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# Nitric oxide synthases in GtoPdb v.2023.1

Timothy R. Billiar[1], Giuseppe Cirino[2], David Fulton[3], Roberto Motterlini[4], Andreas Papapetropoulos[5] and Csaba Szabo[6]

1. University of Pittsburgh, USA
2. University of Naples-Federico II, Italy
3. Georgia Regents University, USA
4. University of Paris Est Creteil, France
5. University of Athens, Greece
6. University of Texas, USA

## Abstract

Nitric oxide synthases (NOS, E.C. 1.14.13.39) are a family of oxidoreductases that synthesize nitric oxide (NO.) via the NADPH and oxygen-dependent consumption of L-arginine with the resultant by-product, L-citrulline. There are 3 NOS isoforms and they are related by their capacity to produce NO, highly conserved organization of functional domains and significant homology at the amino acid level. NOS isoforms are functionally distinguished by the cell type where they are expressed, intracellular targeting and transcriptional and post-translation mechanisms regulating enzyme activity. The nomenclature suggested by **NC-IUPHAR** of NOS I, II and III [12] has not gained wide acceptance, and the 3 isoforms are more commonly referred to as neuronal NOS (nNOS), inducible NOS (iNOS) and endothelial NOS (eNOS) which reflect the location of expression (nNOS and eNOS) and inducible expression (iNOS). All are dimeric enzymes that shuttle electrons from NADPH, which binds to a C-terminal reductase domain, through the flavins FAD and FMN to the oxygenase domain of the other monomer to enable the BH4-dependent reduction of heme bound oxygen for insertion into the substrate, L-arginine. Electron flow from reductase to oxygenase domain is controlled by calmodulin binding to canonical calmodulin binding motif located between these domains. eNOS and nNOS isoforms are activated at concentrations of calcium greater than 100 nM, while iNOS shows higher affinity for $Ca^{2+}$/calmodulin with great avidity and is essentially calcium-independent and constitutively active. Efficient stimulus-dependent coupling of nNOS and eNOS is achieved *via* subcellular targeting through respective N-terminal PDZ and fatty acid acylation domains whereas iNOS is largely cytosolic and function is independent of intracellular location. nNOS is primarily expressed in the brain and neuronal tissue, iNOS in immune cells such as macrophages and eNOS in the endothelial layer of the vasculature although exceptions in other cells have been documented. L-NAME and related modified arginine analogues are inhibitors of all three isoforms, with $IC_{50}$ values in the micromolar range.

## Contents

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## Database links

Nitric oxide synthases
https://www.guidetopharmacology.org/GRAC/FamilyDisplayForward?familyId=253

Enzymes

eNOS(Endothelial NOS)
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=1249

iNOS(Inducible NOS)
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=1250

nNOS(Neuronal NOS)
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=1251

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