



## RESEARCH PAPER

## FUNGAL SMN FROM ASPERGILLUS IN SMA TREATMENT

Amos Gelbard

Zefat Academic College, Zefat, Israel

## ABSTRACT

SMA or Spinal Muscular Atrophy is a rare neuromuscular disorder characterized by loss of motor neurons and progressive muscle wasting, often leading to early death.

The disorder is caused by a genetic defect in the SMN1 gene, which encodes SMN, a protein widely expressed in all eukaryotic cells and necessary for survival of motor neurons. Lower levels of the protein result in loss of function of neuronal cells in the anterior horn of the spinal cord and subsequent system-wide atrophy of skeletal muscles.

Survival Motor Neuron (SMN) is a protein that in humans is encoded by the SMN1 and SMN2 genes. SMN is found in the cytoplasm of all animal cells and also in the nuclear gems. It functions in transcriptional regulation, telomerase regeneration and cellular trafficking.

SMN deficiency, primarily due to mutations in SMN1, result in widespread splicing defects, especially in spinal motor neurons, and is one cause of Spinal Muscular Atrophy.

SMN is evolutionarily conserved in the Fungi kingdom, though only fungal organisms with a great number of introns have the SMN gene.

Aspergillus is a conidial fungi genus consisting of a few hundred mold species, found in various climates worldwide.

Aspergillosis is the name given to a wide variety of diseases caused by infection by fungi of the genus Aspergillus. Fungal infections of the respiratory tract are considered synonymous with invasive pulmonary infections. In a research quoted in this article, side effects to inhalation of Aspergillus include elevated muscle mass within the lungs.

Using Aspergillus for containing doses of Fungal SMN, or fungal SMN from different sources, could prove beneficial in SMA treatment as lower levels of SMN are the main cause for SMA and could show the effects on muscle mass witnessed in the quoted study to possibly be relevant in SMA treatment as well.

**KEY WORDS :** SMA, SMN, Fungal SMN, Aspergillus, Treatment

Spinal muscular atrophy (SMA), also called autosomal recessive proximal spinal muscular atrophy and 5q spinal muscular atrophy, is a rare neuromuscular disorder characterized by loss of motor neurons and progressive muscle wasting, often leading to early death.

The disorder is caused by a genetic defect in the SMN1 gene, which encodes SMN, a protein widely expressed in all eukaryotic cells and necessary for survival of motor neurons. Lower levels of the protein result in loss of function of neuronal cells in the anterior horn of the spinal cord and subsequent system-wide atrophy of skeletal muscles.

Survival motor neuron (SMN) is a protein that in humans is encoded by the SMN1 and SMN2 genes. SMN is found in the cytoplasm of all animal cells and also in the nuclear gems. It functions in transcriptional regulation, telomerase regeneration and cellular trafficking. [2] SMN deficiency, primarily due to mutations in SMN1, result in widespread splicing defects, especially in spinal motor neurons, and is one cause of spinal muscular atrophy. Research also showed a possible role of SMN in neuronal migration and/or differentiation.

SMN is evolutionarily conserved including in the Fungi kingdom, though only fungal organisms with a great number of introns have the SMN gene (or the splicing factor spf30 paralogue), these are filamentous fungus (filamentous fungi) which have mycelia. [1]

Aspergillus is a conidial fungi genus consisting of a few hundred mold species found in various climates worldwide. Aspergillus was first catalogued in 1729 by the Italian priest and biologist Pier Antonio Micheli. Members of the genus possess the ability to grow where a high osmotic pressure exists (high concentration of sugar, salt, etc.). Aspergillus species are highly aerobic and are found in almost all oxygen-rich environments, where they commonly grow as molds on the surface of a substrate, as a result of the high oxygen tension. Commonly, fungi grow on carbon-rich substrates like

monosaccharides (such as glucose) and polysaccharides (such as amylose). Aspergillus species are common contaminants of starchy foods (such as bread and potatoes), and grow in or on many plants and trees.

Aspergillosis is the name given to a wide variety of diseases caused by infection by fungi of the genus Aspergillus. The majority of cases occur in people with underlying illnesses such as tuberculosis or chronic obstructive pulmonary disease (COPD), but with otherwise healthy immune systems. Fungal infections of the respiratory tract are considered synonymous with invasive pulmonary infections caused by *Aspergillus* spp. [2]

An inhalation model of airway allergic response to inhalation of environmental *Aspergillus fumigatus* conidia in sensitized BALB/c mice showed these results: "After a single challenge with inhaled *A. fumigatus* conidia, allergic pulmonary inflammation and airway hyper responsiveness were significantly increased above that of either naive animals or animals that had been sensitized to *A. fumigatus* antigens but not challenged with conidia. *The architecture of the lung was changed by inhalation of conidia with epithelial thickness, goblet cell metaplasia, and peribronchial collagen deposition significantly increased when compared to controls. Additionally, α-smooth muscle actin staining of histological sections showed visual evidence of increased peribronchial smooth muscle mass after fungal challenge*". [4]

Although only reported as tested on lungs and despite being possibly detrimental in the respiratory system, it possibly containing doses of fungal SMN [1] possibly caused SMN surplus. Considering lower levels of SMN are the main cause for SMA, could show the effects on muscle mass witnessed in the above study to possibly be relevant in SMA treatment.

## REFERENCES

1. Mier P1, Pérez-Pulido AJ. "Fungal Smn and Spf30 homologues are mainly present in filamentous fungi and genomes with

Article History	Received	Accepted	Published
	14/06/2018	06/09/2018	20/11/2018

\*Corresponding Author Amos Gelbard  
Zefat Academic College, Zefat, Israel, maatouq101@outlook.com

- many introns: implications for spinal muscular atrophy".  
Universidad Pablo de Olavide, Sevilla, Spain. 2011
2. Anuradha Chowdhary, Kshitij Agarwal, and Jacques F. Meis .  
Donald C Sheppard, Editor. "Filamentous Fungi in Respiratory  
Infections. What Lies Beyond Aspergillosis and Mucormycosis?"  
India, The Netherlands. 2016
  3. Keith A. Powell, Annabel Renwick, John F. Peberdy. "The Genus  
Aspergillus: From Taxonomy and Genetics to Industrial  
Application", page 264. Springer Science & Business Media,  
2013
  4. Scott A. Hoselton, Amali E. Samarasinghe, Jena M. Seydel, and  
Jane M. Schuh. "An inhalation model of airway allergic response  
to inhalation of environmental Aspergillus fumigatus conidia in  
sensitized BALB/c mice". North Dakota State University, Fargo,  
ND, USA. 2011