

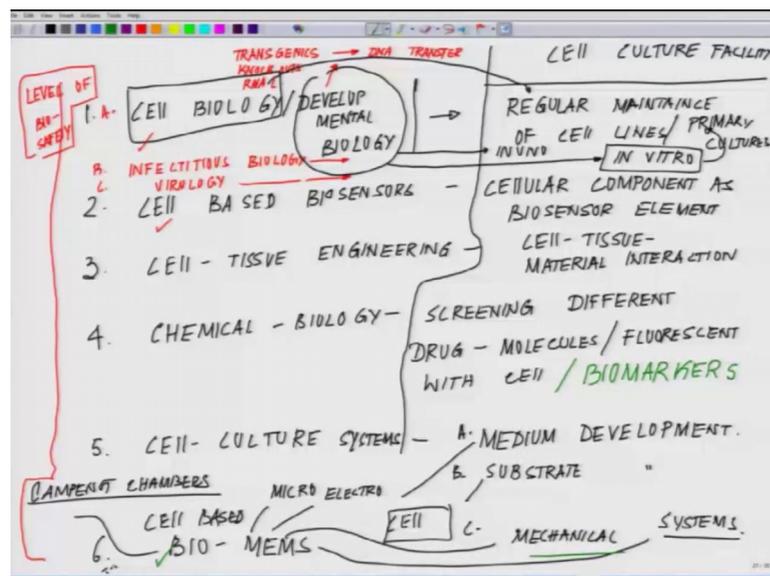
**Cell Culture Technologies**  
**Prof. Mainak Das**  
**Department of Biological Sciences & Bioengineering & Design Programme**  
**Indian Institute of Technology, Kanpur**

**Lecture – 08**  
**Precautions during Designing the Lab Layout – I**

Welcome back to the lecture series in a Cell Culture Technology. So, we are into the second week and we have finished 2 lectures in the last lecture we talked about the or rather started talking about the layout in the design of the cell culture lab. So, while talking about it I highlighted upon the first point is, what is the objective of setting up the lab? What will be the kind of things or kind of experiments what will be conducted in that lab and what is the next 5 year or 10 years plan down the road? How the lab will expand? What all new aspects which has to be added based on that the layout design should be planned.

So, in that aspect we talked about the different kinds of lab like you know whether we have a cell biology facility, wanted to develop or in vitro development biology facilities if you want to develop or you have a lab on cell based biosensors, cell tissue engineering like mostly on the material interaction with the cells or chemical biology.

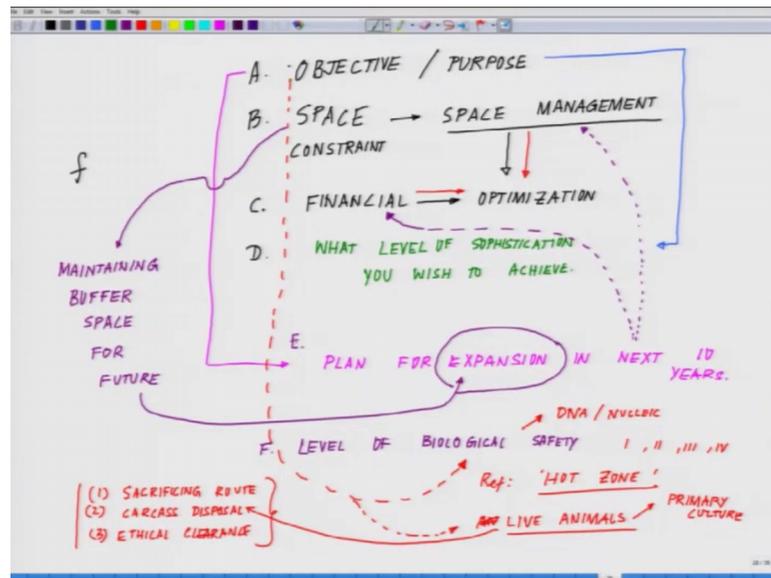
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Where you are screening different kind of drug molecules are fluorescent molecule or some kind of biomarkers, let me add that part while I have added all this or you know the

biomarkers cell culture systems like medium development, substrate development or the bio memes where you have attempting to integrate the cellular or the living component with micro electromechanical systems and based on that the next part we went to figure out the objectives or the purpose what we have already defined.

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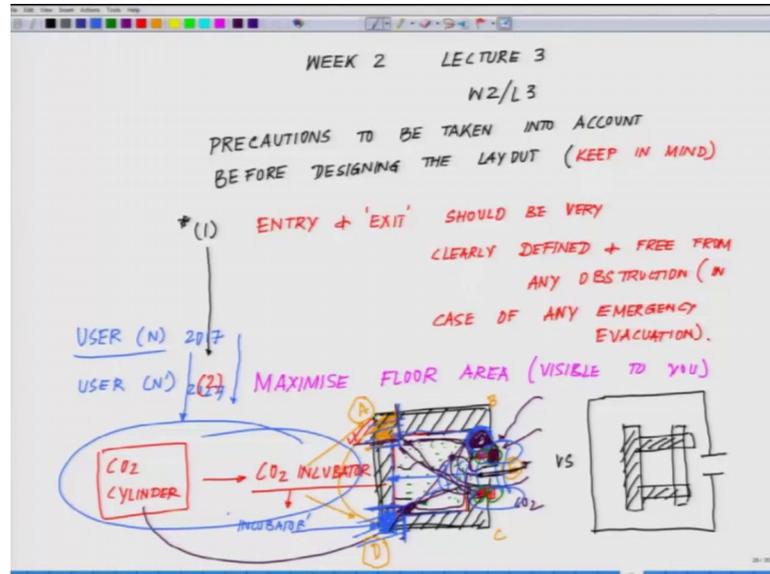


We talked about the space constraint. So, what is the bare minimum space you have, we talked about the financial optimization what level of sophistication one ways to achieve, then we talked about the plan of expansion in next 10 years which is basically you need lot of farsightedness about it and the level of biological safety at which we are looking at. So, from here now we will talk about some of the precautionary measure what has to be taken even before you start thinking about the layout. So, realize one thing see for example, you are designing a building which is far bigger facility and needs a different level of security. So, when you do so there are few points what has to be taken to mind. So, for examples some multi storey building or whatever you know, what are what will be the exit route, what are the safety measures one has to take into account what are the possible hazard which may arise because of ill planning?

So, whenever we talk about setting up a lab, as perceive of the cell culture which is you are dealing with biologically active material and material which should remain confined within a space. The first and foremost thing is that you should have your entry and exit very clear, what I meant by that is that you should have a very clear cut entry into the

system and there should be exit route where without any obstruction one should be able to rush out in case of any emergency.

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So, your entry exit should be very very clear, very clear very clear it should be the passage should be very clear. So, let me just put that down like today we are into week 2, lecture 3, W 2, L 3 precautions to be taken into account before designing the layout.

So, first things should be your before even if you put the layout keep this in mind. So, these are the things which you have to keep in mind, keep in mind your entry and exit should be very clearly defined and free from any obstruction in case of any emergency evacuation. This is fairly critical, now second thing second important thing in cell culture lab I have seen over the years how much over I can put all the things writing most of the time when people designed them they forget some of the basic things, maximize floor area I will explain what does that main maximize floor area into visible to you.

So, see for example, you have a facility see for example, we have a room let me put it down that will make sense what in meant by this see for example, here where room like this fine. So, for example, this is your entry and a common exit, now you have options how you put the benches to work. So, for the working bench over the years what I have realized and what always made sense for keeping the first point in mind this point 1 and link in into the point 2 you should do you should utilize this part, portion I am hatching

or shading. So, you see you have a huge amount of floor area which is I am putting dots this floor area is all available.

So here, so the advantage which such an arrangement is so, you have other options what you can do is some some of the people does which I (Refer Time: 09:01) I will leave it to your judgment how you look at it. So, verses what people does which is definitely not my choice again, facility where people will have tables like this to work or like you know they have a centered table or they may have something like this one table like this, one table like this, like this one, this one, this one there are several combination people does, but over the years after setting up multiple labs all over the world I realize the easiest way is that you utilize this wall space.

So, what you can do you could have your working bench like this and you have all the storage on the walls of course, on has to be very careful when setup the storage area you should not be very high also because at times that or you could have make it high, but on the top shelves we can store all those stuff which will be needing later ok or you can have a complete storage area right.

So, this is something which I will Levitt up to, this is something which is my most preferred one where you are utilizing this whole space. Now all the cell culture labs across the world they use something called co 2 incubator will come later why you need that is, where you are needing the incubator for maintaining the ph inside the culture dish. So, at this point this is not important, important is that to maintain a co 2 incubator you need a supply of co 2 cylinder and if you have this cylinders and these are fairly tall cylinders what you will be using. So, have to have a designated space, very very designated space where you should keep the cylinders and that designated space should be preferably very close to the door, somewhere where I am putting a small boxes or somewhere just outside.

But if you wherever you keep remember one thing this is one practice I am observing in several places where people forget that these are heavy cylinders, if they fall they will hurt horribly bad. So, you should have proper metallic clips to ensure the cylinder does not fall this is absolute, absolute, absolute essential where you are keeping the cylinder, ensure that that cylinder does not fall. Second thing, second thing now the problem comes here see for example, you have a cylinder here just try to imagine you have a

cylinder here or you have a cylinder here, the places I am circling and you have a incubator which is sitting here see for example, on this counter top I am just putting in a blue see for example, you have a incubator setting here. So, adjacent to the incubator you needed to have a cylinder placing the cylinder.

So, you realize if you make the counter top in advance. So, you make this whole counter top then you place the place your incubator here then you do not have any space designated good spot to keep the cylinder. So, even before you design the counter top you ensure that you should have location where the counter top become discontinues something like this, I am just kind of you know curving out in blue pen something like this. Either a space in the corner and prefer, preferred to keep the incubator which will be holding all you cells all your experimental material see for example, this is the incubator preferred to keep it as far away as possible from the main gate and. Secondly, it should be in a corner where this should not be direct contact with the air which is coming directly from outside or you know whose ever is entering there is always a air current which is coming.

So, try to keep it away from that air current zone and as far as possible. So, your option is either I keep it here or your rather option is that you shift it here where, but in both the cases. So, these are the 2 shaded places I am designating for it now, the thing is that whether you put in corner A so I am, D and this is the entry E now, whether you place it at A or whether you place is at D. Now in that case this counter you are making it will be discontinuous out here and there should be enough space to keep the cylinder.

Now, we have to decide that how many incubator you will buying say for next 2 years or in next 10 years your lam may need only one incubator, your lam may need 2 incubators you may need once co 2 incubators, another without co 2 incubator just your incubator. These are important criteria to be taken into account will in advance now think of it how much of the trivia these sounds how much, because I know somebody will think what a big deal this guys talking thinks which, but the thing is that when you are planning a lab you realize tomorrow you will be a leader planning a lab and somebody will tell you know set up this facility your first thing or figure out that how many users are there see for example, number of user.

So, there will be an n which will be coming out of here, number of user number of user say 2017 and your planning it you know down the line, like you know this should be one of the best facilities. So, you have to have a margin to tell that how many user will be there in prime by say 2027 because you are not going to make a facility like that right and this user n varies are you making a departmental facility or you are making an institute facility or you are making an individual facility. If it is an individual facility you should know how many say under graduate, post graduate students will be having or a post doc will be having if you are making it departmental facility you should have a rough number of how many faculties you will have and their corresponding numbers of users see for example, there are 10 faculties and each lab has like you know 2 or 3 designated people to use it.

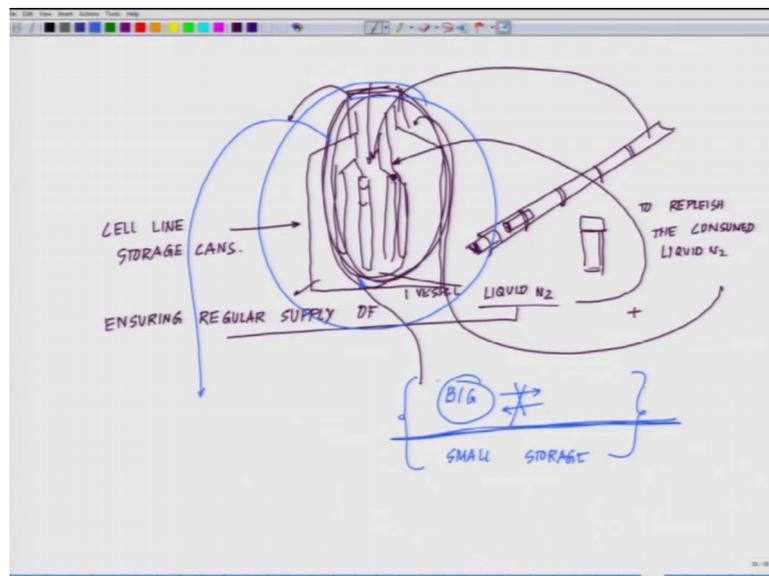
So, while talking about designated people this is again something which is over the years of experience of all most now 2 decades have learned, it is always a good idea for such specialized facilities to have designated people like you know these are the designated who will be using or who will be kind of will be ensuring it too many user in these kind of facilities leads to a lot of contamination problems. It is not always a very good idea that everybody gets in and gets out unless otherwise this is your absolute private facility, this is your own facility and you are the boss, but when it comes to you know departmental and you know institute then it is better to have an idea you know restrict every lab should have some restricted numbers which has its own drawbacks though. But you know one can always at 1 point this month you have these designated people and like something of sort has to be its may be a wise idea, but if you can really manage the train individual you can train them right no problem.

So, I will leave it up to the user how many designated user. So, by see 2017 to 2027 next 10 years how many users will be there, based on that you have to assign out here in these incubators who will be using how many shelves because these are costly (Refer Time: 18:12) when you are getting an CO<sub>2</sub> incubator it causes a fortune. For a new PI or a new faculty who is starting it is always a challenge, see you should have a very clear like you know these shelves are designated. But then again on top of that comes who will be using what kind of stuff see for example, somebody is growing selves directly from animals what we call as primary culture which are much more prone to contamination because it is kind of a very you need very well trained person to take care of it.

Where somebody using a cell line which is less prone because the cells are safely kept in a nitrogen cylinder and. So, how you are going to classify it or you will have like you know suppose there for designated user each user has their own incubator how many incubators all of them you are free from it it is your incubator, but then if you have the incubator then the gas management also should go in hand in hand. I have seen over the years in common facilities you have a gas facility and you know people who are using it forget to figure out that gas is depleted and the cells die these are very common day to day problem and trust me this happens and it creates it creates leads to (Refer Time: 19:48).

So, first and for most you should know how many users you have and how you are going to divide it out and again I am just putting some word of caution sub to you people who will be the user they decide. So, I will not over emphasize, but again I will do an optimal emphasisation on that that please be careful. So, now, next thing comes most of the labs who use a cell lines they needed a facility to store cells in cryocans where you have to have liquid nitrogen ports.

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So, these cans are very interesting these are cans like this draw it for you I will make more sense, those who have milk can it is almost similar to that just little bit more circular and there are lot of holders to keep cells inside them these are like you know cell

holders I am unable to really draw it the right way and there is a cap on top and you put nitrogen into it.

And in these you have holders something like this very nice holder, in these kind of holders you have this wiles small wiles kind of stack those wiles on this, like this, something like this and you take this whole thing and keep it inside. So, these are every cell culture lab or maintaining cell lines they maintain in it and they remain in liquid nitrogen temperature and they can remain years after years, decades after decades in them, but all the thing is that you have to ensure you have liquid nitrogen being supplied time to time re replenish for it and every time you are opening it there is a depletion of the liquid nitrogen we have to replace it period of time or every week or like ways.

So, you have to understand where you want to keep them because these are heaviest stuff. So, coming back to the design, so have to have a designated spot either under that under somewhere you know somewhere you have to have a designated spot where you think that this is the bestest part. I can keep it here because every time you have to pull this out of the lab or you have to bring the nitrogen can and you know refill that. So, you ensure you do not want to travel all the way out here, but that brings us to another problem whenever you have a incubator in this corner you always have to have the nitrogen, sorry the carbonate oxide cylinder to be taken all the way after here.

So, whenever you do it please ensure, please ensure this is happened that you do not spoil the whole floor and ensure that underneath that nitrogen cylinder or sorry carbonate oxide cylinder what you are carrying co 2 cylinder you ensure that at least its clean enough it should not cause un necessary mess around because most of the cylinders when they come. So, wherever you stay wherever you store them ensure as soon as the cylinder arrives from the facility you know clean them up at least mop them down properly it is heavy. So, you have to be careful stack them properly and whenever you need to take them just spray them little bit with an alcohol and clean them and just take them from the side and prefer to follow like this, like this instead of going through the center it is not a good idea because its spoils the floor ok.

So, now after that I have talk to you about where to keep the nitrogen can or these are the cell line storage cans and ensuring, ensuring regular supply of liquid nitrogen to replenish the consume liquid n 2. So, we have to have a designated spot for it. So,

essentially have to have at least one can, one of these vessels and another one to bring the liquid nitrogen to fill this. So, you need to have at least 2 if you are maintaining a cell line minimum 2 and if you design it right in the beginning then you will be doing better and you know this kind of vessels have different sizes and I have seen several labs have several kind of sizes where one thing I realize you have to have really, first of all you have to realize how much quantity of cells you wanted to store some production something.

Second important part about this is that if you take a very big one then its movement will be an issue, will be always an issue. If you take a very small one automatically you have a how much quantity you are you know storage will be big issue. So, somewhere in between you have to draw line what will be the size of it, which is easy to its maneuverability movability should not be a challenge and yet you can you know get you things done. So, that is very important that you understand this part again this all comes in the planning game now coming back to the design area. So, I told you that you have one corner you have the co 2 cylinder as well as the co 2 incubator these are the critical thing which has to be maintained there then you have to have the devour keeping the cell some have stored.

Then we talked about storage of the cylinder at specific location where the cylinders has to be ensured that those cylinders are properly hooked with chains or clamps. So, that they do not fall down. Another important thing whenever I talked about cylinder this is something I have experience and it has pained mid time and again always, always, always by a trolley to transport the cylinders. I have seen graduate students rolling the cylinder moving them like this, it is a very dangerous practice please how much you have boring I sounds these are the god damn problems please when you design a layout facility buy a small trolley with hooks there are things or you can attach hook from your work shop.

So, that it ensure the safety of yourself your fellow colleagues and everybody around please, please, please ensure that because this is something which is drastically immersing and you should have a designated spot for that trolley that no one should take it for some other purpose. So, whenever you need it you should of the trolley with you, you take the trolley bring this bring the cylinder and you may need there is one more small trolley you may need which is slightly of different kind to transport these kind of if

you are really buying a big one the small ones you can really carry in your hand like a bucket, but big ones are always a problem.

So, these are some of the very beginning. So, we will continue in this line what all other things in that process from layout to all the basic requirements will be you know completing in that process ok.

Thank you.