

# Bio-Link Discussion Group

January 2001—December 2001

## **Hosta tissue culture (January 2001)**

I'm looking for a tissue culture protocol for hostas. Carolina has a kit but the tissue culture is started from the bud of a living hosta. Since hostas are not blooming right now, I'm looking for a protocol that uses some other source. It has to be hostas because we are hoping to do this lab with our horticulture department and they need the hosta protocol. We can bring hostas out of dormancy in our greenhouse but don't have time to wait for buds. *Des Moines Area Community College* (#108)

- Zilis, Mark and Zwagerman, Douglas. 1980. Clonal propagation of hosta by scrape section in vitro. HortScience. 14(3) :456 (Abstract) <http://www.aggie-horticulture.tamu.edu/tisscult/chimeras/chimeralec/chimeras.htm> \l<http://www.ca.uky.edu/HLA/Dunwell/HSTPRP.html> *Virginia Tech* (#109)

## **GMP/GLP training programs (January 2001)**

I just got back from a meeting with a representative from our Iowa Biotechnology Association and was assigned the duty of finding out what community colleges throughout the U.S. were doing in the way of GMP/GLP training for biotechnology industries in their regions. *Des Moines Area Community College* (#117)

- BUSM is offering an 8-week course in CGMP/QA right now. *Boston University School of Medicine* (#118)
- Check with Lisa Seidman at Madison Area Technical College. The North Central Region of Bio-Link had a wonderful one week session that may be repeated. (#120)
- Bio-Link website just put on a new section for 'Online Courses' one of the 2 courses currently available is titled "GLP & GMP for Bioscientists" which is offered by Bob Wells out of Montgomery College, MD. The short description is below and the site has links for more complete syllabus info. <http://www.bio-link.org/> GLP & GMP for Bioscientists Description: Available on a quarterly basis (about every 90 days.) Each six week session is self-paced by the student and is exceptionally user-friendly. While the course is valuable as a guide for objectively structuring and managing one's laboratory operations, its deeper purpose is to provide a means of managing the student's laboratory product(s) toward compliance with regulations of the Food and Drug Administration. (#122)
- Several California Community Colleges have focused (solely) on training students for biotech manufacturing. We (Solano College) have all of our students receive several presentations on GMP (mainly we use Genentech GMP trainers) and then we run the labs with as close to GMP as we can muster. (SOPs, batch records, raw materials control, gowning, safety glasses, etc.) I'm not sure that we achieve it, but our goal is to try to emulate industry as closely as possible. In our current construction, our students solely follow GMP and do not keep lab notebooks, etc. (Our program is so manufacturing oriented that our students do not currently touch DNA in our biotech program.) Maureen Harrigan at Moorpark College brings industry reps in from Amgen and Baxter to teach GMP and to run GMP labs. Dave Singer at San Diego City College has his industry instructors teach GMP as well. You could also talk to Kate Levine at Contra Costa College or Celeste Carter at Skyline College who has written labs that have SOPs and batch records ([www.cipb.org](http://www.cipb.org)) If I can depart from California (that I know best) - If you want an excellent model for incorporating GMP into the lab, look at Sonia Wallman's

website. She was nice enough to include all of her SOPs on the website. So far the willingness to teach GMP has been a distinction of the community college systems in California. I went to a seminar for California State University faculty in 1996 where the topic was "introducing GMP into the curriculum" and several (perhaps many) of the faculty were openly hostile and expressed it by saying "we are NOT a trade school." So it was left to the community colleges to be the trade school and to serve as a post-graduate training ground where students graduating from university molecular biology/genetics programs who were not employable while the ink was drying on their B.S. degrees could come to learn practical skills that would make them employable (most students (sometimes 60 - 70%) enrolled in California community college biotech programs have a Bachelors degree or higher.) This barrier seems to be breaking down a bit. I was encouraged to learn that Wendie Johnston from Pasadena City College has formed a close relationship with a faculty member at Cal Poly Pomona (in the California State University system) where they are working on GMP. It is my experience that it's the GMP training that makes students stand out in an interview. Students from a lot of schools have received classroom lectures on gene cloning, DNA sequencing, etc. But few interviewees would have received GMP training. *Solano College* (#123)

- You asked whether companies ever send their technicians to ccs to get training in GMP. We have run a workshop/course here at Madison Area Technical College that is geared towards people working in companies, particularly as technicians. We generally hire an expert from industry to teach the class. We have tried both a lecture format and a combined lab/lecture format. It seems that the industry people prefer lecture only. We have run the course at night. It meets six evenings, three hours per evening. Our GMP course is fairly inexpensive and does not require out of town travel. In our experience, most companies are reluctant to spend a lot on courses that are geared to technicians, as contrasted with managers. However, this may not be true of all companies. At the end of our GMP course, participants receive a certificate of completion. *Madison Area Technical College* (#125)

#### **4 yr biotech/genetics degree program (January 2001)**

I have a very good student finishing our biotech 2 year program and she wants to go on into biotech or genetics in 4 year institution - do any of you have local universities to which I can refer her - do any articulate with biotech programs? Do any of you have information on this? (#126)

- I am a bit biased in my response (since it is in our back yard), but the Rochester Institute of Technology has one of the strongest 4-year biotech programs in the country that continues to grow and gain strength. They have a very strong co-op program that they have an excellent reputation for. As it turns out, Sonia's program at NH Community Technical College and Elaine's program at City College in SF have articulations with RIT and we just finished one ourselves. RIT is very active in establishing these agreements and I think your student will want to take a look this way. *Finger Lakes Community College* (#127)
- St. Cloud State University in St. Cloud, MN has a BS in Biotechnology. Your student should contact Dr. David DeGroot, Department Chair for additional information. (#128)
- Check out Boston University's program. It's research and molecular based, not manufacturing. (#130)
- UC Davis is an excellent choice in California although the tuition would be out of state for the first year. Probably the best choice in the country would be Rochester Institute of Technology in New York. They do articulate with City College of San Francisco and New Hampshire Technical College biotech programs. (#131)
- UW-River Falls, located in the Minneapolis-St. Paul, MN metro area, has a 4 year biotechnology program offered in both the College of Agriculture, Food and

Environmental Sciences and the College of Arts and Sciences. We currently have an articulation agreement with MATC, Madison Area Technical College, and are interested in entering into such agreements with other colleges. (#132)

- Ferris State University (in Big Rapids, Michigan - on the western side of the lower peninsula) has offered a BS in Biotechnology for about 13 years now. I don't have their current URL but a bit of creative surfing should yield success. Their program focuses on Recombinant DNA technology, Tissue Culturing, and Protein/Immunology methodology. Their job placement rate is quite high. Dr. James Hoerter is the Chairperson of the Biological Sciences Department at FSU. Lansing Community College (#134)
- Another word about Ferris State University - they have been offering some VERY good financial aid packages and opportunities for paid internships throughout their program so if finances are a concern for a student, this would be a good place to look. Des Moines Area Community College (#135)

### **Phage DNA isolation (February 2001)**

Does anyone have experience with a good phage DNA isolation that doesn't use phenol? Solano College (#137)

- Qbiogene has two kits, ssPhage for purifying single stranded phage, and Lambda Quick SPIN for lambda phage. Both use silica (Glassmilk) to purify, and there is no phenol. I have used both; you might want to check out the website ([www.qbiogene.com](http://www.qbiogene.com)) and download the protocols. Chula Vista High School (#143)

### **Protein purification (February 2001)**

I'm looking for a protein purification lab that we can do with the Intro to Biotech class we support in area high schools. Since this is their first exposure I would like something relatively foolproof and fairly visual (plant pigments, GFP, etc.). Since we are providing equipment it would also make me happy if it wasn't too elaborate. Any suggestions? Austin Community College (#138)

- I highly recommend Bio-Rad's Secrets of the Rainforest Kit. It is fairly simple to use and uses HIC for the purification of GFP. Finger Lakes Community College (#139)
- The DNA Learning Center - their Genomics Workshop - has a GFP protein purification without columns - your college has sponsored this workshop so should have the protocol. Oklahoma City Community College (#140)
- Check out the NH Biotechnology Center's website at <http://biotech.tec.nh.us> and look at BT210 to find Protocols re: GFP purification. (#141)

### **Mycotoxins in figs (February 2001)**

I am doing research on mycotoxins in figs. What are the reasons and how can we prevent mycotoxins in figs? (#145)

- From my previous work with the FDA I understand that mycotoxins are produced by plants infected with mycobacterium. From my understanding, once the toxins are produced there is no way to get rid of them. Peanuts are another common carrier of the mycotoxin (watch out all you peanut butter lovers!) You might contact the FDA for more information. (#147)
- Mycotoxins are produced by fungi (myco=fungus). Fungi such as Amanita, not associated with food, can also produce mycotoxins. You are correct that Aspergillus can grow on peanuts in storage and Aspergillus flavus produces the carcinogenic aflatoxin. The plant is not infected; this is an example of post-harvest disease. There has been speculation that ergot in wheat flour caused the hallucinations leading people to be accused of witchery. Ochratoxin A (Penicillium and Aspergillus) has been found in figs. Skyline College (#148)

- I am quite sure that the ergot grows on rye, not wheat. The few brown grains of rye found in un-ground rye contain the fungus. Ergot has been blamed as a possible cause of mass hysteria in cultures where rye is consumed as a staple. And so may have lead to accusations of witchcraft as an explanation for the affliction. LSD was in fact, first synthesized from the by-products of the ergot fungus. Middlesex Community College (#152)
- I agree the Salem witch burnings coincided with an outbreak of ergot in rye. However, *Claviceps purpurea* (ergot) does grow on wheat, oats, barley, and other grasses. The North Dakota State University provides us with a nice photo <<http://www.ext.nodak.edu/extpubs/plantsci/crops/pp551w.htm>> Many historical references describe "grain ergotism" (e.g., St. Anthony's Fire). Skyline College (#153)

### **Risk management in biotech teaching labs (February 2001)**

I am curious about the risk management practices used in biotechnology teaching labs - which of the following do you require of students - Personal Protective Equipment:

1. lab coats - all the time?
2. gloves - as needed or all the time?
3. eye protection - as needed or all the time? If worn all the time, is the use of prescription glasses allowed to substitute for safety glasses?

Insurance - do you have medical/accident insurance available for uninsured students to purchase? Is it required or optional? Other? Oklahoma City Community College (#155)

- I do require lab coats, gloves, and eye protection at all times in the lab. Additionally, I have students sign a statement indicating that they understand the hazards that they could encounter and the safety regulations that we and the state require them to follow. We are very safety conscious as you can tell, but my experience it that that is what they will encounter on the job, so why not start in school. Insurance is another issue. I understand my college has liability coverage, but I am not sure of the details. I used to have my own personal liability through the NABT, but I let it lapse. Perhaps you could let me know what you find out about that. Middlesex Community College (#156)
- My students must wear lab coats and gloves at all times. Goggles are provided and worn as needed. We start off the semester with a unit on safety followed by a quiz which the students must pass in order to work in the lab. Our school has liability insurance; I don't have any personal liability insurance. Des Moines Area Community College (#157)
- We have just started our biotech courses here at JSRCC. I am glad to see someone bringing up the issue of safety in the lab. I have a difficult time getting the rest of my faculty to agree on this issue. Can anyone tell me their policies on human body fluids, specifically urine in their general biology and anatomy and physiology courses? If you use it what types of precautions do you take? If you have stopped using human body fluids, what was the main reason and how was it presented to faculty? (#158)
- Bakersfield College's Biology Department came to consensus agreement several years ago to cease handling of body fluids altogether. The basis for this decision was OSHA/CalOSHA regulations at the time. The regulations said students have the same relationship to the institutions as employees have to their employers. Employers are required to provide safety training and equipment for their employees; therefore, the college was obligated to provide same for the students. The decision to forego work with body fluids was mostly an economic one--the consensus feeling was our supply budget could not cover the cost of personal safety equipment for every student enrolled in every course offered by the department. Compliance has not been 100 percent, however. At least one faculty member has violated the agreement more than once over the years. Bakersfield College (#159)
- Johnson County Community College in Overland Park, KS established a Chemical Hygiene policy and Blood Borne Pathogen policy several years ago. The Chemical

Hygiene policy stipulates when gloves, goggles and lab coats are to be worn in the lab, and the Blood Borne Pathogen policy stipulates when gloves, protective eye wear and lab coats are to be used when using biological specimens or potential exposure to blood or other body fluids which may pose a biological hazard to students and staff. Housekeeping staff have been trained in appropriate clean up of spills which might contain body fluids. All faculty and lab support personnel who have responsibilities in the lab are required to attend training in lab safety and chemical hygiene. The school has a full-time Hazardous Materials Coordinator who monitors the compliance of both the Blood Borne Pathogen and Chemical Hygiene policies. (#161)

- In our biotech program at Madison Area Technical College, we have all the students sign a simple safety "contract" every year. It says that they agree to follow all safety rules directed by their teachers and they agree to wear a lab coat and safety glasses at all times in the lab. We have found that students like to wear gloves in the lab -- which is a problem since they seldom remove them when they should. If students wear gloves to protect themselves from ethidium bromide or acids, and then pick up their pens or lab notebooks, or turn the lights on or off, they are likely to contaminate whatever they touch. Therefore, in order to prevent contamination, we are very strict about having the students use gloves when necessary, and remove them as soon as the task is finished. It is expensive to have the students changing gloves so often, so we don't have them wear gloves when handling non-hazardous materials. *Madison Area Technical College* (#162)

### **Perception of biotech (April 2001)**

Biotech is really getting hot in St. Louis but the biotech community here labels itself as "Life Science" and/or "Plant Science" due to the negative press concerning biotechnology. I have colleagues that perceive "Plant Science," even molecular/cellular plant manipulations, as something distinctly different from biotechnology. I have tried to explain that whether you do cellular/molecular work with plants, animals or bacteria it is considered biotechnology and that plant and life science can be under the broad umbrella called biotechnology. I am wondering if any of you have opted to label your program as something other than "Biotech" to change the perception of others and if so, what the results have been. *St. Louis Community College - Florissant Valley* (#171)

- We actually went the opposite way several years ago (in those good 'ole pre-Bt/Monarch Butterfly days). Our two-year AAS degree program had been called "Molecular Biology" but we changed it to Molecular Biotechnology around 1996. So far, no picket lines have formed outside my lab door. <http://www.lcc.edu/science/molecbio> *Lansing Community College* (#172)
- At least in this area of New England, the term "Biotech" is selling well and my guess is that we would be sailing in the wrong direction with the public if we sought to change it. Maybe we are just a little further from the butterflies than are you. Seriously, biotech in New England usually - but not always - refers to human biotechnology not plant biotechnology. (#173)
- We're in the middle of the ag industry here with Pioneer Hi-Bred International and Monsanto within a 10 mile radius of our campus. We continue to proudly call our program "The Des Moines Area Community College Biotechnology Program" and have had no problems with that at all. In fact - it has helped people to be more aware of exactly what we are offering and those that are interested find it a very exciting area of technology. I have found that using the title of "biotechnology" helps industry to recognize the type of program we're offering and makes it easier for students to recognize the wide focus of this field of study (plants, animals, bacteria, viruses, humans). Even though biotechnology has some controversy surrounding it, my perception is that people are still fascinated by it and agree that it is going to be an important part of our future as a state and as a country. *Des Moines Area Community College* (#174)

- We should all call our programs biotechnology. Our local economic development folks tried to market the name of "the Life Science Corridor" (as an equivalent to the term Silicon Valley) to describe the stretch of Interstate 80 between San Francisco and Sacramento – it failed because "Life Science" just doesn't have the sex appeal of the word "biotechnology." Their concern was not an effort to avoid the controversy in the term "biotechnology" but to include medical devices and traditional pharma under the umbrella term. I don't hear anyone saying "Life Science Corridor" anymore - if they had worked in the term biotechnology, the term might have had some legs. At the risk of offending botanists, I really have to council against "plant science." Most of the students that we are trying to recruit equate plants with a snooze fest. Yes, plants are important in biology and in agriculture, and I have a special fondness for them, but the harsh reality is that they don't have the appeal of animals - or even bacteria - to the average student. There is no botanical equivalent to Crocodile Hunter: "Crikey, what a fern!!!!" "Bad vegetable, naughty fruit - down!" Likewise, "Molecular Biology" does not describe what most of our 2 year students will do. Molecular Biology is typically performed by the PhDs at the top of the R & D ladder. It is my firm belief, and I recently heard a talk that gave survey data to back this up, that to most Americans (Europeans might be different) "biotechnology" means the production of new drugs that might save Aunt Mathilda. The appearance that "biotech = evil" might be local to the Saint Louis area since Monsanto is the epicenter of the blundering arrogance that set ag biotech back 10 years. (For a good review of Monsanto's mistakes, see the NY Times piece on January 25 of this year by Eichenwald, Kolata, and Petersen.) But they seem to have finally gotten their act together. Any negatives in the term "biotechnology" should quickly blow over. That's what I see, anyway, when I look into my crystal ball. There is a bigger issue within this discussion and it exactly cuts to the heart of why we have a bio-link. Community colleges traditionally tailor their programs to the local situation; this remains one of our great strengths. But within this strength lies quite a bit of anarchy – the training that one student receives in a "biotech" program at one college might be very different than the training that another student receives at a different college. This fact forces an employer to try to gauge whether the potential employee sitting across the interview table from them graduated from a biotech program where s/he gained the skills useful to that particular employer. That is, the employer will say "Jane Smith is a very useful employee and she got her biotech degree from College X – will you be as useful since you attended the biotech program at College Y?" If we all had some core curriculum (and perhaps all taught to the industry skill standards - or something, I don't know) - then the employer would say "ah, a community college biotech graduate - they are always well trained." The reason that this has struck me is that I getting quite a few recruiting calls from other parts of the country. It seems as if a little more standardization would all of our students more mobile. This is a big topic of discussion; and I first find myself arguing one side and then the other - but - The discussion can start when we all call our programs biotechnology. OK, now that I've argued for unity, I can reverse and argue again for diversity. :v) (And after all isn't the basis of biology the cognitive dissonance of UNITY and DIVERSITY.) I like the term that Maureen Harrigan applies to her program at Moorpark College: Industrial Biotechnology. This rings with - Industrial Strength. But it also differentiates our programs from the 4 year colleges whose graduates receive a curriculum designed to make them university professors (and this is useful to the 0.1% who do) and then their graduates come back to the community college to develop lab skills and the practical knowledge of the industry that makes them employable. (In California, 50 - 70% of the students in biotech programs have a B.S. or higher). So I like Industrial Biotechnology, since it does differentiate the program from Academic Biotechnology. OK, there are my "no holds-barred" thoughts. Biotech rules! Biotech rocks! Solano College (#176)

- I agree with you. I love botany but it won't sell except in areas where people depend on it for a living. Also humans have at least a 100,000 year track record of being a fairly selfish species. We are only interested in ourselves. Kids want to hear about the Human Genome - their genome - first. (#177)
- While we are on the subject, I thought you might all appreciate a letter I received from one of our locals who is a member of the "Vegetarian and Humanitarian conscience." We have been getting quite a bit of press lately for a couple of projects and the announcement of a new articulation with Rochester Institute of Technology. The Rochester papers ran a picture of one of our students over a gel box with a micropipettor in her hand. A woman wrote a letter to the paper and our President in defense of the small animal that she apparently thought she saw in the gel box. She felt that biotech, which she equates to the "butchering of animals for our unworthy gain" should not be conducted at Finger Lakes Community College because it is not part of our mission. Although she was not sure what type of "lab weapon" the student was wielding, she was sure that the animal was going to suffer tremendously. Although I make light of the situation, the public perception is a serious problem. The classic example that I hear throughout the country is the mention of "cloning" as a part of our programs. Cloning means Dolly and human twin for organ farming to most. Sadly, a small circular piece of DNA just isn't as exciting. Just a quick note on "plant biotech." Let's not forget that plant biotech does not always mean Ag biotech. Just down the road from us, the state and Cornell University are developing a Biotech Park that will be primarily agricultural in focus, but a large portion of it will be devoted to the use of crop plants for the manufacture of pharm products (ex. edible vaccines). *Finger Lakes Community College* (#178)
- I agree about 99% this, but as a director of a B.S. program in biotechnology, I have to take issue with two points: "Molecular Biology is typically performed by the PhDs at the top of the R & D ladder." "4 year colleges whose graduates receive a curriculum designed to make them university professors (and this is useful to the 0.1% who do) and then their graduates come back to the community college to develop lab skills and the practical knowledge of the industry that makes them employable." Both statements happen NOT to be true of Boston University BLCS program graduates. Maybe it's not the case where he is, but it's not universal. (#179)

### **Biotechnology awareness education (April 2001)**

We are starting a new biotechnology 2-year program at our college in Fall 2001. We are thinking about partnering with local high schools in order to increase awareness among this population not only about our upcoming program, but also about the field of biotechnology in general, and to remove the current myths and educate them on the facts, i.e., positively influence the students' perception of biotechnology. What we would ideally like to do is hold a one-day biotechnology fair at the area high schools, which would be attended by grades 9-12. We will use a display panel and brochures as educational tools. We might showcase specific biotechnology products and their benefits. We have some enthusiastic industries in our area that we might partner with in this effort. I have two questions regarding the actual implementation: 1. Do any of you have experience doing this sort of thing, and if so, was it hard gaining entry into the high schools, i.e., are the school officials/teachers willing to set aside a day or half a day in a year for us to go in talk to the kids? (what we are proposing would be educational in objective, and therefore would not exactly be a "Career Night" activity). 2. We are also interested in evaluating the success of such an effort, so that we will know if we should repeat the process in the subsequent years, or modify it. Would short questionnaires with a few direct questions work well with high school students? *Sinclair Community College* (#180)

- I suggest that you also partner with local biotech companies. Feeding them the graduates they need gets you the money you need. Put up a map of your area with the locations of

the companies represented by pinned flags. Also list the companies indicating what they do and who they hire. (#182)

- I sponsored a number of "fairs" before I retired from teaching. Here are some helpful hints I picked up along the way: A. NEVER underestimate the value of teachers' time. If you take a day out of their teaching schedule, try to make it VERY worthwhile. Have meaningful educational activities and have a built-in means of assessment for the teachers in order that they can hold the students accountable for attending your "Biotech Fair". B. Your activities MUST be able to hold the students' attention. Very few will participate fully (as you would hope/expect them to) unless activities are engaging and they know their teachers have a means to give them a grade for their participation. C. Work with JUST the science faculty (as opposed to the whole school). Getting students out of science classes will go over MUCH better with the administration (and all the other teachers) and will make life much easier in case you want to try this again next year. Find out the schedule of how many science sections/classes are taught throughout the day; classrooms used; teachers' names (try to personalize everything to individual teachers-- you may think you are offering them something really great, they may think you are intruding into their well thought out schedule of instruction); be especially aware of the LUNCH SCHEDULE; identify a main contact teacher (hopefully the science department head); have plenty of handouts for both students and faculty; have AN ABUNDANCE OF PERSONNEL AVAILABLE FOR SUPERVISION(!!!!) [the school PTA/PTO may have volunteers available to help out]; remember that the teachers will still need some of the class time to do some routine things like take roll, collect/assign homework, give announcements, etc. so plan your class time activities accordingly. D. Plan, plan, plan!!!! Start early by meeting with the science department head, principal, and especially the science teachers assure them that you are going to make their job easier, not harder. ASK FOR AND UTILIZE THE TEACHERS' INPUT!!!! Let the teachers help set up the schedule as far as when in the school year it should occur, which day of the week, times, etc. E. I would advise starting with a half-day (morning) for the first year to see how it goes. Then consider a full-day 'Fair' next year. Assure success the first year if you ever want to come back! For the last question, you must have some means of assessment for the teachers to hold the students accountable. Your questionnaire, in addition to providing you evaluation feedback, must provide academic assessment for the teachers to use. PLAN, plan, plan this out in advance WITH the teachers involved. In order to meet with the teachers, you must make it worth their while. Be sure to have refreshments for any after school planning times. *Carolina Biological Supply Company* (#183)
- I teach I high school biotech course. There are a number of biotech programs in the San Diego Area at the community colleges. I have not been approached by any of the local colleges, although I have approached the instructors in this program and had them in as speakers. Outreach to the students is important; more important is training and support of teachers so they will do some 'biotech' in their classes and more important is outreach to school counselors and parents - they help direct the kids! *Chula Vista High School* (#186)

### **Safety regulations for high school students (May 2001)**

I'm on the advisory board for some high school biotechnology programs. We were discussing chemicals that can be handled (or not) in high school classes and the rationale for determining what was okay or not. And I learned that community colleges and high schools are governed by different safety rules because the high schools have a greater legal responsibility for their students. And so does anyone know if there is a list of safety guidelines specific for high school students that I can share with the high schools? We can guess at some likely regulations, but it would be nice if there's some kind of publication or national safety standard. It would help the instructors to have clear guidelines, like "no ethidium bromide, except by the instructor" or "no transformed cell lines", etc. *Geospiza, Inc.* (#198)

- I can give you the URL for the Texas Education Agency Safety manual. Appendix F has the hazardous chemicals lists and, at least in the Austin school district, teachers are not allowed to use any of the chemicals on the list unless they have a good reason and get special permission. [http://www.tenet.edu/teks/science/stacks/safety/safety\\_manual.html](http://www.tenet.edu/teks/science/stacks/safety/safety_manual.html) *Austin Community College* (#202)
- Toby Horn used to have a booklet on handling DNA and such (at the high school level). I have a copy of it somewhere, but she's on the Bio-Link listserv and maybe she'll respond with more information. (#203)
- NABT has just redesigned its web site. "Working with DNA and Bacteria in PreCollege Science Classrooms" will be available as a downloadable file in the near future. *Virginia Tech* (#204)

### **Request for info on electrophoresis systems (May 2001)**

We are looking to buy electrophoresis systems for students in the biotech program to run mini PAGE gels. I am looking for one which is pretty user friendly when it comes to casting our own gels. We definitely want students to have this experience, instead of simply using pre-cast gels. Here's the problem. Since casting mini gels without leaks is trickier than casting standard size gels, does any one have recommendations for a manufacturer? I have personally used the Bio-Rad mini gel caster, and found it to be pretty messy. Has anyone had much success with the Hoefer or Edvotek systems or any others? *Sinclair Community College* (#208)

- I used the Edvotek one with my students last fall and it worked fine for most of my students; I think one group had a leak. I haven't found a PAGE gel casting system that was fool-proof. *St. Louis Community College* (#209)
- I also used the Edvotek system and had no leaks in 16 gels. (#210)
- I have been using Hoefer min-gels in my molecular biology program for 14 years and really like them. Students simply tape around both open ends (using 3/8 or 1/2 inch tape) and then pressing it firmly against the plexiglass with a pencil or pen. I have not tried the Edvotek systems or any others for that matter. (#211)
- I use the JOEY Gel Casting System from Owl Separation Systems (available from Fisher Scientific). It is a different system that casts the gels in bags. It does keep the liquid acrylamide hazard down. The gels are poured four at a time in bags in a casting stand. I've been using it for years. The students occasionally do mess it up and have a leak, but the bag contains the leak so hazardous material is not spilled all over. *Washington State University* (#212)
- We really like the new BioRad Protean II system and found it pretty easy to cast gels in. *Cornell University* (#213)
- We've compared three pre-cast gel electrophoresis units and we like the Bio-Rad system the best. (#214)
- For pouring our own gels, we also use this system (the Joey Gel Casting System from Owl). We've used this system since 1994 and have never had a problem. Again, though, for pre-cast gels we like Bio-Rad best. (#215)

### **Biotech video tapes for advertising (May 2001)**

I was wondering if any of you have any information on video tapes for advertising two year biotechnology programs. We have some air time that is already paid for and our media services people are looking for time fillers. What a great opportunity but I don't have anything appropriate to air. I'm really under pressure to get more students and don't want to waste this opportunity. They're asking for 10, 15 or 30 minute presentations although they can work with shorter ones. *Des Moines Area Community College* (#217)

- The media department in our institute helped us create a short recruitment video last year. It is a professional quality video about 15 minutes long that includes interviews with people in research, forensics, wildlife management and other fields. If you are interested I

will have to get back to you on how much it would cost to copy and ship. People who were at the Bio-Link Summer Fellows last year may remember seeing it and can tell you if they thought it was worthwhile. NABT bought 250 copies to distribute earlier this year. Austin Community College (#218)

- Thanks for producing such a useful video on biotechnology. Too often the non-pharmaceutical side of biotechnology is left unaddressed. I got a copy from NABT since I participated in their beta testing of Biotechnology on a Shoestring Project. Thanks again! Naugatuck Valley Community College (#225)
- Austin Community College has an outstanding media production group and they donated a lot of time to make a video for us on careers in biotechnology. It is about 12 minutes long and fairly general -- it was meant as a recruiting tool for high school through college age. So many people have been interested in it that we now offer it for sale for \$20 + \$5 s/h. We can also get 3/4" or other formats for people showing it on cable access channels. Austin Community College (#232)

### **PCR for scanning embryos (June 2001)**

I'm working with embryonic cell transplantation research for cancer patients in India. I've looked on the Internet for information about PCR, because we need it for scanning embryos for infection. Also we are planning to use PCR for hematological cancer research. Does any one have any idea about what it is the best set-up just to start it? Khera Hospital, New Delhi (#234)

- Please contact Applied Biosystems. You can contact Frank Stephenson and he can get you to the correct people at ABI. (#236)

### **Help for job descriptions (July 2001)**

We are interested in a comparison of German and American job descriptions in the fields of skilled labor and education. Does anybody have an overview of American job descriptions which appear in the college network? We are also interested in the length of the aforementioned courses, which qualifications it is considered necessary to have, how the curricula are structured etc. IMT Akademie für Technik und Wirtschaft Dresden, Germany (#235)

- Please check out these job descriptions from Wyeth/Genetics Institute's "largest expansion in our 20-year history." These job descriptions cover the entire set of jobs in the biopharmaceutical industry from Molecular Genetics and Discovery Research to Clinical and Commercial Manufacturing. We are (as we speak) linking these job descriptions from the Technician's Home Page of the Bio-Link website at <http://www.bio-link.org/tech.htm> (#239)

### **Competency testing (July 2001)**

I am trying to locate a standardized competency test for graduates of an Associate Degree program in Biotechnology. Does anyone know if such an exam exists? County College of Morris (#241)

- Our college was involved in developing such a test in the spring of this year. You may be able to get info from Cathy Swindell at (919) 718-7212 (office of Ray Epley). Cathy is here on a part-time basis, I believe, but you certainly should be able to leave a message for her. Central Carolina Community College (#242)

### **Forensics courses (July 2001)**

I seem to remember meeting some Bio-Link Fellows who either had a course in Forensics or knew of some one who did. Would you please forward contact info on people who had a course in Forensics, any syllabi for such a course, or web addresses on where to find one? San Jose State University (#244)

- Boston University School of Medicine offers Issues in Forensic Toxicology as a four-credit, six-week course. (#245)

- Here is a link to a private in line school that offers courses in Forensics. When I took one of their courses, the instructors were very good about responding to email inquires. You might try this link and then click on "instructors". The two I dealt with were Norah Rudin and Brent Turvey. (#250)
- Try Bruce Jackson @ Mass Bay Community College. His phone number is 781.239.2232 (he has research lab at BU). (#253)
- I co-teach a Forensic Science course here at Middlesex with Det. David Ritchie from Malden, MA police. The course is primarily for criminal justice majors to use as a four credit science core elective, but it does contain some basic biotech. We use "Criminalistics" by Richard Saferstein (ISBN 0-13-592940-7) for the text and "Criminalistics" by Meloan, James, and Saferstein (ISBN 0-13-727223-5) for the lab manual. We could do more biotech in the course if we had students with a stronger science background than our CJ program requires. Middlesex Community College (#273)
- At Sinclair community college, we are offering a forensics course this quarter for the first time, as an interdepartmental course (chemistry, biology and the regional crime lab). Sinclair Community College (#286)

### **Plant tissue culture references (August 2001)**

We are adding plant tissue culture and biotechnology to the high school program this year. Can anyone give me recommendations for good reference books, lab manuals, or either favorite plant TC/biotech lab? Chula Vista High School (#247)

- Lydiane Kyte and RLM Pierik were the best. CALL NO SB123.6 K99 1996 AUTHOR Kyte, Lydiane. MAIN TITLE Plants from test tubes: an introduction to micropropagation. Lydiane Kyte and John Kleyn. EDITION 3rd ed. PUBLISHER Portland, Or. : Timber Press, c1996. CALL NO SB123.6 P4813 1987 AUTHOR Pierik, R. L. M. TITLE Plantenteelt in kweekbuizen. English MAIN TITLE In vitro culture of higher plants / by R.L.M. Pierik. EDITION [#rd ed.]. PUBLISHER Dordrecht ; Boston : M. Nijhoff ; Hingham, MA : distributors for Pierik has everything and Kyte is readable. We cloned violets, adopted hormones and conducted dose-response studies where a pair of students worked together to test each hormone and attempted to make protoplasts from African violets after using an edvotek kit for red onion protoplasts. See my web page for constructing a simple hood.  
<http://www.biotech.vt.edu:16080/~tmhorn/PTC/ptcindex.html> PDF file for hood  
<http://www.biotech.vt.edu:16080/~tmhorn/PTC/PTCmanual/PTC-PDFs/07--PTCHood.pdf> scroll to bottom for article on the hood that was published in 1989  
<http://www.cast-science.org/sfa12.txt> Virginia Tech (#248)
- I just returned from the Fralin Biotechnology Teachers Conference at Virginia Tech. One of the sessions that I attended was plant tissue culture. Very fun and easy. (#249)
- We are trying to include a unit on plant tissue culture in one of our general biology courses and have used Carolina's kit for African violets but have had very little success with it. I'm not sure if it's a problem on our end or theirs. I do wonder if melting the media for pouring into plates is breaking down the hormones included. Anybody have any ideas about this? Des Moines Area Community College (#252)
- Please see for the online version of the manual Elaine used at the biotech conference <http://www.biotech.vt.edu/~tmhorn/PTC/ptcindex.html> Virginia Tech (#254)
- For general bio, get in touch with Dr. Carol Stiff of Kitchen Culture Kits. She has kits and materials that work well in the classroom Chula Vista High School (#255)
- SCCBEP developed a Natural Products Drug Discovery curriculum last year. It takes leaf samples (or herbs), grind them up, do an organic extract, a microbial bioassay, thin-layer chromatography and computer analysis of spots, Rf values. Follows a shaman, drug development scenario. It went through a few pilots last year. We're hoping to kit it this

year. BABEC and Applied Biosystems had IISME fellows working on a plant PCR lab this summer. I don't know the results yet. (#256)

- There are two excellent books you ought to get. One is by Timber Press called Plant Tissue Culture or Plant Micropropagation by Dr. and Mrs Kyte. The other is from Science Publishers called Plant Biotechnology by Chawa (sp?). This later one is more in depth and includes a lot of plant tissue culture along with topics on plant biotechnology. The American Biology Teachers Association also has a lab book on Plant Tissue Culture that came out several years ago as well as Wm C. Brown/ Mc Graw-Hill have a Plant Tissue Culture lab manual. I have used them all over the past several years. The Chawa book is the most recent one I've found and a good reference for teachers or for undergraduates. *Naugatuck Valley Community College* (#257)
- Melting and pouring the media should not be affecting your final plant growth unless you are re-melting and re-pouring several times. I have been doing plant tissue culture for many years and the hormones--at least for African violet--still seem to work for me. I use the Carolina media too as well now as media from Sigma, Inc and Phytotechnology, Inc. Have you tried giving the plants a bit more light, using younger healthier explants, checking the pH of the media after adding the sugar and agar to see if it is pH=5.6. I found out at UCONN this spring at the Regional Conference of the International Plant Propagators Society that the pH of any batch of media could vary considerably after the agar is added. Wrong pH may not only affect the solidification ability of the gelling agent (agar) but also the solubility of nutrients. It took me a while to get over the contamination problems with African violets, but now I got that protocol worked through thanks to Mark Bridgeon at UCONN. Try some tobacco callus on callus media and some root/shoot media for quick results. I also used Mark's protocol for Torenia and was very surprised to find out just how prolific that plant grows in tissue culture. You need to grow it on M-S media A. (#258)
- Carolina Biological Supply Company has the Career Skills In Plant Tissue Culture Curriculum. It takes a student from the basics of setting up a sterile work area, plant tissue preparation, culture growth environments, media selection and how it effects the growth of the tissue, and studying the financial aspects of creating a business, setting up a plant tissue culture laboratory, and forecasting for the future, The curriculum has 3 modules containing a total of 5 kits. Each kit has a teacher manual, student guide, and a video. *Carolina Biological Supply Company* (#259)

### **Program inquiry (August 2001)**

I heard at a recent Bio-link meeting of a program whose primary focus is to train students to do DNA work for the military (DNA typing, etc.). I believe it was down south, but I can't recall exactly. Does this sound familiar to anyone? *Lakeland Community College* (#261)

- My Program at Mass Bay Community College is currently only Forensic DNA degree program. We train our students in the techniques used in human identification (STR, RFLP, VNTR, DQ-alpha, mtDNA analysis and SNP). Our students intern at the Armed Forces DNA I.D. Labs (AFDIL) in Frederick, Maryland. It is run by the U.S. Army but our students enter a wide range of forensic DNA positions. None so far have gone into federal service. The major usage (and student interest) in Forensic DNA analysis is in the area of anthropology. Our major research training project at Mass Bay is a study linking African-Americans to their ancestral West African tribes and clans using Y-chromosome SNPs. The army (e.g. AFDIL) among other things uses mtDNA to identify the remains of American soldiers from prior wars. They are the premiere organization in Forensics and very education-friendly. AFDIL is essentially civilian but is under army control. The commanding officer of AFDIL is Col. Brion Smith (a great guy) and very helpful to educators. *Mass Bay Community College* (#262)

### **California community college board of governor's grant (August 2001)**

My boss just handed me an RFA for the California Community College's Board of Governor's Workforce Development Initiative. The deadline is August 24. Has anybody out there ever done one of these - successful or unsuccessful? I'd sure appreciate some input into this last minute application. San Joaquin Delta College (#263)

- Try the EdNet center closest to you...they should be able to help! See <http://www.ednet.cc.ca.us/> click services and select biotechnology to find your closest center. Chula Vista High School (#264)
- Lest you labor under the misapprehension of an exceedingly short proposal deadline for a Request for Applications, the item your boss handed you is most likely a request (since I did not see it) for some numbers to find out, IF this Workforce Initiative were to be put in place, what it would cost the college. The August 24th deadline was a request from Community College Chancellor Tom Nussbaums to all College Presidents to have their cost data back to him by then. At this time, there are no RFAs issued because this Workforce Initiative is in the formative stages. This Workforce Initiative is being considered for the 2002-2003 Budget Year proposals, and is not currently funded. Economic Development Network (#266)

### **Plant tissue culture (September 2001)**

I am operating a small Plant Tissue Culture Laboratory in Gingoog City, Philippines, called Microplant R&D. Our lab is propagating banana & orchid and makapuno planting materials. I wish access a whole lot of information about plant tissue culture and agricultural biotechnology because I believe what I have learned in this field still needs to be enhanced through training.

Gingoog City, Philippines (#267)

- The first thing you can do is join the two listserves, Plant Tissue Culture and Home tissue culture. Go to my website for the links <http://www.kitchenculturekit.com>. Kitchen Culture Kits, Inc. (#268)

### **High school program (September 2001)**

I've been asked to assist a local high school in developing some curriculum for a new course in biotechnology. I would like some suggestions on textbooks and some basic experiments. Input from H.S. teachers would be greatly appreciated. (#269)

- Pam Weathers put out a great set of biotech videos that are described at: [www.kitchenculturekit.com/biotechvideo.htm](http://www.kitchenculturekit.com/biotechvideo.htm). Kathy Frame of NABT spent years developing Biotech on a Shoestring and the lab manual should be available shortly: [www.nabt.org](http://www.nabt.org). There also good biotech programs at Iowa and at Virginia Tech. Kitchen Culture Kits, Inc. (#270)
- Please check out my biotech web page at the URL listed below for just what you want. [www.carolina.com/biotech](http://www.carolina.com/biotech) or [www.carolina.com/apscience](http://www.carolina.com/apscience). Carolina Biological Supply Company (#272)
- I teach a trimester course on biotechnology and this year we are using Biotechnology Unzipped. I have been struggling to find a basic text for the high school level and this is the only one that is even close to the correct reading level. It is a 13 but all others tested were 15 and above. (#273)
- Austin Community College has an NSF ATE grant to develop a high school introduction to biotechnology course. I am project coordinator for that grant. We are starting our second year this school year and have classes in 8 high schools. We do a 3 week training course in the summer to prepare the teachers and then follow up with Saturday meetings through the school year. We also develop curriculum (with lots of teacher input) and run an equipment center to supply lab kits. We have recently gotten industry sponsorship of some of the consumable materials. I am attaching our course outline. Austin Community College (#274)

- Our biotechnology outreach program works with many high school teachers in the greater Sacramento Valley, a number of who have created semester to year-long biotechnology classes and institutes. You may reach me at the e-mail or website below and I'll be happy to forward more information. <http://ceprap.ucdavis.edu>. (#277)
- Take a look at the NABT's Shoestring Biotechnology resource. It has not yet been released, but should be at their annual meeting this fall. In the meantime check their web site for info and ideas. The experiments work very well in HS courses. *Middlesex Community College* (#280)
- We have several teachers in our partnership that have developed semester or year-long biotech electives. I'd be happy to forward you a list and what syllabi I have on file. The Bay Area Biotechnology Education Consortium has numerous lab based curricula that were developed for high school students. Check out <http://www.babec.org> for more info. *San Jose State University* (#282)
- I am teaching a freshman biotechnology class so I am kind of in the same boat. I have used Laboratory DNA Science and Understanding DNA and Gene Cloning: A Guide for the Curious by Karl Drlicka. Students liked both books and the labs are super in the first one. The second has some excellent pictures as well as good discussion questions and some general chapters besides background on cloning. I will teach again in the spring so I am interested in other books. I saw a new book called Gene Cloning and DNA Analysis: An Introduction by T.A. Brown to be published this month. Anyone know much about this book? The Genomes book by this author was VERY GOOD. *Marshall University* (#283)
- A quick note regarding high school biotechnology educational materials. Our NSF center has developed a Virtual DNA Fingerprinting Laboratory CD-ROM. The software involves students in solving a forensic mystery. Over the course of seven episodes, students collect evidence, extract DNA, perform a southern blot, use PCR, and finally solve the crime. This software, designed for the high school level and above, is free of charge to educators. Visit the website below to request a CD-ROM or download a copy (if you have a fast Internet connection.) Software evaluations may also be submitted at this site and are greatly appreciated.  
<http://ceprap.ucdavis.edu/Outreach/VDNA/vdna.htm>. (#287)

### **DNA sequencing (September 2001)**

I would like some advice on sequencing equipment. I have approximately \$4000.00 in my budget for sequencing rigs. I would like to purchase at least 4. I don't need that latest rig with all the bells and whistles for my students. We will probably only use one or two sequencing labs per semester. I imagine that we will sequence lambda DNA or a small section of a plasmid. I also have \$6000.00 for the software, gel reader and computer. *Community College of Southern Nevada* (#288)

- The best source of information for schools planning to include laboratories in DNA sequencing is the University of Washington's High School Human Genome Program, The URL is at: <http://hshgp.genome.washington.edu/> This site describes equipment that can be used by high schools or community college laboratories, includes protocols for non-radioactive sequencing, information about purchasing reagents, and lots of great visual materials that can be downloaded and used by instructors. I used the methods described here for several years at Seattle Central Community College and found them to be great. *Geospiza, Inc.* (#289)
- You might want to look into the QuickPoint system from Novex (now owned by Invitrogen). I have not used that system, but have used Novex's other system for proteins. I had good results with it in an undergraduate course. The advantages are ease of use, the smaller size of the gel, and use of pre-poured gels. (#290)

- On the QuickPoint gels...they've discontinued them. Too bad since we'd just completed a nice protocol using QuickPoint gels for sequencing. We'd worked out all the bugs and such. (#291)
- When I used the non-radioactive sequencing protocol from Maureen Munn (UW, High School Human Genome Program), I used the pre-poured sequencing gels and gel stands from Stratagene. It's definitely nice to avoid having students pour large polyacrylamide gels. (#292)

### **PCR (September 2001)**

Does anyone have recommendations for companies that make good (but not expensive) thermocyclers? Naugatuck Valley Community College (#294)

- When it comes to the price of thermocyclers everything is 'relative'. Naturally I'm a little biased, but Carolina offers a great-working thermocycler at a decent "classroom cost". The Omn-E Thermal Cycler holds 48 samples and is fully programmable. It is easy to learn to use (the evidence being that even I can use it) and has memory capabilities for 36 programs. I've had to ship our 'workshop machine' all over the country to use it for workshops and it works great every time -- very durable! One piece of personal advice -- if you're going to spend the big bucks to get a thermocycler, be sure to get one with a heated lid! This will eliminate many opportunities for mistakes by students and will help ensure good results. Our Omn-E Thermal Cycler can be found on page 314 of our catalog and sells for \$2898.98. One other idea -- it may be a good idea to share the cost of a thermocycler among several institutions and/or school systems. It is not something that you will be using in class every day unless you are doing research, so with a little planning and cooperation, several institutes could benefit from the purchase of only one machine. Carolina Biological Supply Company (#295)
- We recently purchased a Sprint Chassis thermocycler with a 24x0.2ml block for \$2295 from Continental Lab Products (800-456-7741). It has a heated lid and the capacity to store 60 programs. We have not used it yet. Some colleagues at Univ. of Cincinnati recommended it to us as a reliable and inexpensive thermocycler. Sinclair Community College (#296)

### **Establishing a certificate program (September 2001)**

We are interested in establishing shorter, certificate programs to accompany our two-year A.A.S. degree in biotechnology. For those of you that have such certifications for entry-level biotechnology workers (particularly those for entry-level production companies), could you provide me some information about your certificates? I would like to know about the length of the programs and the general contents. Montgomery College (#297)

- I have two 16-credit certificates: one's in biotech; the other in clinical research. Boston University School of Medicine (#298)
- You can also go on-line at [www.sciencelearning.com](http://www.sciencelearning.com) JUDGE, INC. (#299)
- We have a certificate available for those who already work in a life-science field and know their way around the lab; they just want to learn the techniques of biotechnology so they can enhance their pay, transfer to another lab, etc. St. Louis Community College (#301)

### **Media to test for oil as carbon source (November 2001)**

Does anyone know a bacterial media formulation where the carbon source is oil or gasoline? I have a student who wants to test parking lots for bacteria that eat oil as a science fair project. Chula Vista High School (#318)

- The Crawford brothers, both professors, at the University of Idaho, were doing research on microbes that could be used to clean up oil spills. They might have an answer for you. Go to: [www.uidaho.edu](http://www.uidaho.edu) and look under the biochemistry department. I think they are

still there unless they went on to form private companies. *Kitchen Culture Kits, Inc.* (#319)

- The standard medium is minimal salt broth/agar (without glucose) and 1% of the desired hydrocarbon. Because gasoline is so volatile it doesn't have to be added to the agar. You can saturate a piece of paper towel in gasoline and place it in the lid of the plate, with the inoculated agar in the bottom of the plate. *Skyline College* (#320)
- I have three protocols for bioremediation of hydrocarbons posted at <http://www.smccd.net/accounts/case/envmic/>. *Skyline College* (#321)

### **Arabidopsis assistance needed (November 2001)**

I was contacted by a student in Houston, Texas who wants to do a project demonstrating the anti-aging effect of cytokines on plants. He would like to work with Arabidopsis and needs seed and some advice. I am a tissue culturist and have worked with lots of plants but never this one. I can provide him with cytokines if someone can provide advice and seed. *Kitchen Culture Kits, Inc.* (#323)

- EDVOTEK Quick Plants are selected strains of Arabidopsis thaliana. Seeds can be ordered from 1-800-EDVOTEK or [www.edvotek.com](http://www.edvotek.com). Catalogue numbers are 1251-1266. (#324)
- Carolina Biological carries Landsberg erecta (a dwarf mutant) and the Columbia ecotype. These are the two strains most commonly used in research. We had previously carried a number of mutant stocks, but discontinued them due to poor sales. They could be added back if demand is there. *Carolina Biological Supply Company* (#325)
- There are two really great sources for Arabidopsis thaliana seed. One is Lehle seeds which have a web site at <http://www.arabidopsis.com>. They carry a huge variety of wild type seed, as well as some mutant seed stock. Different Arabidopsis varieties or ecotypes can have a slightly different phenotype but some commonly used ecotypes are WS and Columbia. These seed can be purchased for \$85 per gram, which represents 50,000 seed. Arabidopsis seeds are REALLY tiny! Another great source is The Arabidopsis Information Resource page. They can be reached online at <http://www.arabidopsis.org>. They have a lot of information about growing Arabidopsis, and about current research. Through this page, you can link to the Arabidopsis Biological Resource Center at Ohio State University. This Center maintains and distributes a variety of Arabidopsis seed stock, including wild type varieties, populations of mutagenized seed, and populations with known mutations in response/production of plant growth hormones. I'm not sure if they have any Cytokine mutants there, but it is worth a look. You have to register to get seed from the Center, and you have to pay a small fee to cover the center's costs. I think that you have to be affiliated with an academic organization to use the center, but that shouldn't be a problem for your student friend. *Madison Area Technical College* (#326)

### **Student background checks (November 2001)**

Is it customary practice for biotech training programs or employers to require physical exams, mental health exams, or criminal background checks before admission to study or employment in the biotech industry? *Santa Fe Community College* (#337)

- This is a good question since I was just asked if a convicted felon could seek training in biotechnology. Since there is no state licensing board like there is for nursing/med. tech. etc. I am operating under the assumption that the person could be trained and be a qualified worker. However, I am assuming that companies ask about felony convictions on their job application but each company may have their own policies regarding hiring convicted felons. Does anyone else have guidance here? Our program requires that our students prior to doing the internship (the culmination of the two-year program) get a

physical examination and all the vaccines necessary. However, we do no criminal check or physical exam prior to their entry into the program. Montgomery College (#341)

- We never had any sort of background check, vaccination, or physical examination requirements for our students at Seattle Central Community College. The issue that concerned our students the most was that of drug tests. Although this would be rare in an academic position, many biotechnology companies do require that employees undergo drug tests. Also, some employers (most notably those working with HIV) would ask employees to participate in HIV testing programs as well. Geospiza, Inc. (#342)

### **Bioreactor (November 2001)**

We are currently in the planning stages for projecting equipment purchases, and I need to get some information on a good bioreactor that some of you might be using. It of course has to have all of the following features: small (1-3L) with a small footprint; high degree of automation; easy to use (student friendly); flexible for use with a variety of applications; "relatively" inexpensive. One person has suggested the BioFlo 110 by New Brunswick Scientific. Do any of you use this? Any suggestions that you might be able to provide would be great. Finger Lakes Community College (#338)

- Our program uses the Virtis system (I can't remember if it is 1.5 or 2 liters). We have a modular Virtis system (3-4 yrs old) and 1-2 year-old Virtis Omni-Flow. It is about \$10,000 and does have a small footprint and is portable. (You can easily move it off the bench to another location when not in use.) The disadvantage would be that it is not easily hooked up to a computer for data analysis; however, the newer model may have changed that. I have not had good luck with the New Brunswick and they are expensive, although they were much older systems. I know that the Indian Hills Community College in Ottumwa, Iowa (strong bioprocessing emphasis) also uses the Virtis system. Madison Area Technical College (#339)
- I really like the New Brunswick bioreactors for teaching purposes. I don't know about the particular model that you are speaking of, but we have a BioFlo3000 which we purchased in 1994. The SOP we've constructed for operating it and for growing human serum albumin in *Pichia pastoris* is on our biotech program website at <http://biotech.tec.nh.us/BT220/SOP/SOP3Obj.html>. It is process controlled and as student friendly as any fairly complicated piece of equipment can be. New Brunswick also offers terrific technical support and for a fairly complicated piece of equipment, that was important for me. Also, we are moving into large scale cell culture in a process controlled bioreactor with CIP/SIP capability with the help of the Eli Lilly Foundation. They have recently donated funds so that we can purchase a 14 liter BioFlo4000 and clean steam generator for this purpose. I am really glad that you and so many other community college biotech programs are moving in the direction of biomanufacturing, since the industry needs folks trained in this field so desperately. (#340)
- The other company to take a look at is Applikon. When we were shopping for bioreactors, we looked at the New Brunswick Bioflow 3000 which Sonia has recommended and I was very impressed with it. We opted for the Applikon only because that's the make that all of our local companies use. (NovoNordisk in Davis grows filamentous fungi in them and they like the ease of cleaning of Applikon). Genentech just uses them for historical reasons. (#346)

### **Low pressure protein purification system (December 2001)**

I am looking for suggestion on a low pressure protein purification system to use in a biomanufacturing course (Fall semester). I'll need a gradient pump, UV monitor, fraction collector and columns. I would like to purify green fluorescent protein. Any suggestions on products or protocols? Community College of Southern Nevada (#343)

- A convenient system to use that has everything that you mentioned is the GradiFrac by Pharmacia. Last I checked it was about \$8,000, but that was a while ago. The key book on GFP is *Green Fluorescent Protein, Properties, Applications, and Protocols* by Chalfie and Kain and it has several protocols in the back. (I recommend buying it, but don't especially recommend GFP by Sullivan and Kay or the *Methods in Enzymology GFP* volume - they have applications, but are not general enough). The key paper on the 3D structure of GFP is online and they have a protocol to isolate it to crystallization purity (let's see if this link works <http://www-bioc.rice.edu/Bioch/Phillips/Papers/gfpbio.html>) To purify green fluorescent protein you can start with an ammonium sulfate precipitation (gfp will salt out at 75% AmSul but will be soluble in 25%) - of course, if you do this, you have to get rid of the salt (dialysis maybe to give the students experience.) You will want an ion exchange column (most everyone uses DEAE) with a 0 - 1 M NaCl gradient and a hydrophobic interaction chromatography column (Bio-Rad told me that their stock column is a methyl-sepharose, which explains the poor purification in their stock kit, I don't know why they use that, except that it might be cheaper; the two resins that work best are octyl-sepharose (most common) and phenyl-sepharose.) You will want to re-suspend your sample in 40% ammonium sulphate to add to the column and run a 2M or 1.5 M ammonium sulfate to 0 gradient. Make sure that your solution is well buffered with Tris or phosphate since the am sulfate can give problems. You can put gel filtration in the mix to show the students, even though I haven't heard of industry using gel filtration for a while. *Solano College* (#345)

### **Education website for biotech (December 2001)**

We are planning a website to be used by high school counselors, students, parents, and teachers to provide information about biotech as a career, career path options and local industry and educational resources. I imagine that others have done this already and would appreciate any suggestions or references to sites you have developed. *Shoreline Community College* (#352)

- We have also been working on that idea for the Bio-Link clearinghouse. At this point, we have mostly been soliciting course outlines and materials that can be used by high school teachers in their classes, but your idea of having resources for counselors, students, and parents is great. You can take a look at what is up there already by going to the Bio-Link Clearinghouse and looking in the curriculum section. *Madison Area Technical College* (#353)
- Fabulous idea. I can get the word out about CityLab Academy, a free, nine-month jobs skills and education program at Boston University School of Medicine. Students receive scholarships for 12 credits if they successfully complete Medical Terminology, Intro. to Biomed. Lab. Sciences, Biotechnology, and Cell Culture Techniques. More information can be found on the city lab web site noted below. *Boston University School of Medicine* (#354)
- We already have a national Bio-Link website. Could we make a section of this devoted to biotech careers? We have begun work on this with the scenarios and the technician page? (#355)
- I'd be interested in having a section of the Bio-Link site devoted to telling the layperson, or prospective student, what biotech is. Here in VT we've got low enrollment, and I'm sure that part of the problem is that prospective students just don't know what biotech is, and what working in biotech might be like. Vermont is also a largely anti-GM foods state, and we are trying to concentrate our 'definition' of biotech on advances in the medical and environmental fields. Most of the sites I've found are put together by Monsanto et al., and seem to be devoted to the defense of agricultural biotech. I'd be happy to contribute the material I'm putting together for our new brochures and website to a Bio-Link site. *Vermont Technical College* (#359)