R&D						
12	Occupational Health & Safety in R&D						
Personal and Professional Competencies							
13	Continuous Learning						
14	Creative Leadership						
15	Critical Thinking/Decision-Making in R&D						
16	Effective Interpersonal Communication						
17	Professionalism/Emotional Intelligence						

3.2 Definition of occupation

The Vice President Research and Development (R&D) is a key member of the executive team who has special, in-depth knowledge of the subject of interest and is well-versed in the requirements of national and international regulatory processes. The key function of a Vice President R&D is to drive product/technology innovation, oversee/direct all aspects of R&D, and facilitate the transfer to commercial development within both the scale-up/commercialization team and senior management.

The Vice President R&D provides insight and direction to the executive team and board of directors regarding the scope, focus, and cost of the research agenda. The VP brings an expert scientific perspective to strategic planning, business case options, briefings, position papers, policy drafts, project directives, and implementation plans. The role also requires effective collaboration with external stakeholders such as universities, research institutes, public sector entities, professional and regulatory bodies, and representatives from the scientific, commercial, and investment areas.

The role works in the following subsectors:

Applicable To	Bio-Health	Agri-Bio	Bio-Industrial	Bio-Energy

The level of complexity of the role is:

Span of Complexity Levels	Foundational	Operational	Specialist/Management	Expert/Executive

3.3 Level of education, training or designations requirements

Typical Education Required	Secondary	College	Bachelor	Master	PhD
Typical Starting Experience	0–5 yrs.	5–10 yrs.	10–15 yrs.	15–20 yrs.	20+ yrs.

- PhD is typically required in larger companies
- OR MSc in a scientific, biotechnological, or engineering field with ten plus years of progressively more relevant experience in a related industry
- Business-related degree such as an MBA is an asset

- Strong understanding of and contribution to scientific publications, technical reports, and patenting is an asset
- Experience in translational research is essential to take applications from concept to commercialization in an industrial setting
- Experience with managing several large projects and multi-disciplinary teams that reflect the full scope of research projects
- Leadership experience at an executive level that fosters and elevates the potential of the organization and its members
- Bilingual or multilingual fluency is an asset in our global economy

3.4 Core competencies list for Vice President R&D In Bio-industrial/Bio-energy

3.4.1 Executive Leadership

Represents the R&D function as a member of the organization's executive leadership team in order to provide organizational direction and operating principles in a way that models the organization's ethical framework and ensures the organization reaches or exceeds its performance goals.

Competency in this role is demonstrated when the individual:

- Actively engages with the executive team to establish the strategic plan and operating framework for the organization.
- Monitors organizational key performance indicators (KPIs) in order to participate effectively in identifying strategic corrective actions that will ensure the organization reaches or exceeds its performance goals.
- Actively engages with the team to resolve organizational issues, difficulties, and stress points, adopting strategies to address these issues before they become entrenched.
- Models ethical principles and standards within the team, e.g., provides information to facilitate executive decisions that benefit the greater organization, even when disadvantageous to R&D.
- Presents a united and consistent executive voice to the organization in keeping with the organization's ethical framework.
- Provides technical support and expertise to the executive team on R&D matters.
- Ensures R&D management and staff are informed of organizational plans and strategies, as appropriate.
- Provides strategic guidance and direction to implement executive decisions within R&D.
- Monitors departmental initiatives, activities, and performance in order to ensure goals are met and are aligned with corporate direction.

Knowledge required for competency at this level:

- Expert technical knowledge of R&D
- Expert business acumen related to the overall business
- Comprehensive knowledge of leadership principles (motivation, integrity, strategic thinking, etc.)
- Comprehensive understanding of the principles of emotional Intelligence
- Comprehensive understanding of the principles and processes of systems thinking

3.4.2 Research Ethics

Exercises integrity and professionalism in order to ensure all R&D is performed in a responsible manner in keeping with the ethical principles of beneficence and nonmaleficence.

Competency in this role is demonstrated when the individual:

- Fosters an organizational culture of integrity and ethical business practices through unwavering personal example.
- Holds the organization accountable to a high standard of ethical conduct by developing and implementing a code of conduct for the organization, including such aspects as a whistleblower policy.
- Oversees organizational policies, processes, and procedures such as HR practices, SOPs, QA/QC, etc. in order to ensure they support ethical practices and stewardship of resources, as well as guard against the risk of sacrificing ethical practices for expediency of desired end results (e.g., shortcutting quality to deliver against over-aggressive timelines, falsifying reports to cover up questionable practices, etc.).
- Oversees the policies, processes, and procedures related to scientific ethics and rules of conduct concerning the husbandry of R&D data in order to ensure integrity, reliability, and ease of retrieval.
- Engages in public discussions related to unconventional research outcomes such as GMO organisms.

Knowledge required for competency at this level:

- Ability to maintain good standing with any professional certification/licensing body required for legal conduct of company activities, e.g., Society of Professional Engineers
- Comprehensive knowledge of the organization's code of conduct

- Comprehensive knowledge of the ethical codes and requirements of the organization, partnered organizations, and funding bodies
- Intermediate knowledge of relevant scientific ethical issues, e.g., use and storage of data, potential harmful environmental impacts, etc.
- Working knowledge of the implications of the general data protection regulation (GDPR) for Canadian businesses

3.4.3 Collaboration

Works effectively with others in order to foster trust and cooperation in the achievement of R&D goals and project objectives.

Competency in this role is demonstrated when the individual:

- Uses feedback regularly to monitor and review the effectiveness of working relationships with colleagues, clients, and stakeholders and to identify areas for improvement.
- Resolves disagreements and conflicts of interest with colleagues and stakeholders in ways that minimize damage to desired outcomes and to the individuals and organizations involved.
- Makes significant adaptations as required to deal with unpredictable or complex interactions with authorities or key stakeholders whose support is essential.
- Provides R&D expertise on new product committees and in the product development process.
- Builds a departmental culture that fosters effective collaboration between the various individuals and teams involved in R&D.
- Integrates the expertise of multiple disciplines (such as engineering, sciences, marketing) into a cohesive product development strategy and execution.
- Collaborates with other local, national, or international researchers who bring complementary expertise, capacities, and capabilities so that R&D projects can be as complete as possible.

Knowledge required for competency at this level:

- Intermediate knowledge of effective collaboration models and techniques
- Intermediate knowledge of change management resources to affect staff culture and dynamics, e.g., Kotter's 8-Step Change Model
- Intermediate knowledge of successful teamwork models and theories such as the Google teams' "Project Aristotle," Tuckman's FSNPA, and Katzenbach and Smith's "The Wisdom of Teams"

3.5 Technical competencies list for Research and Development Vice President In Bio-industrial, Bio-energy

3.5.1 Budget Management

Establishes, tracks, and manages budgets for the team/project, laboratory/department, and/or organization in order to ensure sound fiscal responsibility with designated funds.

Competency in this role is demonstrated when the individual:

- Works with colleagues to define the organization's financial framework, including policies, processes, and fiduciary responsibilities.
- Confers with colleagues to establish R&D's annual operating budget, considering the budget proposals of all departments in balance with the annual income and/or funding projections.
- Utilizes financial systems to track R&D's funding and expenses and make decisions necessary to keep the department aligned with its annual operating budget.
- Involves relevant staff and advisory committees to define a long-term capital plan for R&D, including budget projections, funding/income strategies, and tax incentives.
- Confers with colleagues to make rational and evidence-based go/no-go financial decisions on R&D projects.
- Advises the organization when it is financially judicious to terminate a research/development program.

Knowledge required for competency at this level:

- Advanced knowledge of the capital planning and budgeting system
- Basic understanding of accounting skills and accounting or ERP software
- In-depth knowledge of the organization's financial runway for the next three to five years
- Intermediate understanding of the federal Scientific Research and Experimental Development (SR&ED) Program, if applicable

3.5.2 Developing &/or Overseeing an R&D Program

Defines the focus and strategy of the laboratory/organization's R&D program, determines which projects will be included in the program, generates funding to support the program, and oversees the program from inception to commercial development if applicable.

Competency in this role is demonstrated when the individual:

- Engages the team in critical R&D program decisions.
- Establishes the objectives and identifies areas of focus for the organization's R&D program through a critical assessment of key factors such as corporate strategies, core competence, capacity and research findings related to technical feasibility, market demand, and funding potential, as well as and the degree of certainty of those findings.
- Establishes evaluation criteria for the R&D program, identifying and setting critical decision-gating strategy.
- Defines a strategic plan to achieve the organization's R&D objectives and agenda, including areas of study with high-level funding requirements, timelines, and staffing plans.
- Leads a team to make a final go/no go decision on the specific projects to be included in the R&D program based on a SWOT analysis, key risks, proposed mitigation strategies, and a high-level cost/benefit analysis.
- Provides scientific and technical leadership in order to move products or technologies from discovery or identification through commercialization, utilizing a translational R&D plan that engages stakeholders, where appropriate.
- Secures funding for the R&D program through intensive networking, persuasive dialogue, and effective presentation of business plans and R&D proposals.
- Leads/participates in the pursuit of large grant initiatives.
- Secures R&D partnerships with additional collaborators such as universities, private research institutions, and other organizations.

Knowledge required for competency at this level:

- In-depth understanding of the operational and functional needs of the industry
- In-depth understanding of the organization's strategic direction, roadmaps and, milestones
- In-depth knowledge of best practices and key trends in the industry
- In-depth understanding of opportunities and "pain points" or unmet needs of end users in the target markets
- In-depth understanding of IP development and protection

- In-depth understanding of strategic short and long-term planning and execution
- Comprehensive understanding of the process for translating R&D to commercial products and technologies

3.5.3 Recruiting & Managing the R&D Team

Recruits and manages a qualified workforce in order to ensure the organization's R&D program and projects are properly staffed and that the team is managed in a way that fosters not only compliance to requirements and protocols, but also high performance, strong morale, and a high retention rate.

Competency in this role is demonstrated when the individual:

- Makes the final selection decision for key roles in the laboratory/department, as appropriate.
- Ensures formal performance reviews are completed and that appropriate follow-up is taken.
- Applies fair-minded decision making to promote high performance individuals or to terminate individuals who, even after appropriate coaching and development, are unable to achieve their objectives.
- Applies expertise to contribute to the improvement of team recruitment and performance management practices.
- Ensures the organization provides the necessary resources for managers to stay abreast of HR policies and coaching, development, and training techniques.
- Facilitates team collaboration in the identification and implementation of best R&D practices and project efficiencies.
- Builds organizational capacity by coaching and mentoring others in best practices in innovation, product development, portfolio management, and product support.
- Develops talent and strong, self-directed teams within the department by leveraging the team's diverse competencies and experiences with coaching and mentoring programs and by encouraging members to follow this practice among themselves.
- Brainstorms with the R&D team(s) and management in order to identify and implement effective retention strategies within the department.
- Leads the development of succession planning.

Knowledge required for competency at this level:

- Working knowledge of relevant labour laws
- Comprehensive knowledge of the organization's HR policies, hiring practices, and requirements
- Comprehensive knowledge of the management of multidisciplinary teams of experts

- Comprehensive knowledge of relationship building and management techniques, e.g., French and Raven's power model
- Comprehensive understanding of motivational techniques
- Comprehensive knowledge of applicable diversity and inclusion policies such as Canada's Equity, Diversity and Inclusion (EDI) initiative

3.5.4 Conducting a Feasibility Study

Conducts a feasibility study, including a thorough literature review, analysis of market, technical, and economic viability, environmental, safety, and permitting considerations, and performance of preliminary experiments, if required, in order to minimize the likelihood of error, manage costs, and determine the probability of success of commercialization of a research venture before scaling-up to a pilot plant.

Competency in this role is demonstrated when the individual:

- Ensures competitive analysis is conducted on an ongoing basis to inform feasibility studies.
- Makes a decision on proceeding with the feasibility study in light of the organization's strategic direction for R&D.
- Secures the buy-in of stakeholders such as other departments, funders, and decision makers in order to support and participate in the feasibility study.
- Provides oversight and strategic advice throughout the feasibility study.
- Spearheads go/no-go decisions on whether/how far to proceed with the research venture based on the business considerations identified in the feasibility study.

Knowledge required for competency at this level:

- Comprehensive understanding of the commercial applications and goals of the laboratory or organization's R&D program
- Comprehensive understanding of interdisciplinary sciences
- Advanced understanding of the process for translating R&D to commercial products
- Working understanding of analytical tools such as R, Six Sigma, Aspen, etc.
- Working knowledge of regulatory and permitting factors
- Working understanding of the principles and factors of life cycle assessment (LCA)

3.5.5 Liaising with Key Stakeholders and Influencers

Liaises with investors, government, regulatory authorities, and other influential organizations to build positive relationships and support for the laboratory/organization's R&D program.

Competency in this role is demonstrated when the individual:

- Builds relationships with relevant ministers, government officials, and academic and other partners and stakeholders, identifying their interests and expectations relevant to the organization.
- Identifies the agendas of lobbyists and advocates which may influence legislative or regulatory outcomes that impact the organization's interests.
- Leverages key relationships and networks in order to garner funding support for the organization.
- Establishes partnerships and business-to-business working relationships which advance the success of the organization's strategic business plans.
- Establishes relationships with key opinion leaders (KOLs).
- Consults with/advises government agencies and departments (Revenue Canada, Environment Canada, etc.) on industry regulations and programs for R&D.
- Serves as the face of R&D for own organization on the international stage.

Knowledge required for competency at this level:

- Comprehensive understanding of the principles of positive influence and persuasion
- Comprehensive understanding of the principles of effective communication
- Working understanding of government programs and initiatives related to the industry and R&D activities

3.5.6 Knowledge Transfer

Shares and disseminates technical or scientific knowledge, experience, and ideas from one individual or source to other individuals, groups, or organizations for purposes such as building others' knowledge, training them in a new process, ensuring reproducibility in the event of absence, creating efficiencies, preserving corporate memory, and providing a foundation for scientific collaboration and development.

Competency in this role is demonstrated when the individual:

- Develops/champions a formal plan to preserve and grow all critical components of corporate memory.
- Builds sufficient understanding within the organization of the key aspects of a new technology or concept in order to successfully guide the process from conception to commercialization.
- Shares intelligence with internal decision-makers on national and global R&D trends that may benefit the organization's R&D program.
- Uses scientific expertise to analyze, synthesize, and detail key information on the latest scientific and technological advances in a specific R&D field for dissemination to relevant R&D staff.
- Imparts knowledge of state-of-the-art scientific and technological advances in a specific R&D field through symposiums, conferences, consultations, etc.

Knowledge required for competency at this level:

- Comprehensive understanding of effective secondary research techniques
- Comprehensive understanding of effective presentation skills and techniques
- Advanced understanding of critical thinking principles and techniques

3.5.7 Professional Writing for R&D

Develops and publishes scientific papers in refereed journals or scientific reports and other technical documents internally in order to chronicle and advance the body of R&D knowledge. Also creates project reports to ensure that all relevant R&D information is tracked and available to stakeholders as required and to demonstrate compliance with all regulatory requirements.

Competency in this role is demonstrated when the individual:

- Formulates documents identifying essential research, development, and regulatory protocols and guidelines in order to direct staff in the execution of their work.
- Provides strategic proposals and/or submissions in order to communicate and substantiate the value of the laboratory/organization's R&D strategy and projects to investors/potential investors.
- Develops scientific reports in accordance with professional standards to advance the body of knowledge in own field of expertise, publishing the reports as applicable and permissible.

- Provides input to IP management personnel for writing of documents and preparation of responses to questions from patent examiners.
- Writes or contributes to preparation of peer-reviewed publications, as appropriate.

Knowledge required for competency at this level:

- Fluency in English or French language and grammar as applicable
- Comprehensive knowledge of technical and scientific document structure
- Comprehensive knowledge of the different options available for publishing and disseminating knowledge (peer-reviewed paper, white paper, press release, etc.) and which option best benefits the organization
- Awareness of language in the documentation that may impact staffing, political, and financial resources
- Comprehensive knowledge of scientific, legal, and business writing protocols for various target audiences

3.6 Industry regulatory competencies list for Research and Development Vice President In Bio-industrial, Bio-energy

3.6.1 Legal/Regulatory Compliance in R&D

Manages R&D documents, data, tools, resources, waste products, processes, and procedures in accordance with relevant safety, security, environmental, and ethical protocols—including intellectual property protection—in order to ensure legal protection and compliance with regulatory and funding requirements.

Competency in this role is demonstrated when the individual:

- Fosters a culture of legal/regulatory awareness and compliance by integrating and reinforcing legal/regulatory practices in the organization's operating plans and strategies.
- Ensures the organization's R&D protocols and processes are aligned with governing policies and regulations.
- Oversees the policies, processes, and procedures regarding regulatory requirements and guidelines for R&D.
- Oversees the policies, processes, and procedures for the creation and use of a document management system that ensures informatics and information technology (IT) components are compliant with regulatory requirements.
- Future-proofs processes by ensuring that R&D is conducted to best support cGxP compliance.
- Ensures contractual obligations are fulfilled by the organization and contracting bodies.

Knowledge required for competency at this level:

- Well-versed in national and international regulatory requirements, including relevant certification standards such as ISO, ASME, ASTM, USP, CE Mark, etc.
- Intermediate knowledge of the organization's regulatory framework
- Intermediate knowledge of all regulatory requirements relative to the organization's operations from sources such as Employment and Social Development Canada (ESDC), Environment Canada, the Province, etc., and other regulations, as required
- Comprehensive understanding of IP development and protection
- Comprehensive knowledge of ISO and other relevant world standards
- Comprehensive knowledge of corporate HR policies
- Comprehensive understanding of contractual obligations to/of funding agencies, clients, or contractors

3.6.2 Occupational Health & Safety in R&D

Actively participates in/manages the health and safety program for R&D staff and their workplace to ensure the health and safety of staff. Also ensures the organization's compliance with legislation and regulations related to safe work practices and procedures, corporate procedures, and facility health, safety, and environmental rules.

Competency in this role is demonstrated when the individual:

- Ensures corporate commitment to health, safety, and the environment (HSE) by integrating HSE practices into the organization's operating plans and strategies and putting processes in place to ensure they are enforced.
- Fosters a culture of safety awareness and compliance by promoting the importance of HSE in all organizational pursuits.
- Visibly demonstrates corporate HSE commitments by participating at a management level in HSE meetings, JOHSC meetings, planned inspections, incident investigations, and HSE audits, as applicable.

Knowledge required for competency at this level:

- Intermediate understanding of WHMIS and Workplace Health & Safety (Employment and Social Development Canada - ESDC), as applicable
- Intermediate understanding of the organization's Occupational Health & Safety (OHS) framework and corporate HR policies

- Intermediate knowledge of required and available Health and Safety professional development courses

3.7 Personal and professional competencies list for Research and Development Vice President In Bio-industrial/Bio-energy

3.7.1 Continuous Learning

Continuously undertakes introspection to understand current knowledge and skills in a changing environment, recognizes personal knowledge gaps, undertakes independent action to actively seek targeted opportunities to acquire new knowledge, and reflects on how new knowledge can be integrated and applied.

Competency in this role is demonstrated when the individual:

- Independently pursues learning to advance knowledge and understanding in own field of R&D expertise.
- Assesses new studies and advances in own field of biotechnology R&D and related fields/disciplines in order to determine their value and applicability to the organization.
- Collaborates with R&D experts and industry leaders to advance state-of-the-art knowledge and practices and/or generate scientific breakthroughs.
- Works with marketing and end-user target groups in order to identify best practices, new and emergent issues, and current unmet needs.

Knowledge required for competency at this level:

- Working knowledge of current adult learning principles, processes, and techniques that accelerate learning
- Working knowledge of training resources that can be utilized for personal and professional development
- Working understanding of personal learning style

3.7.2 Creative Leadership

Creates clarity of purpose for colleagues, teams, staff, and the organization, inspires them to transform an idea or vision into reality, cultivates innovative solutions even in the face of complex and challenging circumstances, and effectively manages change.

Competency in this role is demonstrated when the individual:

- Helps shape the organization's culture by consistently living out/manifesting the mission, vision, and values of the organization in all actions and decisions.
- Fosters commitment in others through leading by example, making a conscious effort to use the vision as a guide in personal work choices and strategic organizational decisions.
- Enables the organization to achieve the vision through the conscious design of supportive organizational structures and measurable values that reinforce the vision.
- Rapidly identifies potential organizational difficulties or stress points, adopting strategies to address these issues before they become entrenched.
- Encourages others to expand their thinking, entertain bold and innovative ideas, and pursue goals that stretch them and the organization.
- Commits to productive change by releasing the security of the status quo to explore uncharted territory and risk implementing new/divergent ideas and approaches.
- Models the practices of a continuous learner, including inviting and embracing feedback, being open to new ideas, and having courage to be vulnerable and change as appropriate.
- Responds effectively to significant changes in corporate strategy and goals, especially where this involves significant shifts in project prioritization.

Knowledge required for competency at this level:

- Comprehensive knowledge of influencing and motivational techniques
- Comprehensive understanding of strategic leadership principles and techniques
- Formal leadership training

3.7.3 Critical Thinking/Decision-Making in R&D

Analyzes, synthesizes, and evaluates arguments, information, and data and exercises sound judgement to solve problems and make timely decisions that strategically benefit the laboratory/organization's R&D activities and strategy.

Competency in this role is demonstrated when the individual:

- Offers strategic advice based on up-to-date scientific information even when it is known the recommendation may not be well received, e.g., identifying a potential flaw in a research process or data.

- Makes research/development decisions that require a significant commitment by the organization based on an analysis of observed trends and substantiated data and projections.
- Uses sound judgement to make strategic decisions that impact the organization's direction or resources in the presence of ambiguous or conflicting information, e.g., when two projects differ significantly in their findings.
- Forecasts the consequences of making a decision at that time by analyzing, synthesizing, and evaluating the information and data available in order to assess its adequacy for a substantive decision.
- Engages in regular communication and open discussions with R&D personnel at all levels in order to receive feedback and input on strategic initiatives and projects.
- Continuously liaises with the sales and marketing teams to gather market intelligence.

Knowledge required for competency at this level:

- Awareness of current competition, up-and-coming technologies, and potential needs or “pain points” for end users/customers
- Working knowledge of basic statistical principles for understanding premises and implications of research data analysis
- Comprehensive knowledge of the organization's current business and marketing product strategies
- Understanding of regulatory and reimbursement requirements for new or modified products or technologies
- Awareness of potential IP or freedom to operate issues

3.7.4 Effective Interpersonal Communication

Communicates in ways that create shared understanding, generate support for the achievement of goals and objectives, and facilitate conflict resolution and problem-solving.

Competency in this role is demonstrated when the individual:

- Develops an effective interpersonal communication strategy and plan for each of the various stakeholders.
- Maintains objectivity and respect in order to successfully negotiate a resolution with challenging clients or stakeholders, e.g., settling on a course of action to resolve an adverse event.
- Successfully facilitates internal group discussions to reach consensus on complex issues.
- Explains complex technical issues with clarity and concision for informed decision-making.
- Demonstrates passion for and ownership of the R&D program in order to garner audience support.
- Seeks opportunities to present research to diverse audiences to expand personal communication comfort zone.

Knowledge required for competency at this level:

- Comprehensive knowledge of communication and conflict management models (e.g., DISC)
- Comprehensive understanding of communication principles and techniques such as active listening, engagement skills, and body language
- Comprehensive knowledge of effective communication using different tools (email, in person, video chat, formal presentations, etc.)
- Intermediate knowledge of change management resources to affect staff culture, e.g., Kotter's 8-Step Change Model

3.7.5 Professionalism/Emotional & Cultural Intelligence

Applies emotional and professional sensitivity to become aware of own emotions and those of others they interact with in such a way that they can manage personal and professional decorum to cope with challenging situations, enhance performance, and maintain productive relationships within a diverse, globalized working world.

Competency in this role is demonstrated when the individual:

- Increases the consistency of personal ethical conduct by conducting regular self-evaluation to identify limiting beliefs and biases (self awareness).
- Recognizes the possible negative effects of own actions on others (self awareness).
- Maintains a high level of personal drive and resilience to effectively help shape and lead organizational change (self management/regulation).
- Works effectively under pressure and tight deadlines while mitigating negative effects on performance and interactions with others (self management/regulation).
- Develops the ability to self-regulate emotions and discern how to respond, rather than react, through techniques such as mindfulness, stress management, and positive self-talk (self management/regulation).
- Effectively facilitates consensus discussions on controversial topics among groups that hold highly diverse opinions (relationship management).
- Fosters an internal culture of empathy and other-awareness to create a healthy, outward-focused, and socially responsible organization (social awareness).

Knowledge required for competency at this level:

- Working understanding of the principles of emotional and social intelligence (see the work of authors like Daniel Goleman and Travis Bradberry)
- Working understanding of motivational theories
- Working understanding of the principles of organizational health (see Patrick Lencioni's book, *The Advantage: Why Organizational Health Trumps Everything Else in Business*)

3.8 Essential Skills for Research and Development Vice President (Bio-industrial, Bio-energy)

Essential Skills (ES) are foundational skills required for all types of work. They are not technical skills, but the core skills people need to acquire knowledge and complete workplace tasks and daily activities.

Understanding the ES requirements for a role can allow individuals to compare their skills to those required, assist training/learning providers in developing appropriate supports to ensure ES levels are developed during training, and provide employers with an additional tool for determining who/how to place in particular roles.

Human Resources and Skills Development Canada has defined Essential Skills as follows:

- Reading
- Document Use
- Numeracy, which is further divided into:
 - Money math; Scheduling, budgeting, and accounting math; Measurement and calculation math; Data analysis math.
 - Several different factors related to estimations, including the presence of a set procedure, the number of items being estimated, the consequences of errors in estimation, the amount of information missing, and the accuracy required.
- Writing
- Oral Communication
- Thinking Skills, which are further divided into:
 - Problem Solving
 - Decision Making
 - Critical Thinking
 - Job Task Planning and Organizing

- Finding Information
- Significant Use of Memory
- Digital Skills
- Working with Others
- Continuous Learning

Most of the ES have levels based on complexity, and a role can be analyzed to determine the appropriate levels of ES. The exceptions are noted below:

- "Working with Others" does not have a complexity rating: it simply describes the ways in which the role would be required to interact with other people, either internally within the organization or externally (i.e., with clients, customers, or the public).
- "Continuous Learning" does not have a complexity rating: it describes the types of learning expected in the context of the role (e.g., on the job, being mentored by others, formal training as part of the job, etc.).

NOTE: as of January 2020, ESDC was undertaking a comprehensive review of ES with the intent of adding additional skills, refining existing ones (particularly digital skills) and better aligning ES with similar approaches used in other countries. However the detail was not finalized in time to be used, therefore the profiles developed for this project follow existing standards as of December 2019.

3.9 Canadian Language Benchmark for Vice President Research and Development (Bio-industrial/Bio-energy)

Canadian Language Benchmarks (CLB) are a 12-point scale for task-based language proficiency descriptors which were originally developed as a guide for measuring the teaching and assessment of English as a Second Language (ESL) learners in Canada. Since they were originally developed, the Canadian Centre for Language Benchmarks (CCLB) has continued to refine CLB, and it now includes scales for both English and French language proficiency. ¹

¹ Centre for Canadian Language Benchmarks. Theoretical Framework for The Canadian Language Benchmarks And *Niveaux De Compétence Linguistique Canadiens*. CCLB. Ottawa 2015. p8

The CLB has been validated against both the Common European Framework for Language (CEFL) and the American Council for the Teaching of Foreign Languages (ACTFL) benchmarks and is considered accurate for high-stakes evaluation².

The ES levels for Oral Communication were developed with reference to the Canadian Language Benchmarks³. Comparative work to determine the alignment between the CLB and other Essential Skills has been ongoing, with recent work providing additional alignment with the ES for Oral Communication in both spoken and listening domains, Reading, Writing, and Document Use.⁴

CCLB has developed a set of crossover tables that align CLB ratings with ES ratings for reading, writing oral communication and document use.

Research and Development Vice President (Bio-industrial, Bio-energy) ES/CLB Profile

Essential Skills	Equivalent CLB Level	ES Level				
		1	2	3	4	5
Reading	Reading: 11–12	1	2	3	4	5
Document Use	Reading: 11–12 Writing: 11–12	1	2	3	4	5
Writing	Writing: 9	1	2	3	4	5
Oral Expression	Speaking: 11–12 Listening: 11–12	1	2	3	4	
Numeracy	n/a	1	2	3	4	5
Thinking Skills – Problem Solving	n/a	1	2	3	4	
Thinking Skills – Decision Making	n/a	1	2	3	4	
Thinking Skills – Job/Task Planning and Organizing	n/a	1	2	3	4	

² Centre for Canadian Language Benchmarks. Canadian Language Benchmarks: English as a Second Language for Adults, CCLB. Ottawa 2012 p.11

³ Essential Skills Research Group. Readers Guide to the Essential Skills. ESDC. Ottawa ND. p57

⁴ Canadian Centre for Language Benchmarks. Relating Canadian Language Benchmarks to Essential Skills: A Comparative Framework. 2015, p3

Essential Skills	Equivalent CLB Level	ES Level				
Thinking Skills – Significant Use of Memory	n/a	Types 1,2,3				
Thinking Skills – Finding Information	n/a	1	2	3	4	
Digital Skills	n/a	1	2	3	4	5
Working with Others	n/a	See Below				
Continuous Learning	n/a	See Below				

Explanation of the Essential Skills and the Canadian Language Benchmark for Research and Development Vice President

(Bio-industrial, Bio-energy)

Reading: ES 5 CLB: 11–12

VPs R&D in Bio-industrial/Bio-energy are required to make strategic decisions affecting all levels of the organization regarding ethical governance, setting research priorities, and allocation of resources. They read and interpret complex scientific and technical documents and synthesize the information to set objectives, secure funding, and commercialize products and technologies.

Document Use: ES 5 CLB: 11–12

VPs R&D in Bio-industrial/Bio-energy manage R&D documents, data, processes, and procedures to ensure compliance with legal, funding, and regulatory requirements. They interpret and synthesize information from a wide range of paper-based and digital documents in textual, numerical, graphical, and tabular formats in order to inform decisions made by them and their peers, more senior executives, external regulatory bodies, and subordinates.

Writing: ES 4 CLB: 9

VPs R&D in Bio-industrial/Bio-energy develop and publish reports, strategic plans, policies, position papers, directives, and implementation plans to advance research and to develop and distribute information to stakeholders and others from the scientific, commercial, and investment areas. Their writing provides the foundation for scientific collaboration and development.

Oral Expression: ES 4 CLB: Speaking: 11–12, Listening: 11–12

VPs R&D in Bio-industrial/Bio-energy speak clearly and listen to responses in order to ensure clear and mutual understanding. They present complex scientific and technical information in a variety of formats and forums in order to generate support for projects. They must also be able to mediate, facilitate, and resolve conflicts within their organization, communicate to diagnose and solve business and technical problems, and coach and mentor others.

Numeracy: ES 4+ (Money Math: 4–5, Scheduling, Budgeting, and Accounting: 5, Measurement & Calculation: n/a, Data Analysis: 4–5)

VPs R&D in Bio-industrial/Bio-energy apply financial and accounting skills to develop and manage capital and operating budgets, manage costs, allocate resources, monitor performance metrics, and optimize spending to meet prescribed targets. Calculations are multi-year, encompass many variables, and may require the development of bespoke data models and processes. They must calculate in a probabilistic way, without access to all the data. A clear understanding of financial management and accounting practices, fiduciary responsibilities, and corporate accounting practices is required.

They may also be involved in forensic accounting analysis in order to understand and correct variances and analyze data from a variety of sources to make predictions in a climate of uncertainty.

Thinking Skills:

Thinking skills are subdivided into five domains:

- Thinking Skills — Problem Solving
- Thinking Skills — Decision Making

- Thinking Skills — Job/Task Planning and Organizing
- Thinking Skills — Finding Information
- Thinking Skills — Significant Use of Memory

- **Thinking Skills — Problem Solving: 4**

VPs R&D in Bio-industrial/Bio-energy must apply their intrinsic knowledge of several multi-faceted aspects of their area to solve problems that impact the organization now and in the future. Problems involve multiple variables, and the relationships between variables is not always known. Data can come from many different sources, and there may not be an established method for solving problems, so they must devise an appropriate process.

- **Thinking Skills — Decision Making: 4**

VPs R&D in Bio-industrial/Bio-energy make decisions related to the R&D function that have long term consequences for the organization. Decisions have significant impact, are usually longer term with significant financial and commercial impact, and are difficult if not impossible to reverse. The validity of these decisions may not be known until well into the future, increasing the risk and complexity of the decision-making process

- **Thinking Skills — Job/Task Planning and Organizing: 4**

VPs R&D in Bio-industrial/Bio-energy have broad discretion over the “what and how” of the work they do. They set their own priorities in the context of overall corporate objectives and then manage themselves to meet the established goals. They plan and direct the work of others, setting and adjusting priorities as necessary to meet changing circumstances. They may be involved in decisions to reallocate and rebalance resources in order to ensure schedule variances are minimized.

- **Thinking Skills — Finding Information: 4**

VPs R&D in Bio-industrial/Bio-energy access and interpret information from a wide variety of sources. Often this involves research to find out where the correct information is located. Information must be synthesized from these sources and will often need to be processed or converted in order to be useable. R&D decisions based on incomplete or inaccurate information can have significant commercial impact, so the thoroughness of information sourcing and processing is critical to success.

- **Thinking Skills — Significant Use of Memory: Types 1, 2, 3**

VPs R&D in Bio-industrial/Bio-energy are required to memorize procedures, regulations, policies, and practices through one or all of the following methods:

- Purposeful memorization of procedures, codes, parts numbers, memorization through repetition (Type 1)
- Remembering information for brief periods, e.g., minutes or hours (Type 2)
- Unique events in which learning occurs from exposure (Type 3)

Digital Skills: ES 3

VPs R&D in Bio-industrial/Bio-energy use standard office productivity software tools (Word processing, spreadsheets, presentations, etc.), electronic communication tools (email, text, instant messaging, video conferencing, etc.), and a variety of data analysis tools and technologies in the performance of their duties.

Working with Others: Work Contexts 2, 3, 4

The following work contexts and functions are relevant to the VP R&D in Bio-industrial/Bio energy role:

- Works independently (Work Context 2)
- Works jointly with a partner or helper (e.g., with other VPs, Board to develop policy) (Work Context 3)
- Works as a member of a team (e.g., with other leaders for inter-departmental/corporate initiatives/projects) (Work Context 4)

They are also involved in supervisory or leadership activities, as follows: Functions 1–3, 6–7 & 10–12

- Participate in formal discussions about work processes or product improvement (S/L Function 1)
- Have opportunities to make suggestions on improving work processes (S/L Function 2)
- Monitor the work performance of others (S/L Function 3)
- Make hiring recommendations (S/L Function 6)
- Make hiring decisions (S/L Function 7)
- Assign new or unusual tasks to other workers (S/L Function 10)
- Identify training that is required by or would be useful for other workers (S/L Function 11)

- Deal with other workers' grievances or complaints (S/L Function 12)

Continuous Learning: Types of Learning 1, 2, 3 How Learning Occurs: 1, 2, 3, 4, 5, 6

VPs R&D in Bio-industrial/Bio-energy are expected to continuously learn as a requirement of the role.

Type of learning may include:

- Training in job related health and safety (Type 1)
- Obtaining and updating credentials (Type 2)
- Learning about new equipment, procedures, products, and services (Type 3)

The learning may occur:

- As part of regular work activity (Context 1)
- From coworkers (Context 2)
- Through training offered in the workplace (Context 3)
- Through reading or other forms of self study (Context 4):
 - At work
 - On worker's own time
 - Using materials available through work
 - Using materials obtained through a professional association or union
 - Using materials obtained on worker's own initiative
- Through offsite training (Context 5):
 - During working hours at no cost to the worker
 - Partially subsidized
- With costs paid by the worker (Context 6)

4 REFERENCES

Gathering the data

The development of the National Occupational Standards started with a review of existing information for the role. This review process included: referencing books, job postings, websites, articles, and BioTalent Canada's existing skills profiles to create the first draft. After several iterations via written feedback, focus groups and a national survey with subject matter experts, the National Standards were developed. The following are sources consulted during the creation of the **Vice President R&D in Bio-industrial/Bio-energy** profile:

"Relating Canadian Language Benchmarks to Essential Skills: A Comparative Framework." Canadian Centre for Language Benchmarks (Ed.), 2015.

"Canadian Language Benchmarks: English as a Second Language for Adults." Canadian Centre for Language Benchmarks (Ed.), Oct. 2015.

"Theoretical Framework for the Canadian Language Benchmarks and Niveaux de compétence linguistique canadiens." Canadian Centre for Language Benchmarks (Ed.), 2015.

"Readers' Guide to Essential Skills Profiles." Essential Skills Research Unit, Skills and Labour Market Information, Division Skills and Employment Branch, Human Resources and Social Development Canada, 2017.

Gauthier, Marie-Elyse. "Overview of CLB and NCLC Competency Levels." Canadian Centre for Language Benchmarks, Feb. 2018.

"Bio-Economy Skills Profiles." BioTalent Canada, BioTalent Canada, <https://www.biotalent.ca/skillsprofiles/>.

"Bio-Economy Skills at-a-Glance ." BioTalent Canada, BioTalent Canada, <https://www.biotalent.ca/ataglance/>.

"Vitae Researcher Development Framework (RDF) 2011." Vitae, 2011, <https://www.vitae.ac.uk/vitae-publications/rdf-related/researcher-development-framework-rdf-vitae.pdf/view>.

“SFIA Foundation Skills at a Glance.” The Global Skills and Competency Framework for a Digital World, SFIA, <https://sfia-online.org/en>.

“National Occupational Standards for Environmental Employment (2016).” ECO Canada, 2016, <https://eco.ca/new-reports/nos-environmental-employment/>.

Parker, Jeanette Plauché, and Lucy Gremillion Begnaud. *Developing Creative Leadership*. Teacher Ideas Press, 2004.

Brown, Brené. *Dare to Lead: Brave Work, Tough Conversations, Whole Hearts*. Random House, 2018.

Sloane, Paul. *Test Your Lateral Thinking IQ*. Sterling Pub. Co., 1994.

“Who Does LCA & Why?” Athena Sustainable Materials Institute, <http://www.athenasmi.org/resources/about-lca/who-does-lca-why/>.

Fletcher, Anthony C., and Philip E. Bourne. “Ten Simple Rules to Commercialize Scientific Research.” *PLOS Computational Biology*, Public Library of Science, Sept. 2012, <https://journals.plos.org/ploscompbiol/article?id=10.1371%2Fjournal.pcbi.1002712>.

“Journal of Analytical & Bioanalytical Techniques Open Access.” *Journal of Analytical and Bioanalytical Techniques- Open Access Journals*, <https://www.omicsonline.org/analytical-bioanalytical-techniques.php>.

Mittu, Bharti, et al. “Analytical Method Development and Validation: A Concise Review.” *OMICS International*, OMICS International, 23 Feb. 2015, <https://www.omicsonline.org/open-access/analytical-method-development-and-validation-a-concise-review-2155-9872-5-233.php?aid=40535>.

Kenton, Will. “Bringing a Product to Market through Commercialization.” *Investopedia*, Investopedia, Dec. 2020, <https://www.investopedia.com/terms/c/commercialization.asp>.

Crater, Jason S, and Jefferson C Lievens. “Scale-up of Industrial Microbial Processes.” *FEMS Microbiology Letters*, Oxford University Press, 1 June 2018, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5995164/>.

“New Thinking about Manufacturing. Putting Those New Ideas into Practice Today. Educating the Manufacturing Leaders of Tomorrow.” *Institute for Manufacturing (IfM)*, <https://www.ifm.eng.cam.ac.uk/>.

“Engineering Design Process.” Wikipedia, Wikimedia Foundation, https://en.wikipedia.org/wiki/Engineering_design_process.

“Research Process: 8 Steps in Research Process.” IEduNote, 2 Feb. 2021, <https://www.iedunote.com/research-process>.

“Noble Precision Blog: 3 Reasons to Develop Engineer Research Skills.” Noble Precision, <https://www.nobleprecision.com/blog/>.

Campana, Natalia. “What Does a Research Engineer Do? - Career Insights.” Freelancer Blog, 24 Mar. 2020, <https://www.freelancermap.com/blog/what-does-research-engineer-do/>.

Pharmaceutical Processing. “Challenges of Scale-up and Commercialization.” Pharmaceutical Processing World, 11 Oct. 2019, <https://www.pharmaceuticalprocessingworld.com/challenges-of-scale-up-and-commercialization/>.

“Nine Steps for Developing a Scaling-up Strategy.” World Health Organization, ExpandNet, https://www.who.int/immunization/hpv/deliver/nine_steps_for_developing_a_scalingup_strategy_who_2010.pdf.

“What Is Design of Experiments (DOE)?” ASQ, <https://asq.org/quality-resources/design-of-experiments>.

Alentic, <https://alentic.com/>.

Syngenta, <https://www.syngenta.com/en>.

“FP Innovations.” FPInnovations, <https://web.fpinnovations.ca/>.

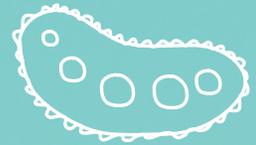
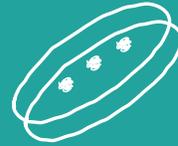
“Biologics, API & Drug Development CdmO.” BIOVECTRA, <https://www.biovectra.com/>.

“Smart Materials and Nanocomposites.” META, <https://metamaterial.com/>.

“National Recruiting Agency: Summit Search Group: Canada.” Summit Search Group, 4 Feb. 2021, <https://summitsearchgroup.com/>.

During the research period, several job posting boards were reviewed for this profile.

You already have a stellar team. Here's how to enhance their key skills.



PROFESSIONAL DEVELOPMENT

- Essential Skills Fundamentals
 - Introduction to the Bio-economy, Reading, Writing, Numeracy, Document Use, Communication, Collaboration, Problem Solving
- Technical Skills Fundamentals
 - Scientific Report Writing, GLP, GCP, GMP, QA/QC



Give your team the BioReady™ Edge

biotalent.ca/essential | biotalent.ca/technical



Funded by the Government of Canada's Sectoral Initiatives Program. 

The opinions and interpretations expressed in this publication are those of the author and do not necessarily reflect those of the Government of Canada.

Copyright 2022 by BioTalent Canada. This publication may not be reproduced or distributed in whole or in part without express permission from BioTalent Canada.

© 2022 BioTalent Canada™, The PetriDish™, BioSkills Match™ and BioReady™ are registered trademarks of BioTalent Canada. BioTalent™ is a trademark of BioTalent Canada.
March 2022.



biotalent.ca

 facebook.com/biotalentcanada

 twitter.com/BioTalentCanada

 linkedin.com/company/biotalent-canada

 youtube.com/user/BioTalentCanada

