

Imaginary Creatures in Real Life: The Advance of Cell Fusion

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“Griffin” is a creature that has wings, the upper body of eagles, and a lower body of lions. “Mermaid” is a creature with an upper body of humans and a lower body of fish. Like these imaginary creatures, you might have once imagined a unique creature that has several features of creatures and doesn’t exist in real life. If these creatures appeared in front of us, it would be amazing and our common senses would be changed. However, recently it is possible that these creatures are produced. The technology of this realization is called “cell fusion”.

In 1978, Melchers G succeeded in producing “Pomato” by fusing a tomato’s cell with a potato’s cell, which is a new hybrid plant with leaves and a stem of tomatoes, and a root of potatoes.^[1] As a result, it has got two characteristics, heat resistance derived from

tomatoes and cold resistance derived from potatoes. Like this, the technology to produce a new cell by fusing two cells from different species is cell fusion and it was reported by Yoshio Okada in 1957.^[2] Cell fusion is a common phenomenon in vivo, such as muscle cells, but the method of inducing cell fusion artificially had not been realized. Then he discovered that the cell infected with Sendai Virus (HVJ) was able to fuse with other cells and it was possible to fuse cells even if the virus was made inactive and to do between cells of the other species. In fact, it is easy to fuse cells of the same species. On the other hand, it is difficult to fuse cells of different species. But researchers have developed several ways such as chemical reagents and voltage pulses and advanced cell fusion technology. So a variety of fused cells can be produced now.

Since cell fusion was discovered, this phenomenon has attracted a lot of researchers. First, cell fusion makes it possible for existing creatures to get new features. As previously stated, pomato gets heat resistance and cold resistance and people hope that tomatoes or potatoes grow in areas where they can't grow. A plant cell has a cell wall unlike an animal cell, so this cell wall is removed in order to fuse cells. The cell without a cell wall is called "protoplast". Using protoplast makes it possible to fuse cells of different species. But, in fact, only cell fusion has difficulty for existing creatures to get new preferable features. It is true that pomato succeeded to get heat resistance and cold resistance, but it wasn't able to produce enough fruits like that its tomato was smaller than a cherry tomato and its potato seemed a burdock. So, researchers have been trying to develop cell fusion technology. As a result of their efforts, recently there are some new hybrid plants such as "Oretachi (a hybrid of an orange and a trifoliate), which will be commercialized. In addition to these applications, cell fusion is applied to several scientific areas and allows us to clarify the mysteries of creatures. In 2016, Naoki Wada

and his research team partially succeeded to fuse a human cell and a thale cress.^[3] They researched whether the chromosomes of a human or a plant were able to function correctly in this fused cell. As a result, it was proved that there were some same systems of gene expression between a human and a plant and these systems were very important that creatures were able to live. Therefore, a lot of researchers are interested in cell fusion technology.

Cell fusion technology has changed the biological and medical research field a lot. For example, one of the biggest merits of cell fusion technology is to get new features for existing creatures, and the application using this merit is producing “monoclonal antibodies”. Antibodies are a kind of big molecules made by antibody-producing cells and function to protect our body from viruses and illnesses in the immune systems. Of antibodies, homogenous antibodies produced by a single antibody-producing cell are called monoclonal antibodies. When an antibody-producing cell fuses to a cancer cell, this fused cell has the feature of making antibodies derived from an antibody-producing cell and of increasing themselves derived from a cancer cell. As a result, it is able to produce a lot of monoclonal antibodies. Previously people got antibodies for treatment from animal serum, but these antibodies were low purity and didn't have enough effects for target viruses and illnesses. On the other hand, monoclonal antibodies produced by the fused cells are high purity and useful for treatments. Now many kinds of monoclonal antibodies are produced easily by using this technology and applied to medicine. Besides this application, cell fusion technology is used in many areas such as producing target proteins and brewing.

Cell fusion technology allows us to make new good features into existing creatures or cells and applied in a lot of areas such as agriculture, biology and medicine,

and this technology enhances our life as if we imagine amazing life when we were children. Then one of the most interesting things for scientific researchers is being able to realize them. In the future, you may create and ride on “Pegasuses”, and fly substituting for an airplane.

※ When I wrote this essay, I didn't use AI programs such as chatGPT and DeepL.

《Referances》

[1] Melchers, G., Sacristán, M. D., & Holder, A. A. (1978). Somatic hybrid plants of potato and tomato regenerated from fused protoplasts. *Carlsberg research communications*, 43, 203-218.

[2] Okada, Y. (1958). The fusion of Ehrlich's tumor cells caused. *Virus*, 2048, 4096.

[3] Wada, N., Kazuki, Y., Kazuki, K., Inoue, T., Fukui, K., & Oshimura, M. (2017). Maintenance and function of a plant chromosome in human cells. *ACS Synthetic Biology*, 6(2), 301-310.

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