Assessment Data is from what semester?  ___Spring 2014________________________

Faculty Name(s):  __Deepal Pandya_________________________

1. Course Name and Number:

Mammalian cell culture, BIOT115A_01, BIOT115A_02.

2. List all Course SLOs from the Course Outline of Record:

   The student will:
   1. Learn basic laboratory safety for culturing mammalian cells.
   2. Practice aseptic technique, media preparation, and determine cell growth requirements
   3. Identify Sources and Types of Mammalian Cells
   4. Learn basic microscopy techniques
   5. Use of biosafety cabinets
   6. Employ routine cell maintenance, freezing and thawing techniques.
   7. Evaluate contaminated cell cultures
   8. Staining and counting mammalian cells
   9. Techniques for passaging adherent and suspension cell lines

3. Specific Course SLO(s) assessed as part of this project:

   A new SLO was introduced for BIOT115A_02: Transient transfection of adherent mammalian cells

4. Is this course on GE Plan A?  ____Yes  __X__ No  (See Catalog pages 49-51 & page 55)

   If Yes, identify what area.  (All GE course assessments count as GE assessments.)
   ___Area I Natural Sciences
   ___Area II Social and Behavioral Sciences
   ___Area III Fine Arts/Humanities
   ___Area IV Language and Rationality
   ___Area V Physical Education/Wellness
   ___Area VI Intercultural/International Studies
   ___Area VII Information Competency

5. How did you assess the SLO(s)?  (Attach any related documents at end of form.)

   SLO 1: Students were made aware of biosafety levels and of potential risks of usage of transformed mammalian cell lines during lectures and everyday laboratory.

   SLO 2: Major emphasis of this course was on aseptic technique. Students were asked to observe the cell culture they handled for contamination. Points were given to students for absence of contamination indicating proper aseptic techniques. Students were taught to calculate percentages of media components and thereafter make their own media, proper storage of media. An experiment was designed to determine effect of different cell media on cell growth. (A related question was asked on the finals, is attached at the bottom)
SLO 3: Students used suspension (SP2/0, mouse hybridoma) and adherent (NIH3T3, mouse embryo fibroblast) cell lines. Students were taught to identify and observe difference in morphology and growth characteristics of these two cell lines.

SLO 4: Students were taught the optics of Phase contrast microscopy and compound microscopy and used both the microscopes routinely.

SLO 5: Students learnt principle, operation and care of biosafety cabinets. They were asked to follow the sterilization procedure for effective use of biosafety cabinets on a routine basis.

SLO 6: Another main goal of this course was routine maintenance and passaging the cell lines. Students were trained to observe cells under the microscope, estimate % confluency, count viable cell number and then passage the cells. They also learnt how to freeze and thaw cells as a separate lab.

SLO 7: Cell culture contamination was covered during lecture and actual contaminated cultures were shown to students so that they can identify any contamination based on color change of media, turbidity and altered morphology of cells under the microscope. Students were asked to follow a strict aseptic technique in order to avoid contamination.

SLO 8: Students were taught to stain, count and calculate number of cells in a given culture. A cell count calculation problem was asked in the final exam. Counting of cells became routine procedure during the course of this class. (A representative lab exercise is attached below)

SLO 9: see SLO 6. Students were taught trypsinization procedure (theory, practical) for adherent cells before the passage. Students were asked to maintain a flask of their own throughout the course of both the cell types and passage them regularly.

New SLO: For BIOT115_02: Transient transfection: Students were taught to transfect adherent cells with pEGFP plasmid using Lipofectamine method. Transfection results were assessed using fluorescent microscopy.

6. Results and analysis of the data. (Attach any related documents at end of form.)

SLO 1: Most of the students were wearing proper PPE and were cautious of usage of transformed cell lines throughout the course. They learnt how to contain the spills of cell culture as well.

SLO 2: All the students could successfully make their own media and maintain it till the end of the course. Effects of using different cell media on the cell growth were discussed in the class and most of the students understood significance of % of serum, glucose and glutamine used in the media. Most of the students from both the batch (01 and 02) maintained their cell lines contamination free. There were 1 or 2 students who identified contamination in the culture they were maintaining and could track the source of contamination. (The old tube of media was the culprit!)

SLO 3: Everyday discussion included names and source of the mammalian cell lines used in the class hence all the students scored full points for the question of name, source of cell lines used in the class during final exam!

SLO 4: Students were using phase contrast microscopes (to observe cells) and compound microscopes (to count cells using hemocytometer) so routinely that at the end of the course, they became very confident in operating these microscopes.

SLO 5: Students were either assigned their own smaller biosafety cabinet or shared between 2 students for larger units throughout the course. All the students were diligently turning the uv light for 20 minutes and blower for 10 minutes before the use of cabinets, would do cleaning using 70% ethanol before and after use. Not a single student was found irresponsible of their duties towards the biosafety cabinets.

SLO 6: 6 out of 8 (01) and all 4 (02) students could successfully passage the cells independently. 2 students from batch 01 needed some guidance on how much dilution of cells should be carried out for passaging. Freezing the cells was very well done by all the students. Our -80°C freezer broke down hence frozen cells did not survive. Therefore the viability of cells were almost nil after thawing the cells.
SLO 7: Students from both the batches were very cautious of maintaining their cultures without contamination. Although, some of them did get contamination but I'm glad that they could identify the contaminated culture themselves and were honest about it. I asked them to track the source of contamination so that in the future they will not encounter the same problem. The source came to be their media which was either not stored properly or not cleaned from outside with disinfectant before the usage.

SLO 8: Mostly all the students became quite familiar and independent in staining and counting cells towards the end of the course.

SLO 9: see SLO 6 above.

In general, most of the students earned a grade of ‘B’ or higher and most importantly became confident in handling mammalian cell culture.

New SLO 10: Done only for batch 02 as the plasmid I had ordered took time to arrive and I had to spend some time on isolating plasmid from bacterial culture.

Students were excited to perform the transfection experiment (they brought their other fellow student friends too, to the class while performing transfection). The transfection procedure was very successful, they learnt how to operate fluorescent microscope. Students were thrilled to see the mammalian cells glow green due to expression of green fluorescent protein within the cells. They were taught to optimize the experiment by using different ratio of plasmid DNA to transfection reagent.

7. What are you going to do based on the results of the data? (Any planned revisions?)

Definitely include transient transfection experiment as part of the curriculum for this course as its one of the common procedures used in Biotech industry.

I would check the -80 C freezer before freezing the cells.

Continue with making students work independently on passaging the cells.

Please save your finished document in the following format. (Date should be for the semester in which data was collected; same date should be listed at top of this form.)

yyyysemester-sloa-curseid.doc

Example: 2014spring-sloa-engl101c.doc

Attachments:

SLO 2:

Two new mammalian cell culture feeds have arrived in the market Feed A and Feed B. Feeds are supplemental media to be used in addition to basal media such as DMEM. These are proprietary feeds hence; the composition (especially Glucose and Glutamine amounts) is unknown. The recommended range of serum % to be used in the media is from 5-15%. You are given 6-well plates to test out different growth conditions using the new feeds. Design an experiment (You can either write in a paragraph or simply draw schematics or both ) to test out the new feeds on adherent cell line in your lab. Include control(s). (4)
Lab assignment # 6  
Lab 4 Post-Lab Exercise – Hemocytometer (14 pts)  
DUE: Lab 5, Monday, March 17th, 2014 (at the beginning of lab)

Objectives: To learn how to 1) calculate the total number of cells/mL in the hemocytometer, 2) calculate the total number of cells per mL in the culture the cell sample was taken from; 3) calculate how many of the total cells are viable (living).

1. Total cells counted: ____________    Living: ____________    Dead: ____________

Complete the following calculations:

(Using the hemocytometer)    (Assuming cells were diluted ½)

2. \[
   \text{Cells/mL} = \frac{\text{Total cells counted} \times 2 \times 10^4}{10} \]

   ** Each square of the hemocytometer, with cover-slip in place, represents a total volume of 0.1 mm³ or 10⁻⁴ cm³. Since 1 cm³ is equivalent to approximately 1 ml we multiply by 10⁴ to determine the number of cells/mL.

3. \[
   \text{Total number of cells in the original culture dish} = \text{Cells/mL} \times \text{number of mLs of media used to resuspend the cells} \]

   *** You measured the number of mLs in the original culture flask in Step 3, Protocol 1.

4. \[
   \text{Percent cell viability} = \frac{\text{Number of living cells}}{\text{Total number of cells counted}} \times 100
   \]

5. \[
   \text{Viable cells per mL} = \frac{\% \text{ Viability}}{100} \times \text{Cells/mL}
   \]

   Or, \[
   \text{Viable cells/mL} = \text{Ave. number of Viable cells} \times \text{Dilution factor} \times 10^4
   \]