

I'm here to talk to about building a biotech company in Colorado Springs. My experience is in the development. A lot of what is being done in Colorado, the universities, and what is in the paper recently is the light research, which I'll talk briefly about. But at some point the scientists have to turn the products over to somebody who can manage to them to market. It's a different discipline. And so I'm here to talk about something a little bit different than basic science.

So, a little bit of the definition. Biotechnology in my mind is, which I've taken off the Internet, it's a matter, methods, and techniques that go hand in hand themselves to develop products for human health care. So the common thread for the technology is to produce proteins, or vaccines, or gene therapy, or other types of therapy. Biotech with chemistry and other technology support advances in health care. Colorado Springs has a very nice infrastructure for the device company, so I'm going to be talking about the drug side. But the device side is going to be a key to insuring success on the drug side as well.

So, why biotechnology - it's currently the fastest growing sector in the industry. The forecast record sales are \$250 billion by 2015 and it's grown at twice the rate of the overall drug development. And when I say overall drug development, we say, in my book, we distinguish biotechnology as being different from small amounts of drugs like the valium, and the aspirins and all. So biotechnology is growing at twice the rate. And you can consider that either a positive or negative depending on how you look at it. 1.2 billion dollars and 98 months or so an average to get a drug from light research - that's a significant amount of money. So, it can be seen as a daunting task to raise that kind of money. Or it can be seen as an opportunity to obtain some of that money as it goes through the pipeline. I choose to try to get my piece of it.

There is a one in 5,000 chance of success. I was sitting at the lunch table and a friend of mine said that based on the data that we've seen in animals, if rats or mice had money we'd be wealthy. But that doesn't always translate to dollars - which is why there is one in a 5,000 chance. There's always going to be work trying to get that 5,000 - money to approve the work.

So, I'm going to talk a little bit about it today - the level of drug development and timeline. They are similar timelines, but not exactly in that the regulatory constraints are different and some of clinical trials, etc. will be different. But this is close. So, Colorado Springs takes advantage of the university in generating the projects, and that's the research. It takes one to five years isolate a compound, make sure you develop a small process to making up the test. In animals, we're looking for efficacy and safety. And once you've seen that then you say, O.K., is there a market out there? Will this be useful and healthful? And companies won't touch a project unless they can project \$500 million in sales or more. So there are a lot of niche markets that aren't getting adequately funded. So there are a lot of opportunities. \$500 million is a lot of money, but if I can \$100 million a year, I'm perfectly happy with that. But that's what Colorado Springs should look at it. Levi Strauss made his fortune on selling pants to people that were prospects. And that's what Colorado Springs can do. Provide assistance, services to these folks and also enjoy the success of good products as well.

So I've done enough animal data that it looks like this stuff works - and how it's going to translate to humans. So what do we do next? We need to do toxicology studies to make sure it's safe. And then once you've done that, then you file an IND to get into the human clinical trials. So Phase One clinical trials take more than two or three years to do. And usually that's looking at safety. You want to push through to Phase Two. A lot folks don't like to see any adverse affects from the drugs, but you have to get there at some point. And 20-40 patients, depending on what your drug is, and how well you can test, how long the drug stays active, you can predict these things, how much you need, etc. Colorado Springs could easily set up a data point clinic where you can run studies and capture some of that income. You can do it through the hospitals and you can set up a standardized research facility.

Then after you've you determined it's safe, you go to Phase Two, which can take several hundred to a thousand patients. The numbers studied again depend on what you're trying to prove. And that takes three to four years to accomplish. And hopefully at the end of that time you'll have a dosage that you think is safe and efficacious. And now you need to prove to the FDA. And that's where the money comes in.

So then you do your Phase Three trials. And that could be thousands of patients. It also depends on what the market is that you're going after. If you're going after a small drug, which is the clinical indication is people of less than 200,000 in the United States per year, they probably won't touch that. But if you can get that, you can do smaller clinical. But if you're doing an antibiotic, you'll need thousands of patients. Because you want your label to say you're better than your competitors. You have to do those trials to show that and that could be thousands of patients. When I was at Genentec, we were doing a study to that show that (one drug) was better than (another drug) and that was over 40,000 patients. And it cost, I believe, \$50 million. And it was a very simple trial. It wasn't a very complicated trial. I'll talk about the process for complicated trials in a minute. But 40,000 patients – that's quite a lot of people. But it was a very marketing strategy. They detected the market while they were doing the study and luckily it came out positive, so it was a good situation all the way around.

So then after you have your safety and efficacy and your dose and you've proved it in two or more clinical trials, then you file a market application. The FDA takes about 12 months or more. And then you've got more testing. So if you look at the timeline it could be up to 15 or more years. And as I was saying, drugs drop out of each one of these steps. So finally at the end of the day you have that makes it market. It could be a \$100 million or it could be a blockbuster of a billion dollar a year drug. Again, it depends on the indications and how creative your marketing force is. When I was at Genentec the price was market driven, so for reason everything was \$2,000 a dose. But then again, how much is your life worth? That's what the sales force.

So anyway, it's an expensive proposition. Non-clinical testing, all the animal miles, and the toxicology are actually up to \$5 million per pound practically. It can be very expensive. Manufacturing, when you're looking at a biotech product, it could three to five million dollars just to get the first lot to go to the toxicology studies and through the phases and clinical trials. Again, if it's just a small amount it could be \$1 million. But it's still not an inexpensive proposition. And again to build a facility it's more than \$1,000 a square foot for construction. Using Genentec as an example, they built a plant outside of San Francisco, and I believe the first phase, they had to capture overflow manufacturers, I think they spent \$200 million. And the recent build out was over \$60 million. So they got close to a billion dollars this year just for facilities. That's a lot of money. They brought up a plant in Spain and tried to renovate it and were not very successful.

And then the clinical trials are very expensive. A fully burdened clinical trial, and when I say fully burdened, that means all the money you pay for the doctors and all the money you pay for patients, and all the money you pay for the contracts, to capture the data, to analyze the data, to produce the reports, etc., can be up to \$50,000 a patient. When I started in regulatory affairs, dealing with the FDA, it was \$5,000 a patient. Part of the increase is because these are smart companies and they say, "Well, so and so is doing it, why don't you do it?" And it may not be enough. So the clinical trials are expensive.

So, how do you get there? Once researched, taking something out of the university, and trying to go public with it. Some companies have a lot of money sitting around and are looking for places to put it, so once you have gone through Phase One it's not that difficult to get decent funding. But to get there you have to have some sort of money and support from the government - statewide or U.S. Government to go forward. Early development would be Phase One – again take advantage of the grants and public money that you can get. And then the companies start getting interested. And then when you get into late development you have the companies very interested. At that point you can go on an IPO, a public offering depending on your product and if it looks like you have a blockbuster drug. A lot of companies have done that. I have no idea how they were able to do, but they went ahead and did. Another way is to partner with another company and that's the strategy that most companies are doing nowadays. They get a quicker return and reduce the risk.

And post approval, the income comes in from sales and sales funds. And the reason the \$1.2 billion dollars came in is because your funding was probably millions or more. And hopefully have a successful product. How would this benefit Colorado Springs? It's a relatively recession proof industry. And people continue to get sick. And in the United States, we've got to have something fast. "I feel bad, give me a drug." And people are living longer. And they are taking advantage of the technology that is coming out

and the drugs that are coming out. And there's an opportunity to keep money in the community. You know successful drugs can generate sometimes a billion dollars a year in sales. And support from the community will lead to jobs. Let me tell you some of the types of jobs that you can have. Animal modeling – you can build a small research facility. You can have a small model facility - mice, rabbits, rats, dogs. And you know how animal rights activists can be. In San Francisco, forget it - which is sort of why we're looking for places that will do this sort of work. There are toxicology, pharmacol genetics, and distribution. There are a lot of jobs for technicians, scientists, the kind that go along with clinical work. There's a lot of manufacturing needs at present. A lot of folks are going overseas due to the expense. However, we recommend our clients stay in the United States so they can closely monitor what is going on. And we find that very important. The further away things happen – it makes it very difficult to communicate. Formulation work is also available. The same thing goes for biotech products. They're very, very touchy. So if you can come up with people who can create and develop formulations, you would make a very large group of biotech companies happy.

And then there's testing at every step of the way. Release testing. Everything has to be released and stability tested. Stability testing is \$25,000 per time point per condition. For example, if you're doing a local formulation, you have various types of stability testing. And it's required by the government and FDA. You have to do it. The better testing you can do, reliably and quickly – it's a nice way to bring jobs and money into the area.

Phase Two to Four – it's all over the world, but there is an ability to capture some of that work. The vaccine and clinical trails - you can't expose patients to a challenge test for Anthrax. So a lot of the basic work is done in animals. But we have to do large safety trials. And one way to do that would be to if you have an area like Colorado Springs that has a large military population going overseas, you can do a safety trial there.

Office support function, military affairs, legislative, regulatory affairs, sales and marketing, legal, engineering, administrative support. Even if you're not a biotech company yourself, each one of these subs will have these people and you need these people. Because once you file with the FDA you are then under government scrutiny and fall under a number of acts. And sales and marketing forces – you have to have them help you design the clinical trials to capture the data so that you can go out and effectively convince physicians, early adopters, or your patients for that matter. Engineering for your facilities, administrative support, we all need that. The nice thing is, once you get an infrastructure in Colorado Springs, it will support 90-95% of drug development, whether it is biotech drugs, small molecule drugs, and probably even device work. Colorado Springs has a very nice infrastructure for device work and you need to capitalize on that – it's an area that is growing quite quick. The diagnostic arena is one way to go – the pharmacology, in my mind, is going to be one of the waves of the future.

We're always looking for people, like I said, to do the testing for us - people who are reliable and flexible. And in mind I don't care how expensive it is, if it's done right and it's done right the first time - because you need that data early.

So in Colorado Springs you have numerous universities and folks generating potential talent. There's no reason you can't capitalize on that. Get an educated workforce. You can take of those folks that are out here in the aerospace industry and the IT industry that may be looking for a job to retrain in. Proximity to west coast biotech – like I said, if we had a local place to use. It's such a great opportunity. There's no way we are going to be able to build anything in California. So if we build something here, we can fill up very quickly. And then the cost of living and the quality of life - I was amazed - it's a beautiful place. You want to attract a young workforce. And they're going to want the hiking, skiing, and the weather. Obviously the surfing in San Francisco is not that great.

Become a high quality player. I mean, you can build that up fairly quickly and easily. Be the best in your specific area and you will get clients, other people to come. You need a conservative city and statewide effort to attract people. You need champions. You need somebody that's out beating the bushes saying, "This is the best place to come for biotech." And have something to show for it as well. Biotech's been in existence for 30 years. You're not going to catch up. You're going to have to something a little bit

different. And you're going to have to do it very quickly or you're going to get passed by. It's going overseas, a lot of the work. And we need to capture it here in the United States. It needs to be flexible and creative. You don't have to sit there and hand out money to get the people here. You just have to be able to work it. And that would be very helpful. I don't know what the zoning is here or about the companies that come and help them, but that would be great. There are a lot of communities in the country that won't do that.

And you need to be competitive with the other areas – you have to move quickly. The growth is exponential. It's not going to slow down, and if you don't jump on it now, you're going to get passed by. To attract biotech you need to get VC's and entrepreneurs here somehow. Colorado Springs I'm not so sure ranks very high on getting them. You need to get there. You need to get that presence. You need to show that you can perform and do work. You need to find some incubators – you need to be able to take the area of research from the university into a company that might fund. An incubator is a very low cost of doing that. I know they have one in Aurora. You need one here as well. You might be duplicating the effort – you need to check into that – but there's no reason why you couldn't. You don't have to be big, but you have to have some sort of presence. You need to take full advantage of whatever grants are out there. Everybody else is. You might as well get some of your tax money back and put it to good use. The SBIR grants, the NIH, and the MCI grants. Bio-terrorism, the other grants, they're all out there. Get the money in and get started and get a concept. If it doesn't work, fine. Move on to the next one. You need to provide support and incentives to attract and keep core companies. You don't need a large company – you just need a company who is steady. And you don't necessarily have to have a success of going to market, because in our business killing a project early actually makes money. If you can create the concept, go through the safety, find the dose – if you can get there very quickly that would be very beneficial for the industry. You don't have to make it through approval. You can just be a company that does that.

So if you can have a process development laboratory to have small companies be able to come in and work with either your scientists or just the equipment and work out all these kinks in the development - that would be very useful. There's nobody out there that does that very well. People are scrambling to find places that can do early development and production.

Potential issues – you need to move quickly. It doesn't mean it can't be done. It just means you need to do it soon. It doesn't appear that you have a whole lot of government support statewide or citywide. So you'll just have the business or public funds to assist folks. That would need to be changed. You need a champion out there. Another thing is the availability of water and all the water that it would take for downstream purification. It's a huge amount. But that can be managed by not doing production, just development. The high cost of building manufacturing facilities. You don't want to build a facility if you're a small biotech company until you know you'll have a product that will sell \$500 million a year. So you may not want to be building facilities until you attract more business, but it's a catch 22 situation. So you may have to work your way up into that. And then you have to have the ability to compete with outsourcing overseas. I recommend to my clients that everything be done in the United States because they're trained to operate under the regulated system of the FDA. If you're going overseas, you have a certain amount of trained people that have been trained in the United States and then go back; however, it's not always the same. Sometimes it's not worth the risk.

So in conclusion you can be a player in the States. You just need to decide how you want to play - whether you want to be drug, biologic, or device, or supporting other industries. Short term, you look at your research capability. That's the easiest and the quickest and you already have a nice infrastructure here. You may want to build a facility for what's coming out of the university. It just depends on where you want to go. But you just have to get out there and do it. You can't wait.

I just want to acknowledge David and everybody at the Colorado Springs EDC for bringing me out here as well as the Bioscience Association, and two of my colleagues (Mike Edwards and Mike C.), and thank you very much for having me out here today.