

Protein Annotation Assignment

Using the National Centre for Biotechnology Information (NCBI) website, the details about the protein product of the gene (ID: 3043) were identified. As can be seen in Figure 1, the given gene is hemoglobin subunit beta (HBB) and it codes for its corresponding protein, hemoglobin subunit beta, also known as beta-globin or hemoglobin beta chain.

HBB hemoglobin subunit beta [*Homo sapiens* (human)]
 Gene ID: 3043, updated on 8-Nov-2020

Summary

Official Symbol HBB, provided by [HGNC](#)
Official Full Name hemoglobin subunit beta, provided by [HGNC](#)
Primary source [HGNC:HGNC:4827](#)
See related [Ensembl:ENSG00000244734](#) [MIM:141900](#)
Gene type protein coding
RefSeq status REVIEWED
Organism [Homo sapiens](#)

Names & Taxonomy

Protein names¹ Recommended name:
Hemoglobin subunit beta
 Alternative name(s):
 • Beta-globin
 • Hemoglobin beta chain
 Cleaved into the following 2 chains:
 • LVV-hemorphin-7
 • Spinorphin

Gene names¹ Name:HBB
 Organism¹ Homo sapiens (Human)
 Taxonomic Identifier¹ 9606 [NCBI]
 Taxonomic lineage¹ Eukaryota > Metazoa > Chordata > Craniata > Vertebrata > Euteleostomi > Mammalia > Eutheria > Euarchontoglires > Primates > Haplorrhini > Catarrhini > Hominoidea > Homo [H](#)
 Proteomes¹ UP000005640 Component1: Chromosome 11

Figure 1: Identification of gene name and protein name from the given gene ID

The amino acid length of the final protein product is 146 amino acids as obtained from the UniProt database and is shown in Figure 2.

PTM / Processing

Molecule processing

Feature key	Position(s)	Description	Actions	Graphical view	Length
Initiator methionine ¹		Removed By similarity 1 Publication			
Chain ¹ (PRO_0000052976)	2 – 147	Hemoglobin subunit beta	Add BLAST		146
Peptide ¹ (PRO_0000296641)	33 – 42	LVV-hemorphin-7			10
Peptide ¹ (PRO_0000424226)	33 – 39	Spinorphin			7

Figure 2: Amino acid length of the given protein

The UniProt identification number of the given protein is P68871 as seen in Figure 3.

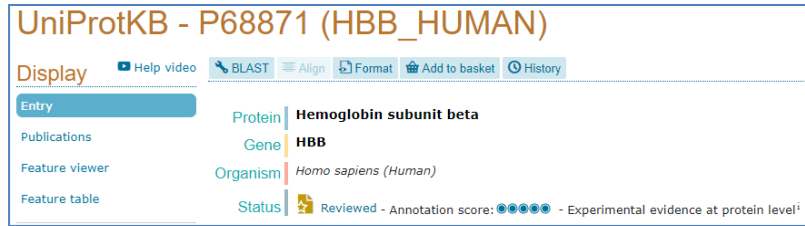


Figure 3: UniProt identification number of the given protein

The specific function of the given protein was noted from the UniProt database, which is transport of oxygen from the lungs to various peripheral tissues, as can be seen in Figure 4.

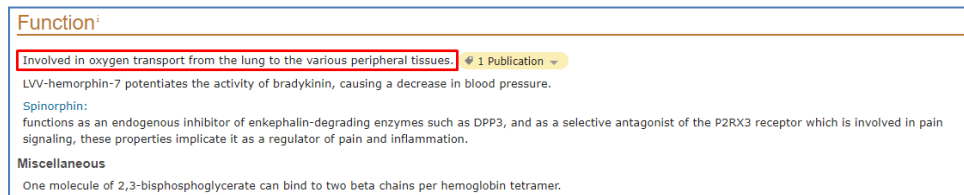


Figure 4: Specific function of the given protein

The given protein HBB, according to the EMBL-EBI database, belongs to the globin family and it has one conserved globin domain from amino acids 8 to 112, as seen in Figure 5.

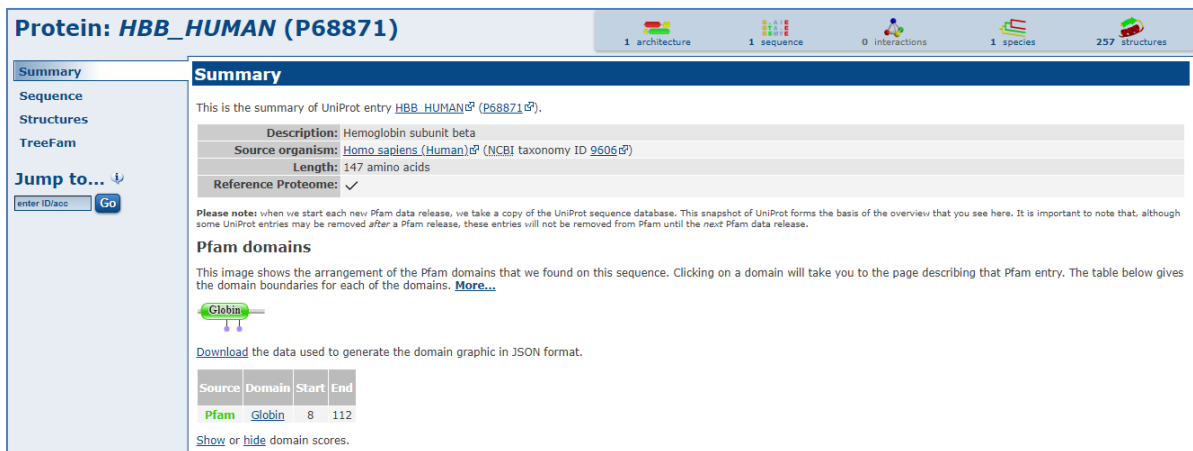





Figure 5: Family and conserved domain of given protein

The gene ontologies for molecular function, biological process, and cellular component are shown in Figure 6a, 6b, and 6c respectively. Under molecular function,

GO:0020037 corresponds to heme binding signifying selective and non-covalent interaction of the protein with heme. The second molecular function corresponds to GO:0019825 which is oxygen binding, signifying selective and non-covalent interaction of the protein with oxygen.




GO:0020037   

heme binding

Molecular Function

Definition ([GO:0020037 GONUTS page](#))

Interacting selectively and non-covalently with heme, any compound of iron complexed in a porphyrin (tetrapyrrole) ring.

GO:0019825   

oxygen binding




Molecular Function

Definition ([GO:0019825 GONUTS page](#))

Interacting selectively and non-covalently with oxygen (O2).

Figure 6a: GOs for molecular function of the given protein

Under biological process, GO:0015701 corresponds to bicarbonate transport, where a transporter or a pore is used to transport bicarbonate into or out of the cell. The second biological process corresponds to GO:0007596 which is blood coagulation, where multiple coagulation factors interact to give rise to an insoluble fibrin clot.




GO:0015701   

bicarbonate transport

Biological Process

Definition ([GO:0015701 GONUTS page](#))

The directed movement of bicarbonate into, out of or within a cell, or between cells, by means of some agent such as a transporter or pore.

GO:0007596   

blood coagulation



Biological Process

Definition ([GO:0007596 GONUTS page](#))

The sequential process in which the multiple coagulation factors of the blood interact, ultimately resulting in the formation of an insoluble fibrin clot; it may be divided into three stages: stage 1, the formation of intrinsic and extrinsic prothrombin converting principle; stage 2, the formation of thrombin; stage 3, the formation of stable fibrin polymers.

Figure 6b: GOs for biological process of the given protein

Under cellular component, GO:0071682 corresponds to endocytic vesicle lumen, which means the volume enclosed by the endocytic vesicle membrane. The second cellular component corresponds to GO:0005576 which is extracellular region, which refers to the space outside the most external cell membrane.



GO:0071682   [JSON](#)

endocytic vesicle lumen

Cellular Component

Definition ([GO:0071682 GONUTS page](#))

The volume enclosed by the membrane of an endocytic vesicle.

GO:0005576   [JSON](#)

extracellular region

Cellular Component

Definition ([GO:0005576 GONUTS page](#))

The space external to the outermost structure of a cell. For cells without external protective or external encapsulating structures this refers to space outside of the plasma membrane. This term covers the host cell environment outside an intracellular parasite.

Comments

Note that this term is intended to annotate gene products that are not attached to the cell surface. For gene products from multicellular organisms which are secreted from a cell but retained within the organism (i.e. released into the interstitial fluid or blood), consider the cellular component term 'extracellular space ; GO:0005615'.

Figure 6c: GOs for cellular component of the given protein

The total number of interactors of the HBB protein is 4 according to the UniProt database as seen in Figure 7.

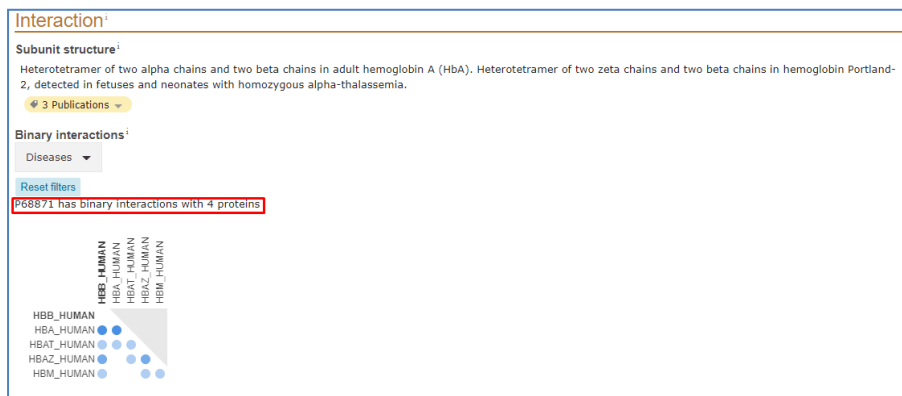


Figure 7: Number of interactors of the given protein

The names and protein IDs of these 4 proteins as seen in Figure 8 are HBA2 (P69905), HBM (Q6B0K9), HBQ1 (P09105), and HBZ (P02008).

P68871		
With	#Exp.	IntAct
HBA2 [P69905]	27	EBI-715554,EBI-714680
HBM [Q6B0K9]	3	EBI-715554,EBI-12805802
HBQ1 [P09105]	3	EBI-715554,EBI-10193656
HBZ [P02008]	7	EBI-715554,EBI-719843

Figure 8: Names and protein IDs of interactors of the given protein