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Data Article

Data on the association of the nuclear envelope protein Sun1 with nucleoli

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ABSTRACT

SUN proteins participate in diverse cellular activities, many of which are connected to the nuclear envelope. Recently, the family member SUN1 has been linked to novel biological activities. These include the regulation of nucleoli, intranuclear compartments that assemble ribosomal subunits. We show that SUN1 associates with nucleoli in several mammalian epithelial cell lines. This nucleolar localization is not shared by all cell types, as SUN1 concentrates at the nuclear envelope in ganglionic neurons and non-neuronal satellite cells. Database analyses and Western blotting emphasize the complexity of SUN1 protein profiles in different mammalian cells. We constructed a STRING network which identifies SUN1-related proteins as part of a larger network that includes several nucleolar proteins. Taken together, the current data highlight the diversity of SUN1 proteins and emphasize the possible links between SUN1 and nucleoli.

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Specifications Table

Subject area	*Biology*
More specific subject area	*Cell biology*
Type of data	*Fluorescence microscopy, 3D reconstruction, Western blot, sequence alignment, STRING network*
How data was acquired	*Confocal microscopy, Western blotting, database search and analysis*
Data format	*Analyzed*
Experimental factors	*Oxidative stress*
Data source location	*McGill University, Montreal, Canada and NCBI*
Data accessibility	https://www.ncbi.nlm.nih.gov/protein/

Value of the data

- SUN1-related proteins can localize to nucleoli.
- SUN1 nucleolar association is maintained during oxidative stress.
- SUN1 nucleolar localization is cell type specific.
- SUN1 is part of a larger network with links to the nucleolus.
- Data provide the foundation to define the mechanisms through which SUN1 controls nucleolar functions.

1. Data

SUN (Sad1-UNC84 homology) proteins connect the nuclear lamina to the cytoskeleton [1–3]. Most SUN proteins studied to date concentrate in the inner nuclear membrane, where they interact with other membrane components and the nuclear lamina. In the perinuclear space, SUN domains bind KASH (Klarsicht, ANC-1 and Syne homology) proteins that are embedded in the outer nuclear membrane. In this scenario, SUN proteins contain domains in the nucleoplasm, the inner nuclear membrane and the perinuclear space.

Members of the SUN protein family contribute to a wide variety of biological activities, including mechanotransduction to the nucleus [4], formation of bipolar spindles and progression through mitosis [5], DNA double strand break repair [6] and HIV replication [7]. Moreover, SUN1 and SUN2 exhibit cell-type specific functions that are critical to nucleokinesis in the developing cerebellum [8]. While there is some functional overlap between SUN1 and SUN2, both proteins make also unique contributions to cell physiology.

Our data focus on SUN1, a protein with established links to human health. For example, SUN1 promotes proper myonuclear positioning [9], and *SUN1* is a disease modifier gene for Emery–Dreyfus muscular dystrophy [9]. In addition, SUN1 can regulate adhesion to the extracellular matrix and thus affects the formation of invadopodia in cancer cells [10]. Recently, novel SUN1 activities have been described that go beyond the interaction with nuclear membranes or the lamina, suggesting that SUN1 controls nucleolar function [11], mRNA export [12] and sperm development [13]. Multiple SUN1 isoforms exist [13–15] that can differ in subcellular localization, association with binding partners and cellular function. These diverse properties of SUN1 proteins are not fully understood. Several of these properties are addressed in Figs. 1–5 and Table 1.

Supplemental File 1. SUN1 interactors identified by STRING are listed. The properties of individual nodes are described. The presence of SUN1 interactors in nucleoli is based on data published for spatial proteomics that investigated the proteome of different subcellular compartments [17].