

TaqMan® Human and Rat Phosphodiesterase Arrays

These arrays are part of a collection of TaqMan® Gene Signature Arrays that enable analysis of hundreds of TaqMan® Gene Expression Assays on a micro fluidic card with minimal effort.

Phosphodiesterases are a group of enzymes that cleave a variety of substrates, including phosphodiesterase and pyrophosphate bonds of nucleotides and nucleotide sugars. Five distinct families are included in these arrays: 1) cyclic nucleotide phosphodiesterases; 2) nucleotide pyrophosphatase/phosphodiesterases; 3) acid sphingomyelinases; 4) neutral membrane sphingomyelin phosphodiesterases, and 5) glycerophosphodiester phosphodiesterases.

The cyclic nucleotide phosphodiesterase (PDE) superfamily currently includes 24 different genes grouped into 11 different PDE families. They degrade the second messenger molecules, cyclic AMP (cAMP) and cyclic GMP (cGMP). PDEs have an important role in signal transduction because they regulate cyclic nucleotide signaling. PDEs are often targets of drugs due to their ability to regulate cyclic nucleotide levels, their unique tissue distribution, substrate specificity and pharmacological properties. Inhibitors of PDEs prolong or enhance the effects of physiological processes mediated by cAMP and cGMP providing therapeutic benefits for erectile dysfunction, asthma, heart failure, inflammation and depression.

The ectonucleotide pyrophosphatase/phosphodiesterases (ENPPs) are a structurally diverse group of enzymes that have an extracellular, catalytic site that releases nucleoside 5'-monophosphates from nucleotides. There are seven genes in the family, and increased expression of ENPP1 is associated with type 2 diabetes.

The acid sphingomyelinases (ASMs) and neutral membrane sphingomyelin phosphodiesterases are enzymes that catalyze hydrolysis of sphingomyelin (SM) into ceramide and phosphorylcholine. Three forms of ASMs have been described, an intracellular form found in lysosomes and two extracellular secreted forms. Two neutral SM phosphodiesterases have been studied, a plasma membrane and a Golgi membrane protein. Ceramide, which is generated by the sphingomyelinase

pathway, is released and can act as a signaling molecule in apoptosis or growth arrest.

Glycerophosphodiester phosphodiesterases (GDPDs) catalyze the hydrolysis of deacylated glycerophospholipids to glycerol phosphate and alcohol. Members of this family may provide a link between phosphoinositide metabolism and G protein signal transduction.

The TaqMan® Human Phosphodiesterase Gene Signature Array contains 43 human assays and five human controls. Orthologous genes to the human array are in the Rat Phosphodiesterase Array with two exceptions: Pde6g and Gdpd4 are missing and two added controls (Arbp and Ywhaz) are in the rat array.

Group	Category Description	#	Human Gene Symbols
PDE1	CaM-dependent PDE	3	PDE1A–PDE1C
PDE2	cGMP-stimulated PDE	1	PDE2A
PDE3	cGMP-inhibited PDE	2	PDE3A, PDE3B
PDE4	cAMP-specific PDE	4	PDE4A–PDE4D
PDE5	cGMP-specific PDE	1	PDE5A
PDE6	Photoreceptor PDE	6	PDE6A–C, PDE6D, PDE6G, PDE6H
PDE7	cAMP-specific PDE	2	PDE7A, PDE7B
PDE8	cAMP-specific PDE	2	PDE8A, PDE8B
PDE9	cGMP-specific PDE	1	PDE9A
PDE10	dual specificity PDE	1	PDE10A
PDE11	dual specificity PDE	1	PDE11A
ENPP	ectonucleotide PPase/PDE	7	ENPP1–7
SMase	sphingomyelin PDE, neutral	2	SMPD2, SMPD3
ASM	sphingomyelin PDE, acid-like	3	SMPD1, SMPDL3A, SMPDL3B
GDPD	glycerophosphodiester PDE	6	GDPD1–5, MIR16
CNP	2'3'-cyclic nucleotide 3' PDE	1	CNP
Controls		5	18S, ACTB, B2M, GAPDH, PPIA
TOTAL		48	

References:

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- CNP *J Mol Biol* 2005, 346:789–800
- ENPP *J Biol Chem* 2001, 276(2):1361–1368; *J Clin Endocrinol Metab* 2006, 91(12):4948–52
- GDPD *BBRC* 2006 Mar 31, 342(1):323–9; *Gene* 2006 Apr 12, 371(1):144–53
- MIR *Gene* 2006 Apr 12, 371(1):144–53
- SMase *J Biol Chem* 2006, 281(23):16157–16167
- ASM *Protein Science* 2004, 13:3172–3186

