
By: Navis, Adam R.

"In vitro Experiments on the Effects of Mouse Sarcomas 180 and 37 on the Spinal and Sympathetic Ganglia of the Chick Embryo" were experiments conducted by Rita Levi-Montalcini in conjunction with Viktor Hamburger and Hertha Meyer and published in Cancer Research in 1954. In this series of experiments, conducted at the University of Brazil, Levi-Montalcini demonstrated increased nerve growth by introducing specific tumors (sarcomas) to chick ganglia. Ganglia are clusters of nerve cells, from which nerve fibers emerge. This work led to the discovery of nerve growth factor (NGF) and later the Nobel Prize in Physiology or Medicine in 1986.

This experiment is based on related work performed by Elmer Bueker, [2], who discovered sarcomas capable of being invaded by nervous tissue, and also earlier work by Levi-Montalcini, who confirmed and expanded his results by showing local increases in nerve growth by implanting tumors into a developing embryo. This paper is an extension of that earlier work, demonstrating that the ganglia are responding to direct effects of the tumor, and not a latent effect of all tumors. Levi-Montalcini isolated the ganglia and in a tissue culture to determine the effects of the tumor separate from normal chick development.

Levi-Montalcini used a hanging drop tissue culture for this investigation. This was in opposition to previous studies which had examined the effects of the sarcomas in vivo. The tissue culture technique allows for a more direct study of the ganglia and tumor interactions than experimentation during chick development. The technique involves explanting ganglia from six and seven day chick embryos and placing it in the tissue culture. Five mouse sarcomas were selected for the study of nerve growth effects: sarcoma 180, sarcoma 37, sarcoma 1, adenocarcinoma dbb6, and neuroblastoma C1300. In addition, the chick ganglia were introduced to two types of heart tissue, embryonic chick heart tissue and embryonic mouse heart tissue, as a control to demonstrate the effects of normal tissue. In general, the tumors were placed between 1 to 2 mm from the sarcoma; however, in another experimental series, the distance between the sarcomas was varied to study chemical action at a distance.

The in vitro development of an isolated chick ganglion proceeded more slowly than in vivo. In the first sixteen hours no nerve fiber outgrowth occurred in the explanted tissue. Between twenty-four and forty-eight hours, the nerve fibers associated with the spindle-cells and grew radially into rows and columns. By the third day, many of the neurons began to degenerate and were removed by macrophages, which digest many types of dead or foreign tissue.

In this paper, Levi-Montalcini showed that the nerve growth inducing tumors are able to act at a distance. The paper also notes that the nerves approach the tumor they show a marked increase in density indicating the presence of a diffusible factor. She also showed that this effect was due to a direct action of the tumor on the ganglion rather than a metabolic breakdown of the tissue's normal resistance to nerve growth. This work paved the way for future work characterizing the nature of nerve growth factor with Stanley Cohen and a 1986 Nobel Prize in Physiology or Medicine.

Sources


"In vitro Experiments on the Effects of Mouse Sarcomas 180 and 37 on the Spinal and Sympathetic Ganglia of the Chick Embryo" were experiments conducted by Rita Levi-Montalcini in conjunction with Viktor Hamburger and Hertha Meyer and published in Cancer Research in 1954. In this series of experiments, conducted at the University of Brazil, Levi-Montalcini demonstrated increased nerve growth by introducing specific tumors (sarcomas) to chick ganglia. Ganglia are clusters of nerve cells, from which nerve fibers emerge. This work led to the discovery of nerve growth factor (NGF) and later the Nobel Prize in Physiology or Medicine in 1986.

Subject

Topic
Experiments [29]

Publisher
Arizona State University. School of Life Sciences. Center for Biology and Society. Embryo Project Encyclopedia.

Rights
© Arizona Board of Regents Licensed as Creative Commons Attribution-NonCommercial-Share Alike 3.0 Unported (CC BY-NC-SA 3.0) http://creativecommons.org/licenses/by-nc-sa/3.0/

Format
Articles [29]

Last Modified
Wednesday, July 4, 2018 - 04:40

DC Date Available
Thursday, May 10, 2012 - 13:10

DC Date Created
2007-10-30