

<<神经系统发育>>

图书基本信息

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内容概要

《神经系统发育(原著第3版)(导读版?英文版)》由三位知名学者主笔，以现在和既往的重要实验与观察结果为例，对业已建立的和正在演变的神经发育原理进行广泛和基础的讨论。

《神经系统发育(原著第3版)(导读版?英文版)》按照个体发生的顺序组织内容。从出现神经原基开始，随后每一章节按神经发育事件出现的顺序组织：神经系统的模式建成和生长，神经元命运决定，轴突导向和靶点寻找，神经元存活与死亡，突触形成与发育的可塑性。在结构部分基本完成后，最后一章讨论了行为的出现。

新版的《神经系统发育》反映了通过新的分子遗传学和细胞生物学方法的应用取得的最新成果。丰富的彩色照片和原始绘图，辅以简明的叙述，使《神经系统发育(原著第3版)(导读版?英文版)》非常适合这一有趣领域的初涉者，包括高年级本科生、研究生和研究人员。

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章节摘录

版权页：插图：The human brain is made up of approximately 100 billion neurons and even more glial cells. The sources of all these neurons and glia are the cells of the neural tube, described in the previous chapters. Neurogenesis and gliogenesis, the generation of neurons and glia during development, is collectively also called histogenesis. Once the neurons and glia are generated by the progenitors during development, they almost always migrate over some distance from their point of origin to their final position. This chapter describes the cellular and molecular principles by which the appropriate numbers of neurons and glia are generated from the neural precursors, and gives an overview of some of the complex cellular migration processes involved in the construction of the brain. The number of cells generated in the developing nervous system is likely regulated at several levels. In some cases, the production of neurons or glia may be regulated by an intrinsic limit in the number of progenitor cell divisions. The level of proliferation and ultimately the number of cells generated can also be controlled by extracellular signals, acting as mitogens, promoting progenitor cells to reenter the cell cycle or alternatively as mitotic inhibitors that induce progenitor cells to exit from the cell cycle. However, as we will see in Chapter 7, the number of neurons and glia in the mature nervous system is a function not only of cell proliferation, but also of cell death. As we saw in Chapter V the nervous system of *C. elegans* (as well as the rest of the animal) is derived from a highly stereotyped pattern of cell divisions. Therefore, in these animals, the lineages of the cells directly predict their numbers. The regulation of these cell divisions appears to depend less on interactions with surrounding cells than is the case in vertebrates. The lineages of the *C. elegans* progenitor cells also predict the particular types of neurons that are generated from a particular precursor, and it appears that the information to define a given type of cell resides largely in factors derived directly from the precursors. The same is true for the neuroblasts that produce the *Drosophila* central nervous system: the production of neurons from the neuroblasts is highly stereotypic. The neuroblasts of the insect CNS delaminate from the ventral-lateral ectoderm neurogenic region in successive waves (see Chapter 1). In *Drosophila*, about 25 neuroblasts delaminate in each segment, and they are organized in four columns and six rows (Doe and Smouse, 1990). Once the neuroblast segregates from the ectoderm, it undergoes several asymmetric divisions, giving rise to approximately five smaller ganglion mother cells. Each ganglion mother cell then divides to generate a pair of neurons. These neurons make up the segmental ganglia of the ventral nerve cord and have stereotypic numbers and types of neurons. In the vertebrate, the situation gets considerably more complex. The neural tube of most vertebrates is initially a single layer thick. As neurogenesis proceeds, the progenitor cells undergo a large number of cell divisions to produce a much thicker tube. A section through the developing spinal cord is shown in Figure 3.1A, and an example of a progenitor cell is shown as a schematic in Figure 3.1B and in the actual neural tube in Figure 3.1C, labeled with a fluorescent protein to visualize the cell as it progresses through a cell division. At this stage of development, almost all the cells in the neural tube resemble those shown in Figure 3.1B,C, with a simple bipolar shape. They extend one process to the central canal of the neural tube (named the ventricular surface because it is continuous with the ventricles of the brain) and they extend their other process to the outer surface of the neural tube. If one were just to look at the nuclei of the neural tube at this stage, there would appear to be many cell layers, and at first, the early neurohistologists thought this was the case. However, in the early 1900s it was recognized that the cells of the neural tube move their nuclei from the inside of the neural tube to the outside during each cell cycle. This movement can be directly observed using time lapse recording of cells labeled with fluorescent proteins (Figure 3.1C). This constant nuclear movement is termed interkinetic nuclear migration. In this process, the nuclei move to the inner, ventricular surface moment just before mitosis, and divide into two daughter cells; then the nuclei of these daughter cells move away from this surface during S-phase; but wherever they are just before the next mitosis, they rapidly move back to the ventricular surface to complete division (Norden et al., 2009).

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