# Analyzing the Position and Distribution of Centriolar Satellites

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## ABSTRACT

Centrosomes are dynamic non-membrane bound organelles that are found in mammalian cells [1]. Centrosomes play roles in cell division, orienting the mitotic spindle, and can influence cell shape, polarity, and motility [2]. Drastic disruptions in centrosomes can cause embryonic lethality and cancers, while subtle disruptions can cause congenital birth defects, degenerative tissue disorders and heart, brain, and limb malformations [3,4]. Centrosomes are formed when a network of proteins and matrix components are recruited to centrioles, which then surround them forming a donut-like structure called a toroid [1,5-6]. Centrosome proteins are found both at the centrosome as a part of the core population and spread throughout cells as satellites. As organelles work together to maintain homeostasis in the cell, disruptions in one organelle may affect the distribution patterns and regulatory mechanisms of other organelles, proteins, and cellular components. I conduct pharmacology experiments using fluorescence microscopy and live human cells to determine how disturbances in organelles may affect centrosomes and their satellite's distribution patterns.

## Introduction

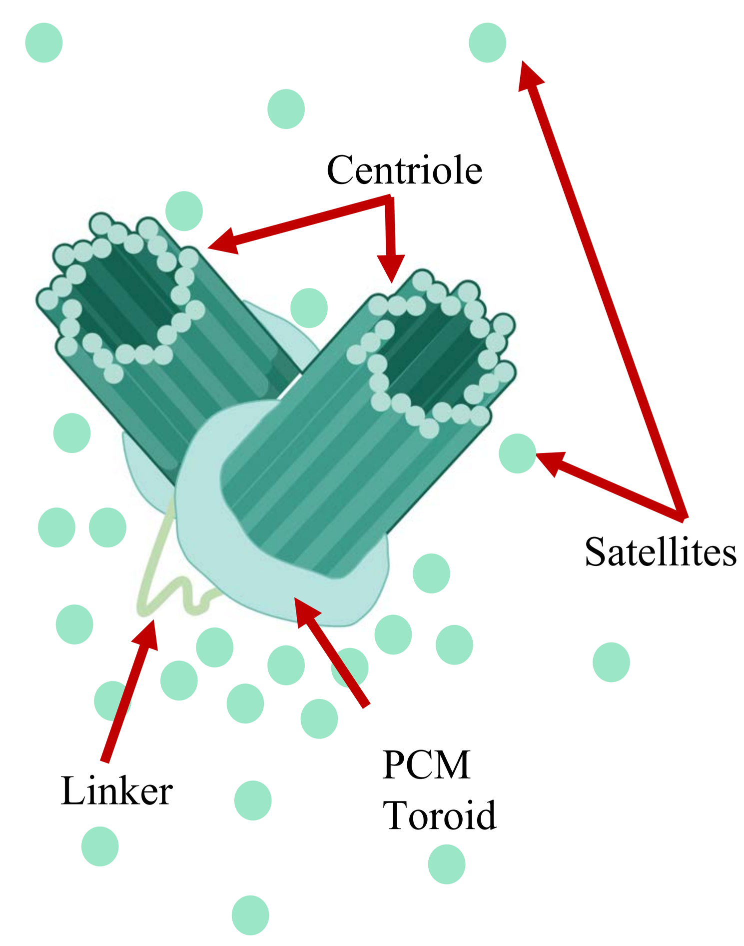



**FIGURE 1**: Schematic of centrosome components.

- Centrosomes are dynamic non-membrane bound organelles (**Figure 1**) [1,5-7].
- Pericentriolar material (PCM) is comprised of proteins and other pericentriolar material components[1].
- PCM components are dynamic and traffic to and from centrosomes[5]. These are referred to as centriolar ***satellites***.
- During mitosis, centriolar satellites disperse and are then reformed during G1.
- Similarly, the Golgi follows the same dispersal and reformation pattern[8].
- Microtubules were thought to be the only regulator of centrosomes and their satellites. However, when microtubules are disrupted, centrosomes remain intact[9].
- We propose that the Golgi may act as a secondary regulator due to the similar disruption and reformation pattern observed during the cell cycle.

## Satellite Dispersal is Dependent on Cell Cycle Stage

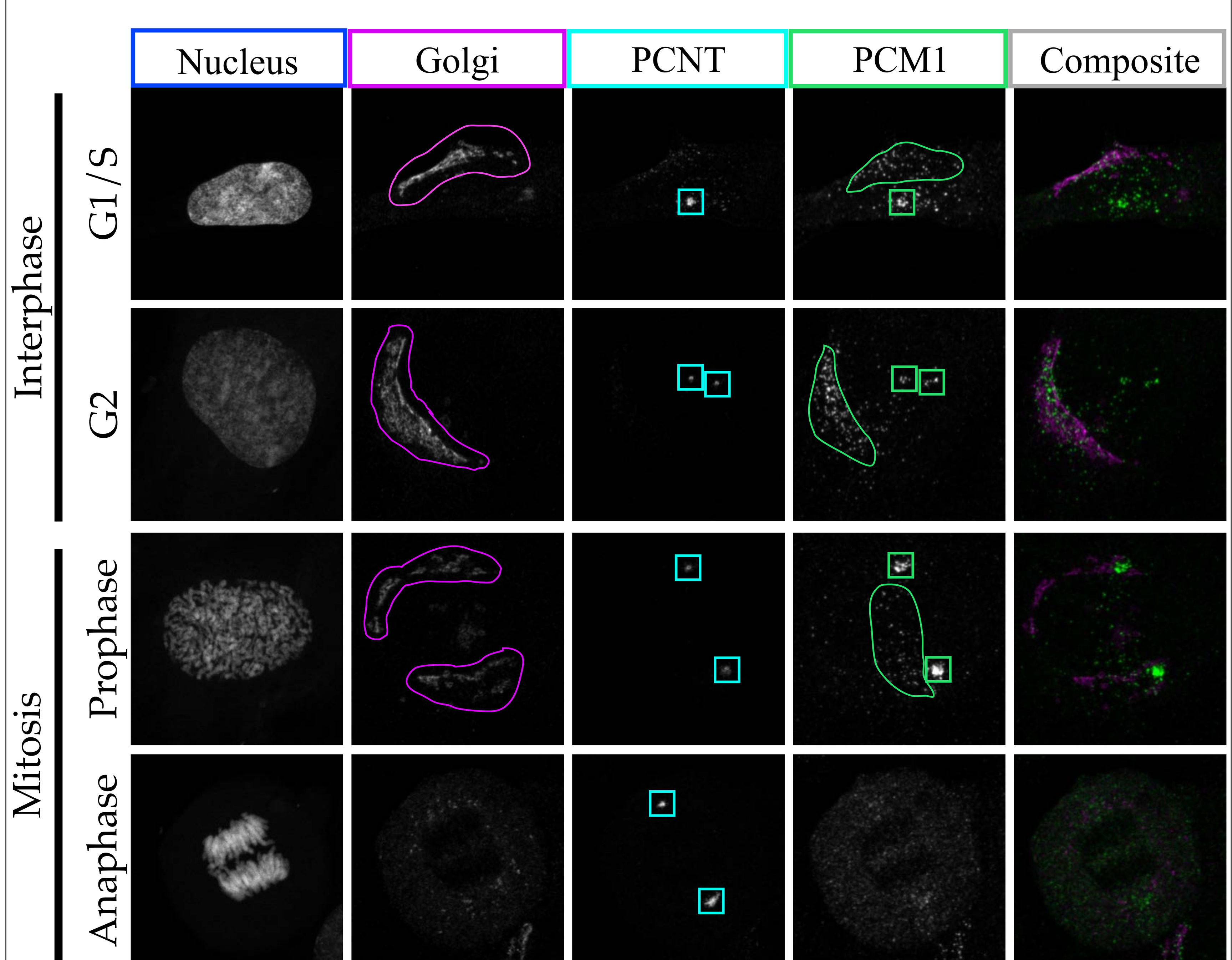



**FIGURE 2**: Centriolar satellites disperse with the progression of the cell cycle, as does the Golgi.

## Golgi Dispersal Impacts Satellites

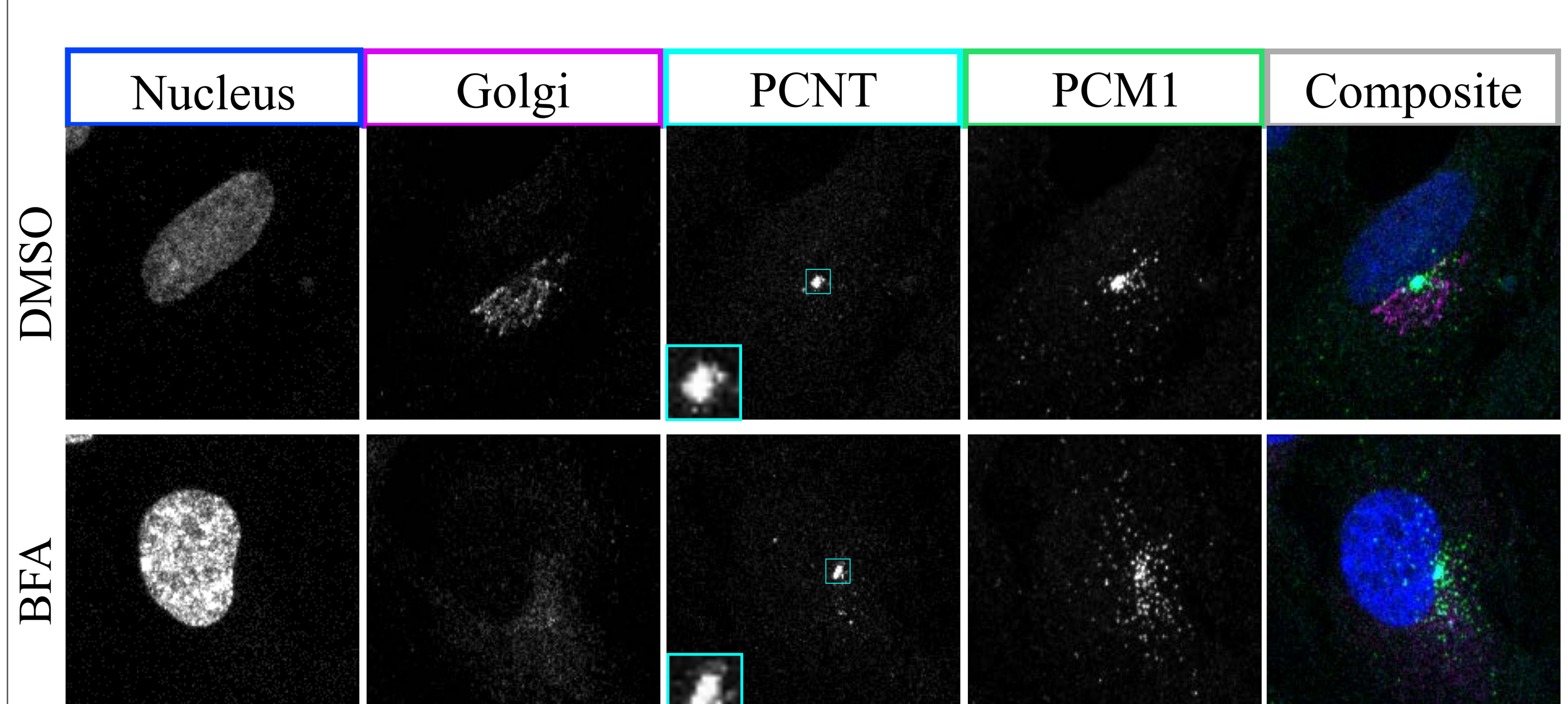



**FIGURE 3**: Satellite dispersal with and without the addition of a Golgi disruptor.

## Relative Centrosome and Golgi Positioning in Interphase Cells

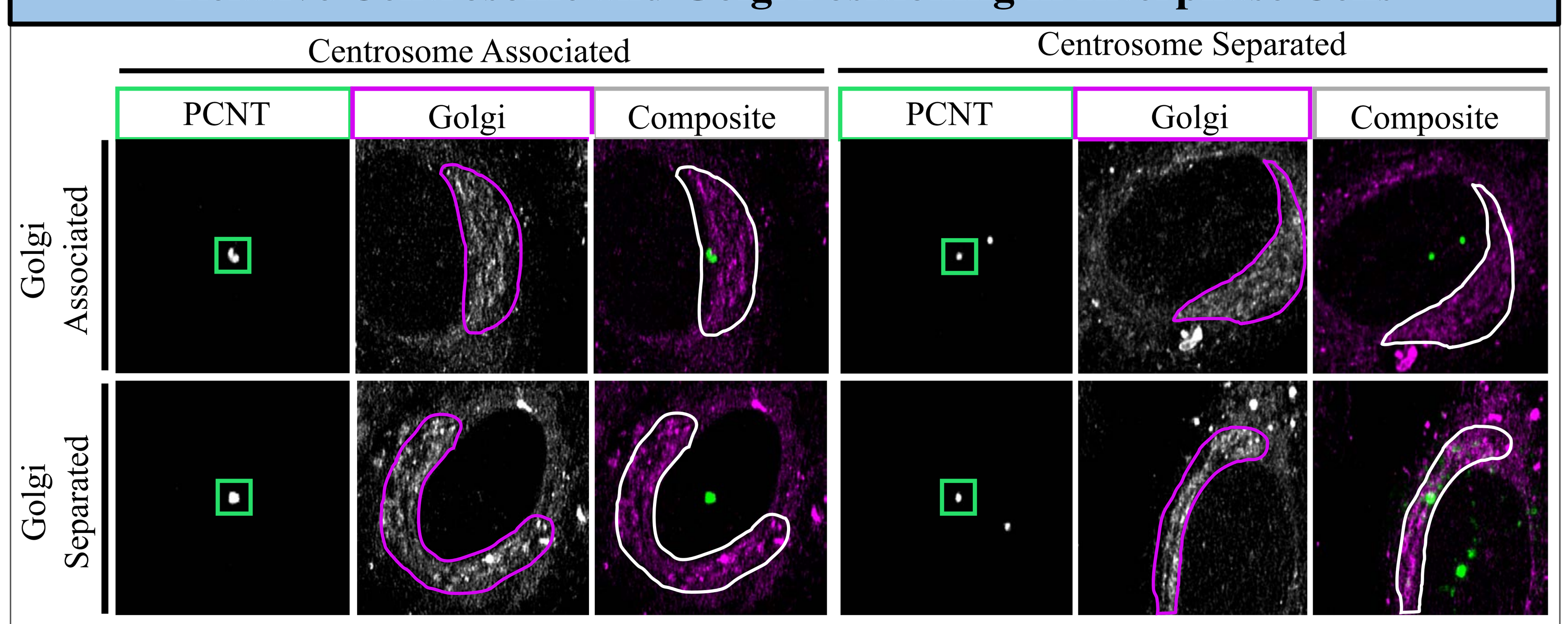



**FIGURE 4**: Interphase cells are categorized based upon the number of centrosomes present and their relative position to the Golgi.

## Golgi Morphology and Centrosome Position Impact Satellite Distribution

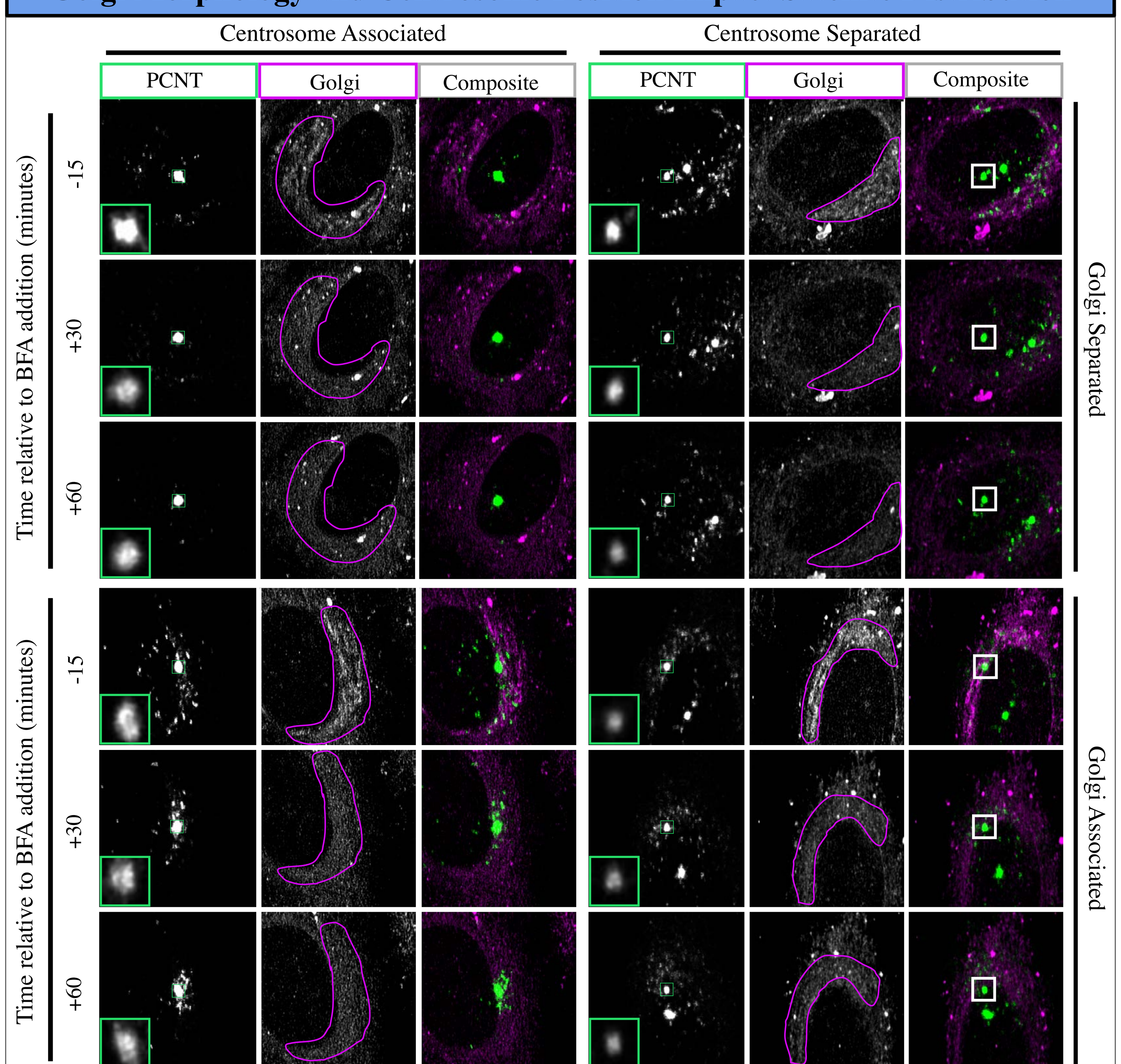
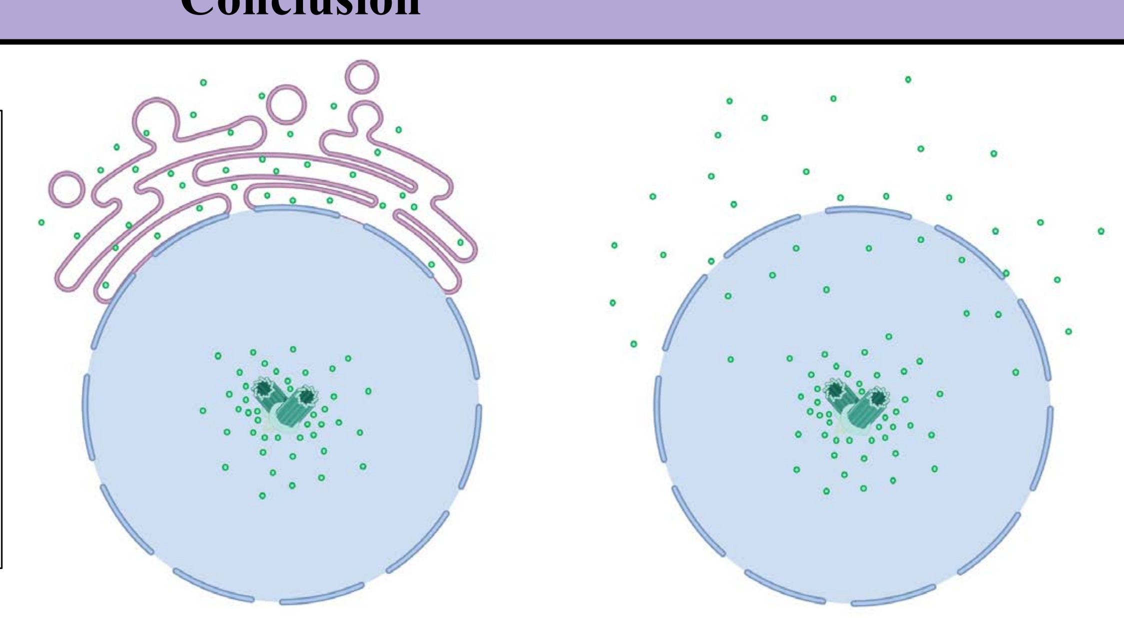



**FIGURE 5**: Satellite distribution patterns differ after Golgi disruption based upon centrosome number, the centrosomes position relative to the Golgi, and Golgi morphology.

## Conclusion

**FIGURE 6**: Proposed model of satellite dispersal after Golgi disruption for cells with centrosomes separated from the Golgi.



- Satellite and centrosome dispersal patterns differ based upon cell cycle stage (**Figure 2**).
- Satellite dispersal patterns can be disrupted by inducing a change in Golgi morphology (**Figure 3**).
- Interphase cells contain different numbers of centrosomes, of which exhibit differing association status with the Golgi (**Figure 4**).
- Based on the centrosome and Golgi categorization, the effects of Golgi disruption differ (**Figure 5**).
- Proposed model shows Golgi satellite population dispersing after Golgi disruption, while centrosome satellite population remains largely unchanged (**Figure 6**). This phenotype is observed in cells where the centrosome and Golgi are not associated with one another.

## Citations

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