



HAL
open science

Sphingomyelinases: their regulation and roles in cardiovascular pathophysiology.

Catherine Pavoine, Françoise Pecker

► **To cite this version:**

Catherine Pavoine, Françoise Pecker. Sphingomyelinases: their regulation and roles in cardiovascular pathophysiology.: Sphingomyelinases in cardiovascular pathophysiology. Cardiovascular Research, 2009, 82 (2), pp.175-83. 10.1093/cvr/cvp030 . inserm-00371935

HAL Id: inserm-00371935

<https://www.hal.inserm.fr/inserm-00371935>

Submitted on 25 Feb 2010

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Table. Sphingomyelinases in cardiovascular physiology and pathophysiology

Group	Acid sphingomyelinases		Neutral sphingomyelinases		
Gene	<i>Smpd1</i> ^{24,25}		<i>Smpd2</i> ²⁹	<i>Smpd3</i> ³⁰	<i>Smpd4</i> ¹²
Protein	L-ASMase ⁵²	S-ASMase ⁵²	NSMase1 ²⁹	NSMase2 ³⁰	NSMase3 ¹²
Biochemical properties	Zn ²⁺ , pH 5 optimum ^{4,9,11,22}		Mg ²⁺ , pH 7.4 optimum ^{4,9,29}	Mg ²⁺ , pH 7.4 optimum ^{4,9,29}	Mg ²⁺ , pH 7.4 optimum ^{4,9,29}
Subcellular compartment	Lysosomes/ endosomes ^{9,53} , Outer plasma membrane ⁵⁶	Secreted ^{9,11,26,52,54}	ER ²⁹	Golgi ^{30,33} Plasma membrane ²	ER, golgi ¹² Plasma membrane ^{13,14}
Cellular expression	Ubiquitous ^{23,28,34} with high expression in EC ^{54,55}		Ubiquitous ²⁷	Ubiquitous ³³	Ubiquitous with high expression in heart ¹²
Biological activator	I/R insult (CM) ⁴⁶⁻⁴⁸ Ischemic preconditioning (CM) ^{47,49} Fas/ FasL (EC) ⁵⁹⁻⁶⁰ MR1 agonist (VSMC) ⁶¹ Oxidized phospholipids (VSMC) ⁶⁷ ROS ⁷⁶⁻⁷⁸	IFN gamma (EC) ⁵⁵ IL1-beta (EC) ⁵⁵		TNF, ROS, oxLDL (VSMC) ⁹⁵⁻⁹⁷	TNF (CM, VSMC) ^{83-84,95} IL1-beta (CM) ⁹⁵ ApoC1HDL, oxLDL (VSMC) ⁹³⁻⁹⁴ Hypoxia/ reoxygenation (CM) ¹⁰⁴
Biological effect	Lysosomal sphingolipid storage (all cell types) ²³ Post-IR cell death, contractile dysfunction (CM) ⁴⁶⁻⁴⁹ Vascular tone constriction (EC, VSMC) ⁵⁹⁻⁶¹ Oxidized phospholipids -induced apoptosis (VSMC) ⁶⁷			Growth ³³ TNF-, ROS-, oxLDL-induced proliferation (VSMC) ⁹⁵⁻⁹⁷	TNF-, IL-1, hypoxia/reoxygenation-induced apoptosis (CM) ^{83-85, 104,109} TNF-, IL1-beta-induced negative inotropic effect (CM) ^{84,112,85} ApoC1HDL-induced apoptosis (VSMC) ⁹³ OxLDL-, TNF-induced proliferation (VSMC) ⁹⁴⁻⁹⁵ Vasorelaxation (EC) ^{14,100-101}
Pathophysiology	Niemann-Pick disease (<i>smpd1</i> null mutation) ^{23,35} Atherosclerosis ^{59-61,68}	Atherosclerosis ^{62-66,68} Heart failure ^{79,81}			Heart failure ⁹¹⁻⁹² Atherosclerosis ^{93,95-97}
Biological inhibitor		Oxidized glutathione ⁹	Oxidized/ reduced glutathione ^{29,88}		Oxidized/ reduced glutathione ^{29,88-92}
Pharmacological inhibitor	D609 ⁴⁶ , Desipramine ^{48-49,81} , NB6 ¹¹⁹ , L-carnitine ¹²⁰			Scyphostatin ^{14,122} , GW4869 ^{101,123}	NAC ^{89,92} , Lipoic acid ¹⁰²
Pharmacological activator	Doxorubicine ¹²⁰				
Therapeutical target	Atherosclerosis ⁵⁹⁻⁶⁸ Pre/post conditioning ^{46,48}			Atherosclerosis ⁹³⁻⁹⁷	Heart failure ⁹¹⁻⁹²
Diagnostic tool		Heart failure ^{79,81}			

VSMC, vascular smooth muscle cells; EC, endothelial cells; CM, cardiomyocytes; ER, endoplasmic reticulum; I/R, ischemia/ reperfusion; ROS, reactive oxygen species.