Interview Records of Mr. Fang Haizhou

1. Research methods

This study adopts the interview research method of social survey method, and adopts in-depth interview and non-frame questioning. The researcher designed relevant questions for the research topic. During the interview, the interviewees were asked to state their answers and express their opinions on this question within a limited time. After the interview, the researchers summarized and refined the answers of the interviewees, and completed the writing of interview records with the interviewees' review and approval.

2. Respondents

The researcher invited Mr. Fang Haizhou, managing director of Essex Bio, for an interview. Essex Bio is a pioneer in the industrialization of genetic engineering technology in China. Its products have been used by more than 8 million people. With GMP standards in line with the production plant, development and research center, quality inspection center and marketing center. It is the first company in the world to use genetic engineering to construct strains to produce bFGF growth factors and apply them in clinical practice. It has rich experience in the research and development, production and marketing of biological drugs.

Mr. Fang Haizhou is one of the founders of Essex Bio. He has been studying biology for many years and has been concerned about the development of synthetic biology. He has profound knowledge in the field of microbial

fermentation production and drug synthesis, and also has a certain understanding of synthetic biology and iGEM.

The team believes that Mr. Fang Haizhou has the ability to understand the project quickly and has more connection with the application field of the product developed by the project. His comments may indicate the further direction of the project.

3. Interview records

According to the project team's evaluation of the respondents, the project team took seeking "Suggestions" as the core objective of this interview and formulated the following questions. In order to obtain the required complete information, the researcher provided the interviewee with some information and documents about the project in advance. During the interview, the researcher would use the keywords in the introduction of question design in the following text and “could you please give an example?” And other words to prompt.

3.1 Would you please briefly introduce your field of work?

Fang: We are one of the first companies in China to develop drugs using genetic engineering technology. Now we have successfully developed a class I genetic engineering drug in three countries and all of them have been successfully marketed, and the annual sales volume has exceeded 1 billion. Our products now cover nearly 6,500 hospitals in China, and over 8 million people use them every year. We used genetic engineering techniques to assemble the bFGF gene into plasmids, thus creating an

expression system of e. coli that can produce bFGF. We are the first company in the world to industrialize bFGF through genetic engineering technology. It has great application value in wound repair. We have developed a series of bFGF drugs, including the BF eye drops, which are widely used in clinical practice to promote corneal injury repair.

3.2 What problems do you think exist in the field of microbial fermentation and drug production?

Fang: Synthetic biology is a further development of genetic engineering. Genetic engineering, where it used to be difficult to insert a gene into a plasmid, has become much easier, and can even be assembled as a component. These are major technological advances. Developing drugs is hard, not just to make them, but to meet three words: safe, effective and controllable. You can imagine genetic engineering to make an active factor like a protein. But is this active factor useful? Is there biological activity? What problems can it solve? This is called validity. Second, is it safe? There may be something that is very effective, but very toxic. It could be benefits and side effects, which may outweigh the benefits, or even unacceptable, and the drug will not succeed. Thirdly, the so-called controllable production quality is stable and controllable. In particular, the activity of protein drugs varies greatly. To ensure the stability of each batch of production, many quality control links are required, which is quite difficult. So there's a lot of experimental work that goes into doing these three words, and every single piece of research requires a lot of investment. Abroad, a genetically engineered drug might cost $1 billion. In China now also requires

considerable investment. And the development cycle is very long, maybe 10-15 years. As a result, the success rate of making a drug is very low. From the beginning of research and development, to the actual success of the market, may be less than. That is to say, a research result needs to overcome some very big difficulties before it can be translated into practical application. It's not just about technology itself, but also the money.

3.3 Have you heard of synthetic biology? In what way?

Fang: We research biology constantly in understanding the progress of synthetic biology. Synthetic biology is developed on the basis of genetic engineering, and the technology of genetic engineering itself is also the early synthetic biology. Now with the development of biology, these ideas are more advanced, it is easier to create a new organism. In this industry, we are constantly learning these new technologies. At the same time, my child also participated in an iGEM competition last year, so I learned more about it.

3.4 this project applies the database construction technology of synthetic biology to provide a metabolic optimization method of flow control for actual fermentation production. Do you think this project will help the current biofermentation industry?

Fang: Of course. Increasing output is always the goal of industry. Increasing production or presentation is one of the most effective ways to reduce production costs. By applying the advanced techniques of synthetic biology, it is very good to design for higher yields at the genetic level. The only way

to increase production is through upstream design, with these new methods, to design it theoretically first, like your project. The second is to explore the process. You can improve the performance of the strain, there must be a good application value. However, it is a new challenge whether this strain can express the product and pass generation stably. In the next study, you should consider these. But as long as you can increase production, it has good prospects.

3.5 This project proposes a socialization scheme of synthetic biology based on the nature of the project and external opinions. What effect do you think this scheme will have on the synthetic biology industry?

Fang: Any technological progress can bring benefits to the society, but can it be industrialized? There are many determinants of industrialization. First of all, if you do the survey, can the project solve the existing problems? Does it have economic value? There are many indicators of evaluation. Next, if the project wants to realize industrialization, need somebody to do, want to have capital to support. Success is made up of many factors. How does good technology translate into good products? A good product definition can meet the needs of consumers. Technology and products are two different things. Technology is just the foundation. Synthetic biology, for example, is a good technology, but how to make a technology into a product that can be used in the clinic, those are two concepts. Industrialization is actually a complex process. This is a lot of technology, finally did not realize industrialization, or go halfway to die. If you can put a good project, step by step to go down, achieve industrialization, commercialization, in your life, is

a very big achievement.