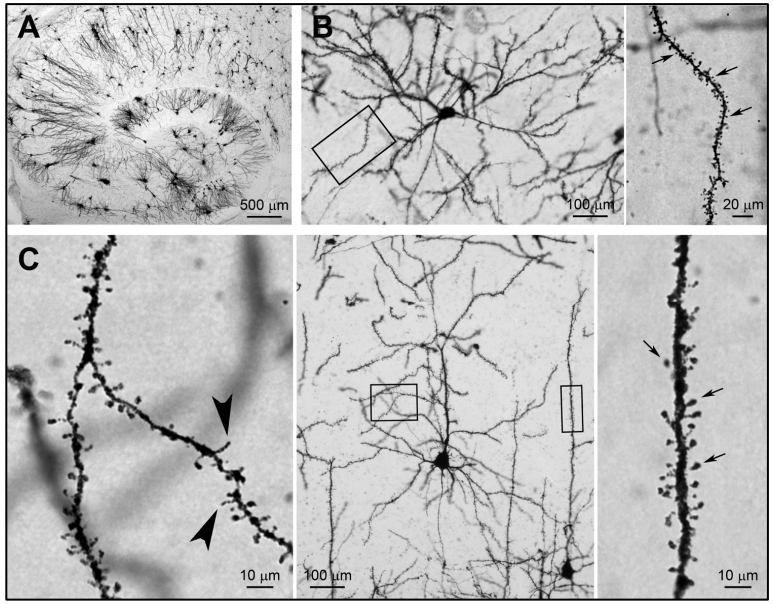
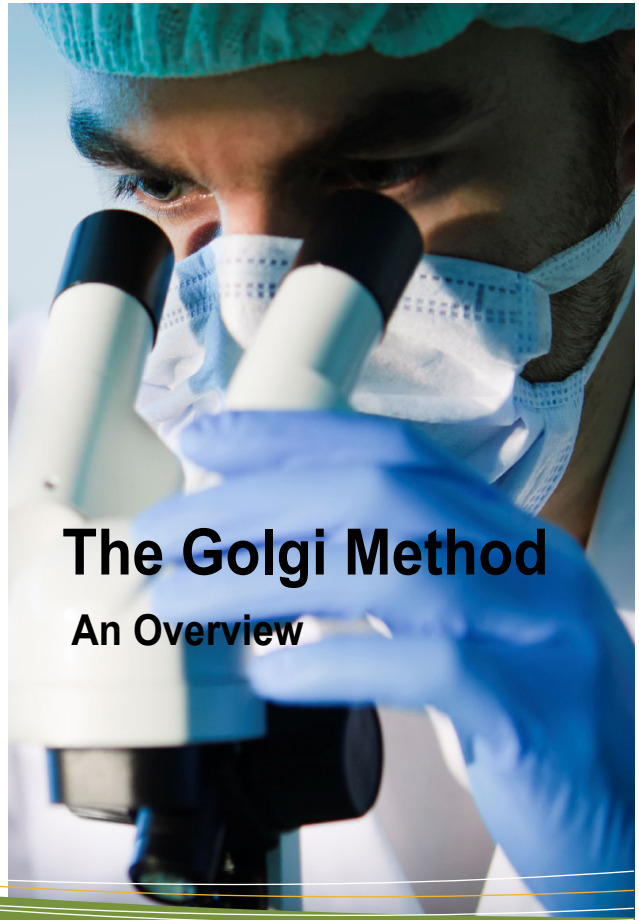
PROVEN RESULTS





The Golgi Method

An Overview

BIOENNO SUPERGOLGI KIT

Based on the principles of the Golgi method, Bioenno Tech LLC has developed the **superGolgi Kit**, an enhanced and rapid Golgi-Cox impregnation and staining system. In the Kit, a refined Golgi-Cox solution and an enhanced developer of impregnated neurons are included. The benefits of the Kit are:

- Reliable and high contrast labeling of dendrites and dendritic spines
- Refined and stable Golgi-Cox solution
- Impregnation time of only 1 to 2 weeks
- Suitable for tissues freshly harvested from animals and for specimens of postmortem human brains
- Sufficient for 10-12 blocks (~1×1×2 cm) of brain tissue
- Streamlined staining protocol
- Warranty: 18 months

DESCRIPTION

A: Impregnated neurons from the hippocampus of a 5-month-old C57BL mouse (4×).

B: An impregnated striatal neuron taken from the posterior caudate of a 2-month-old Wistar rat. (Left: 20×; Right: 63×, arrows denote spines)

C: Pyramidal neurons (Middle panel) from the cortex of a 3-week-old CD1 mouse. Filopodia-like protrusions (arrowheads), the immature spines, are often observed at this age. (Left: spines on oblique branches, 100×; Middle: 20×; Right: spines on main dendrite, 100×)

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The Golgi Method

AN OVERVIEW

Beautiful in its simplicity

Optimal for dendritic spines and branches

HISTORY OF THE GOLGI METHOD

In 1873, Camillo Golgi introduced the silver impregnation method in which potassium dichromate and silver nitrate were used to stain the neural cells, including the axon and the dendrites of neurons. By using the silver Golgi method, Santiago Ramón y Cajal was able to describe the cellular structure of the vertebrate nervous system. To acknowledge their contributions to formulating the foundation of modern neuroscience, Golgi and Cajal were jointly awarded the Nobel Prize in Physiology or Medicine in 1906.

The Golgi method is elegant in its simplicity for staining the spines that extend from neuronal dendrites and make synaptic connections with passing axons. The method has helped scientists in laboratories and clinics in understanding neuronal structure and function over time. The Golgi method including the original and its modifications can be grouped into two main categories: the silver ***"rapid Golgi"*** and the mercuric ***"Golgi-Cox"*** methods, based on the metallic salts used and impregnation time.

CHEMISTRY USED IN THE GOLGI METHOD

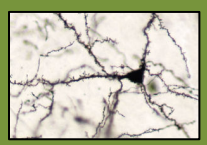
The principle of the Golgi method is based on the crystallization of silver chromate (Ag_2CrO_4), a brown-red monoclinic crystal. However, the exact mechanism by which individual neurons are selectively impregnated still remains unknown. Silver impregnation is notoriously unpredictable requiring modifications to improve the reliability of the original method. Among the modifications, the Golgi-Cox method described by Cox in 1891 is widely used, in which a mixture of potassium dichromate and mercuric chloride is used instead of silver nitrate, followed by a photographic development like procedure. The impregnation generally takes 2 to 4 weeks, and the black deposit in impregnated neurons has been suggested to be mercuric sulphide. This modified method is particularly useful for tracing dendritic branches and quantifying dendritic spines.

GOLGI METHOD STILL REMAINS SUPERIOR

New techniques including intracellular labeling and transfection of fluorescent protein (*e.g.* GFP, YFP) have become increasingly attractive for neuroscientists to study the dendritic structure and function, but ***none*** of these methods even come close to matching the overview of whole brain regions that the Golgi method can provide.

The fact remains that even after one century of its introduction, ***the Golgi method still remains superior***, not only in neuroanatomy studies, but also in studies exploring the relationships between morphology and behavior. The method allows for excellent visualization of dendritic arbors and dendritic spines with several advantages, such as lower cost, ease of use, no need for transgenic animals and special equipment.





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