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CAENORHABDITIS ELEGANS IN NEUROSCIENCE RESEARCH: ADVANTAGES AND LIMITATIONS IN ITS USE[1]

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INTRODUCTION

There are some advantages and limitations of working with invertebrate model organisms in neuroscience (MURTHY; RAM, 2015). The most important advantage of working with this kind of model is the large diameter of neurons, moreover, glia and muscle cells facilitates microelectrode recordings, the simplicity of the neural-system which are very small and/or compact compared with vertebrates. These organisms have well-known behaviors, it is very important because we can explore their physiological and genetic code (MILLER et al., 2005).

On the other hand, some important invertebrates that are used to develop research such as C. elegans, have their whole genome code sequenced (LEE et al., 2003). These characteristics are very important when an animal model is selected (BURNE et al., 2011). When an animal model like C. elegans is used in research it can be an outstanding alternative because the results can be easily replicated through the world. As we know, reliable results are those that can be compared or repeated.

It is important to understand that there are two main purposes which can be attended for animal models in clinical neuroscience research (HAGSTROM et al., 2015). One of the goals is to simulate the mechanisms of the models, which we are going to use, and then, finding out these mechanisms through research. (BURNE et al., 2011). Secondly, it is to screen for potential effects of treatments or understand how animals sense, interpret and respond to the world around them and to internal cues (BACHÈRE, 2003). It is important to keep in mind that all animal models have some kind of limitation because of differences between species. For instance, invertebrate model and humans have many issues to explore and to compare, we need to understand the components of their anatomic and physiological structures (SENGUPTA; SAMUEL, 2009; BURNE et al., 2011; GRÜNEWALD, 2012).

As a result, C. elegans previously been used for pharmacological, genetic and toxicological studies. Nevertheless, in the current days they had been useful in a wide variety of fields as physiology, neurophysiology, neurobiology and biomedicine (LEE et al., 2003). Several studies have coded phenomena physiological, genetic and neural these invertebrates, therefore, the scientific community has aroused interest in studying. In this study, we establish to provide a compact overview of an invertebrate animal model (Caenorhabditis elegans) showing its advantages and limitations to neuroscience research.

Modalidade do trabalho: Ensaio teórico
Evento: XXI Jornada de Pesquisa

METHODOLOGY

This article arises from a bibliography analysis and its intents to informe key features in usage of Caenorhabditis elegans in the current scenario of neuroscience. In addition, this paper is seeking to intensify the use of alternative invertebrates models besides the use of vertebrate animals.

RESULTS AND DISCUSSION

The main research question that was addressed by Miller, 2005 is about the step reaction of C. elegans chemotaxis mechanism and the stepwise temporal changes in the presence of an attractant substrate concentration. The main conclusions arising from this study exposed that C. elegans' chemotaxis are complexes, with many stages and a nonlinear requirement on the sign and amplitude of the stimulus. The organism chosen in this research was C. elegans; Invertebrates models are important because they can be used in many research such as genetic, biochemistry, physiology, etc. This study finds to explore the effects of chemotaxis mechanism in C. elegans, thus, the model used in this research found to construct validity.

As we know, C. elegans is an organism profoundly studied in some parts of the world; also, this organism has its whole genome sequenced. Consequently, utilization this organism as model is possible to measure and compare technical results. Another important advantage using it in the study is the possibility of apply the new discoveries in other research (e.g. this research explored the effects of chemotaxis mechanism, another research could compare the effects of any drugs in the chemotaxis). Also, C. elegans has a Simple nervous systems with few nervous systems with a small number of neurons enhancing the tractability of neuronal circuitry, it is very important because it makes the analyses processes simpler to comprehend the interactions and/or amplify tests (Fig. 1) (BURNE et al., 2011).

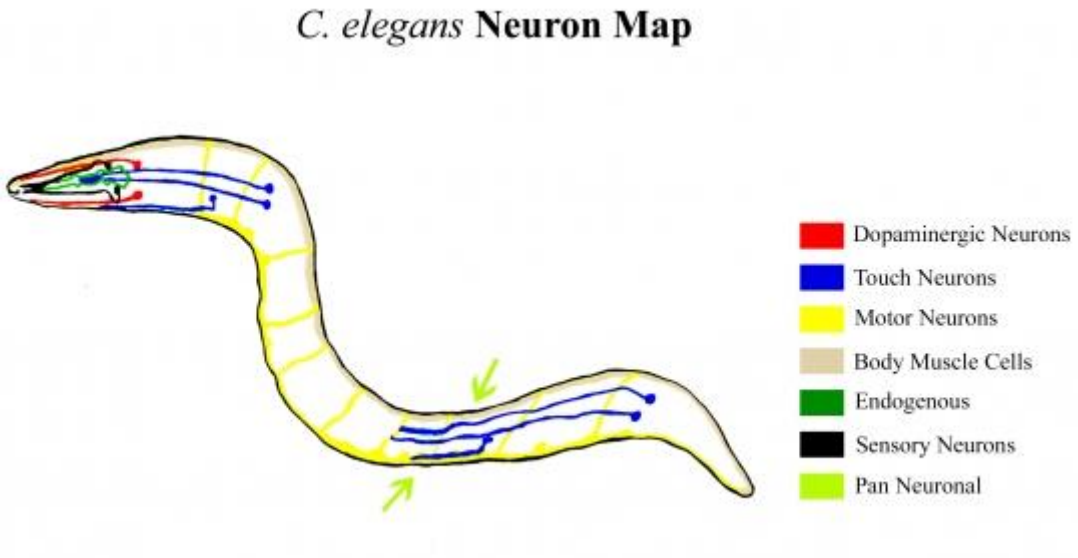

Figure 1: C. elegans neuron map shows dopaminergic neurons, touch neurons, endogenous, motor neurons, body muscle cells, sensory neurons and pan neuronal (up arrow: APL-1Ext, down arrow: APL-1). This animal model was mapped its neuron system as well as its genome code. Source: The authors, based on Alexander; Marfill; Li, 2014.

Modalidade do trabalho: Ensaio teórico
Evento: XXI Jornada de Pesquisa

From another perspective, do not exist a perfect model that can be described as the best, only better than. A model organism need to be most possible similar with the treated issue (disease or organism-target), however, the utilized specimens might be inconstant between themselves. I be certain of that when a research has analogous targets used in the Step-Response Analysis of Chemotaxis in Caenorhabditis elegans it will be precursor of many other kinds of studies. This research has a strong scientific value because it finds to make a profound analyses in which explores important characteristics of an useable model organism. From this view, this kind of research makes an important investigation of chemotaxis that will allow application of new drugs or how it will work in different vertebrates. As we perceive, the development of studies in invertebrates can be applied in vertebrates so is necessary more expertise about model. Essentially is necessary to evidence neuroscience as a science that objectives to understand how animals sense, although this knowledge is possible to interpret and reply to the world around them and to internal cues. To explore these issues, is important to interpret some important aspects that are used to comprehend researches that were used in the invertebrate model.

CONCLUSION

From this perspective, we need to comprehend the component parts of the nervous system for instance, neural circuits, cells, neurotransmitters, proteins, genes, it is deeply important to make comparisons between animal models. Secondly, the understanding about how these components interact to generate information processing dimensions for example, sensitivity, attention, learning, memory. Finally, individual characters need to be considerate such as specific ecological niches, and interact within groups of animals for example, rearing, social behavior. It is important to highlight the considerations about ours interpretation of neuro-behavior and its influence in the natural environment. Although many studies are available to the scientific community, need to even greater scientific productions directed the potential that this organism, as well as other invertebrate models that show great potential for application and dissemination of scientific concepts and inferences.

KEY-WORDS: Neuro-behavior; Research; Invertebrate Animal Model.

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Modalidade do trabalho: Ensaio teórico
Evento: XXI Jornada de Pesquisa

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