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Tissue Culture Commonly Refers to the Culture of Animal Cells and Tissues with the more Specific Term Plant Tissue Culture Being Used for Plants

Malak Halawy^{*}

Department of Stem Cell Biology and Therapy, Imperial College of London, UK

*Corresponding author: Malak Halawy, Department of Stem Cell Biology and Therapy, Imperial College of London, South Kensington, UK Email: malakhalawy088@edu.uk

Received Date: November 02, 2021, Accepted Date: November 17, 2021, published date: November 25, 2021

Citation: Halawy M, (2021). Tissue Culture Commonly Refers to the Culture of Animal Cells and Tissues with the more Specific Term Plant Tissue Culture Being Used for Plants. J Stem Cell Bio Transplant. Vol 5 Issue 6: 56

Introduction

Tissue culture is the growth of tissues or cells in an artificial medium separate from the parent organism. This technique is also called micropropagation. This is typically facilitated via use of a liquid semi-solid or solid growth medium, such as broth or agar. In 1885 Wilhelm Roux removed a section of the medullary plate of an embryonic chicken and maintained it in a warm saline solution for several days, establishing the basic principle of tissue culture. In 1907 the zoologist Ross Granville Harrison demonstrated the growth of frog embryonic cells that would give rise to nerve cells in a medium of clotted lymph. In 1913 Steinhardt C. Israeli, grew vaccinia virus in fragments of guinea pig corneal tissue. In 1996, the first use of regenerative tissue was used to replace a small length of urethra, which led to the understanding that the technique of obtaining samples of tissue growing it outside the body without a scaffold, and reapplying it, can be used for only small distances of less than 1 cm. Gottlieb Haberlandt first pointed out the possibilities of the culture of isolated tissues, plant tissue culture. He suggested that the potentialities of individual cells tissue culture as well as that the reciprocal influences of tissues on one another could be determined by this method. Since Haberlandt's original assertions, methods for tissue and cell culture have been realized, leading to significant discoveries in biology and medicine. His original idea, presented in 1902, was called totipotentiality: "Theoretically all plant cells are able to give rise to a complete plant."

Modern Usage

In modern usage, "tissue culture" generally refers to the growth of cells from a tissue from a multicellular organism in *vitro*. These cells may be cells isolated from a donor organism (primary cells) or an immortalised cell line. The cells are bathed in a culture medium, which contains essential nutrients and energy sources necessary for the cells' survival. Thus, in its

broader sense, "tissue culture" is often used interchangeably with "cell culture". On the other hand, the strict meaning of "tissue culture" refers to the culturing of tissue pieces, i.e. explant culture. Tissue culture is an important tool for the study of the biology of cells from multicellular organisms. It provides an in vitro model of the tissue in a well-defined environment which can be easily manipulated and analysed. In animal tissue culture, cells may be grown as two-dimensional monolayers (conventional culture) or within fibrous scaffolds or gels to attain more naturalistic three-dimensional tissue-like structures (3D culture). Eric in a 1988 NIH SBIR grant report showed that electrospinning could be used to produce nano- and submicronscale polymeric fibrous scaffolds specifically intended for use as in vitro cell and tissue substrates. This early use of electrospun fibrous lattices for cell culture and tissue engineering showed that various cell types would adhere to and proliferate upon polycarbonate fibers. It was noted that as opposed to the flattened morphology typically seen in 2D culture, cells grown on the electrospun fibers exhibited a more rounded 3dimensional morphology generally observed of tissues in vivo. Plant tissue culture in particular is concerned with the growing of entire plants from small pieces of plant tissue, cultured in medium. Plant tissue culture is a collection of techniques used to maintain or grow plant cells, tissues or organs under sterile conditions on a nutrient culture medium of known composition. It is widely used to produce clones of a plant in a method known as micropropagation. Different techniques in plant tissue culture may offer certain advantages over traditional methods of propagation.

Plant tissue culture relies on the fact that many plant cells have the ability to regenerate a whole plant (Cellular totipotency). Single cells, plant cells without cell walls (protoplasts), pieces of leaves, stems or roots can often be used to generate a new plant on culture media given the required nutrients and plant hormones.