Associate of Science Degree (AS) Track 1 Biology Program

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DISCOVER

SEATTLE COLLEGES
North · Central · South

What is the program?

Associate of Science Degree (AS) Track 1 / Biology

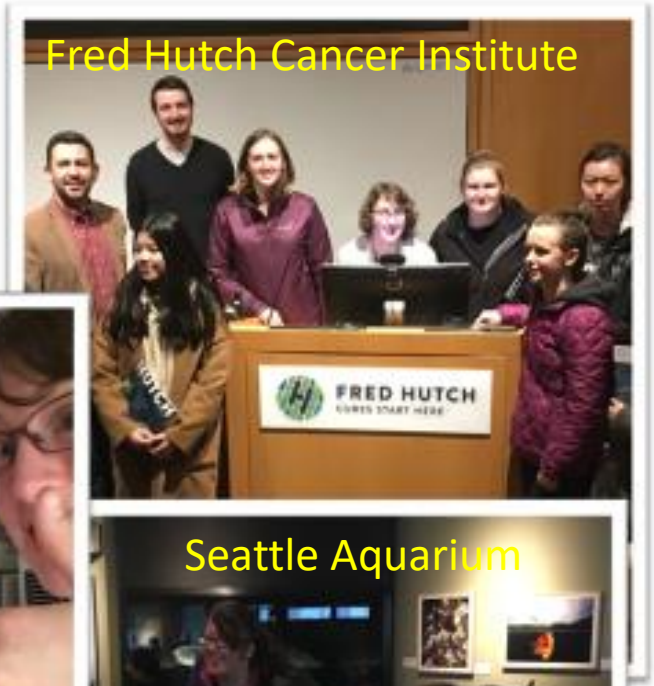
The Science Pre-Major Associate of Science (AS) degree program prepares students for transfer to science programs at four-year colleges and universities and will give students basic skills needed by scientists studying fields such as Biology, Chemistry, Environmental Science, Geology, and Earth Science. Students planning to complete degrees in Medicine, Dentistry, Pharmacy and Physical Therapy can complete this degree as part of their academic career.

Where is this program offered?

South Seattle College
Seattle Central
North Seattle College

Excellence in Teaching/Learning

Excellence in Teaching/Learning



What do you learn?

Faculty in the AS Track 1 Program:

- Dr. Amanda Vega (Anatomy and Physiology)
- Dr. Henry Olson (Biology, Microbiology)
- Prof. Ruben Murcia (Major's Biology)
- Dr. Jessica Pikul (General Chemistry)
- Prof. Stephanie Endsley (Organic Chemistry)

Skills you will learn in the AS Track 1 Program:

Experimental design
Collecting and analyzing data
Hypothesis testing
Critical thinking
Microscopy
Modern lab techniques in chemistry, microbiology, and DNA research

What do you learn?

The Search For A New Gene In *Pseudomonas fluorescens*

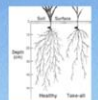
Joy Dubay, Fatuma Ali, Faduma Yusuf
Facilitator: Professor Ruben Murcia, Lab Technician: Camille Stewpowski, Institution: South Seattle College

Abstract

There are several strains of the bacteria *Pseudomonas fluorescens* that have been previously sequenced. Our college biology department is among 11 other schools in WA state that is helping to sequence the unknown sections of the genome of the strain L5.1-96 to see if we can help pin point gene(s) responsible for the strong colonization of this particular strain. This bacteria has been found to be very beneficial in the battle against a fungus that affects wheat crops called take-all disease.The clone we analyzed did show the existence of 2 hypothetical proteins that with further investigation may prove advantageous in future research aimed at solving this dilemma for wheat crop production.

Background

This fungus that causes **take-all** disease is *Gaeumannomyces graminis var. tritici* and it invades the roots of the plant and inhibits uptake of water and nutrients causing the plants' roots to rot.

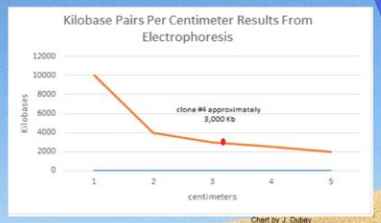


This rot quickly spreads to neighboring roots and will typically cause 10%-50% of the crop to die, but in some instances may kill the entire crop. There is a natural defense against take-all in the form of *Pseudomonas fluorescens*. This bacteria provides the antibiotic 2,4-diacetylphloroglucinol (2,4-DAPG). Unfortunately to counteract the damaging effects of take-all can take 7 growing seasons, too long for farmers dependent upon healthy crops for their livelihood.

Methods

As a class we first learned to use micropippeters & to make agarose gels. We divided into 8 groups & were each given a numbered sample of Kanamycin resistant clone (E.coli DH10BT1-R with L5.1-96 vector) to work with. The methodology is as follows:

- **Culture** the bacteria for plasmid amplification by incubation at 37°C for 24 hours, then at room temp for 24 hours. Centrifuge, pour off liquid growth medium, repeat until all culture is used and a usable pellet is formed.
- **Lyse** the cell under alkaline conditions separating plasmids from chromosomal DNA and proteins by adding 250 uL of P1 buffer & vibrate to break up pellet, Add 250 uL of P2 buffer & gently rotate and wait for solution to become clear. Add 350 uL of N3 buffer & centrifuge for 10 min @ 1300 rpm causing formation of pellet. Pour supernatents in spin column, add 50 uL of EB buffer & centrifuge for 1 min.
- **Run** part of sample during electrophoresis to check for amount & quality. Refer to chart below



- **Analyze** DNA base pairs and the distance travelled compared to the control DNA ladder. See above figure of DNA in Polymerase Chain Reaction by adding to 2 different PCR tubes;1 uL DNA; 2 uL buffer 2 uL BigDye® Terminator; 4 uL ddH2O and finally to one sample 1 uL Primer SL1 & to the second 1 uL of Primer SR2. SL1 attaches nucleotides to the leading strand of DNA, while SR2 attaches nucleotides to the lagging strand. Making for a higher chance of success in realizing a usable sample to be sequenced.
- **Achieve** PCR results by rapid heating & cooling in a Thermal Cycler which causes DNA to denature & anneal to the BigDye® nucleotides

- **Clean up** of samples with XTerminator ®& SAM® to scavenge contaminants such as dyes & salts.
- **Sequence** sample at Bellevue College.
- **Analyze** results with BLAST in GenBank to compare to previously sequenced organisms

Results

Based on the nucleotide sequence, our clone's sequence matched with the *Pseudomonas brassicacearum* subspecies *brassicacearum* NFM421 genome. *P. brassicacearum* falls within the *P. fluorescens* group and has copper resistance protein which is used as an antibiotic and growth-promoting additive. We also found using the translated database two hypothetical proteins that relate to *Pseudomonas* species which scientists can further study and perhaps isolate their function.

Discussion

Pseudomonas brassicacearum and *Pseudomonas fluorescens* are closely related and have many identical genes. Many groups in class had sequences that matched *Pseudomonas brassicacearum* higher than 99%, might just be called *P. brassicacearum* in the near future.They were hypothetical proteins found in several places in our clone. Perhaps these proteins will unlock information in the search for answers regarding the take down of take-all.

Acknowledgements

SOUTH SEATTLE COLLEGE

Pathway: Biology

Area of Study: **Science, Technology, Engineering & Math (STEM)**

Suggested Schedule to Earn an Associate Degree

The suggested schedule below meets the requirements to earn an Associate in Science (AS) Track 1 degree with an emphasis in Biology. If classes listed below don't fit your schedule or interests, you can take alternate classes! Visit this website for instructions: www.southseattle.edu/pathway-map-help.

Year One

Quarter One *Credits*

- ☐ MATH&146: Intro to Statistics 5
- ☐ BIOL&100: Survey of Biology **-or-**
  BIOL&160: General Biology 5
- ☐ CMST&101: Intro to Communication -or-
  CMST&220: Public Speaking -or- ART 111: Drawing .. 5

Quarter Two

- ☐ ENGL&101: English Composition I 5
- ☐ MATH&151: Calculus I 5
- ☐ SOC&101: Intro to Sociology **-or-**
  PSYC&100: General Psychology 5

Quarter Three

- ☐ MATH&152: Calculus II 5
- ☐ CHEM&139: General Chemistry Prep 5
- ☐ ENGL&235: Technical Writing **-or-**
  CSC&110: Intro to Comp Programming 5

Year Two

Quarter Four *Credits*

- ☐ BIOL&211: Major's Cell 5
- ☐ CHEM&161: General Chemistry I 5
- ☐ PHYS&114: General Physics I **-or-**
  PHYS&221: Engineering Physics I 5

Quarter Five

- ☐ BIOL&212: Major's Animal 5
- ☐ CHEM&162: General Chemistry II 5
- ☐ PHYS&115: General Physics II **-or-**
  PHYS 222: Engineering Physics II **-or-**
  Foreign Language I 5

Quarter Six

- ☐ BIOL&213: Major's Plant 5
- ☐ CHEM&163: General Chemistry III 5
- ☐ PHYS 152: Engineering Physics I **-or-**
  Foreign Language II 5

Total Credits Required: 90

To Do List

Quarter 1

- ☐ Make an Ed Plan with an advisor
- ☐ Get involved on campus thru Student Life
- ☐ Tour the MySouth student portal

Quarter 2

- ☐ Apply for free money with FAFSA or WASFA
- ☐ Attend a transfer fair and research options
- ☐ Apply for Ready Set Transfer

Quarter 3

- ☐ Attend your major's info sessions at transfer institution
- ☐ Attend a resume workshop

Quarter 4

- ☐ Update your Ed Plan with an advisor
- ☐ Attend transfer events, including personal statement workshops

Quarter 5

- ☐ Apply to your transfer school
- ☐ Re-apply for FAFSA or WASFA if transferring
- ☐ Apply for summer research or internship opportunities

Quarter 6

- ☐ Apply for Associate degree from South
- ☐ Order cap and gown; attend graduation!

Pathway: Biology

About the Biology Pathway

This pathway is designed to meet the Associate in Science (AS) Track 1 degree requirements with an emphasis in Biology. If you enjoy science and are curious about how living things work, consider entering this pathway.

Biology is an increasingly complex and exciting field, one that overlays other critical subdisciplines from anatomy, pathology and ecology to chemistry, genetics and botany. Each of these intersects with the study of life and living organisms. And of course, medical and scientific innovation continue to drive biology into new and thrilling directions. This means that your biology education will touch on issues impacting human, animal and plant life far and wide, including subjects like genetic engineering, transhumanism, GMO farming, and global climate change.

In this pathway, you'll learn about life on Earth and how it forms, functions, evolves and interacts. Courses explore topics like evolution, genetics and the cellular process in microorganisms, plants and animals. You'll also learn about the scientific method and gain hands-on experiences in the lab. Most of our biology students continue their education by transferring to a four-year college or university at a junior standing.

Length of Program

90 credits = 6 quarters if you take 15 credits* each term.

Students who take 15 credits each quarter earn their degree faster, qualify for more financial aid, and earn more money over their lifetime because they complete their schooling faster.

Which Quarter Can I Begin?

Fall, Winter, Spring, or Summer.

Class Times/Delivery Format?

Classes and labs are offered M-TH (2 days or 4 days a week) from 8am-4pm and in the evenings. We offer on-campus, online, or hybrid (part on-campus, part online) formats.

Career Opportunities

- Biologist
- Biological Technician
- Environmental Conservationist
- Biochemist
- Physician
- Dentist
- Veterinarian
- Physical Therapist
- Health Educator
- Genetic Counselor
- Health Communications Specialist
- Microbiologist
- Nurse Practitioner
- Pharmaceutical Sales Representative

A bachelor's or higher degree may be required for some careers listed above. For current employment and wage estimates, please visit the Biology program page on South's website.

Future Education Opportunities

Once you complete this Associate degree, additional education opportunities include:

- A bachelor's degree in biology, molecular biology, genetics, pre-med or a related field at a four-year college or university.
- A Bachelor of Applied Science (BAS) degree at one of the Seattle Colleges.

Program and admissions requirements vary from college to college. Contact an advisor to create an educational plan tailored to transfer to the institution of your choice.

Approximate Costs Each Quarter

Tuition*.....$1550

Books, supplies, and miscellaneous fees $200

Tuition based on WA resident rates. Rates for international students and non-residents may vary.

Apply for Financial Aid

Did you know that the average student at South spends 3 hours applying for financial aid and gets more than $4000 per year?

Visit **www.southseattle.edu/financial-aid/** to apply for financial aid, including grants and scholarships you don't have to pay back.

Find Out More

(206) 934-5387 • AdvisorSouth@SeattleColleges.edu • RSB 11

Careers/Jobs

Physician (MD)	Physician's Assistant	Nurse Practitioner
Education Required: Pre-med (3-4 years) Med School (4 years) MD Training (2 years) Residency (2-5 years)	Education Required: Prerequisites (3-4 years) PA School (2.5 years) Clinical rotation (1 yr.)	Education Required: Pre-requisites (2 years) RN or BSN (2-4 years) Nurse Practitioner Program (2-4 years)
Yearly Salary (Avg): $200,000 and up	Yearly Salary (Avg): $90,000 - $140,000	Yearly Salary (Avg): $90,000 - $140,000
Job opportunities upon graduation: Multiple job offers	Job opportunities upon graduation: Multiple job offers	Job opportunities upon graduation: Multiple job offers

Careers/Jobs

Dentist	Physical Therapy (DPT)	Pharmacist
Education Required: Pre-dental (4 years) Dental School (4 years) MD Training (2 years) Residency (2-5 years)	Education Required: Prerequisites (3-4 years) PT School (3 years)	Education Required: Pre-requisite (2-3 years) Pharm School (4 years)
Yearly Salary (Avg): $140,000-$160,000	Yearly Salary (Avg): $80,000 - $120,000	Yearly Salary (Avg): $120,000 - $140,000
Job opportunities upon graduation: Multiple job offers	Job opportunities upon graduation: Multiple job offers	Job opportunities upon graduation: Multiple job offers

Q & A

What additional information about the AS Track 1 Degree in Biology can I provide today?

Contact information:

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Telephone: (206) 934-5880

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