List of mutants of the enzyme 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS) in the PDB

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PDB Code	Organism	Class (*)	Sensitve/ Resistant	Mutation	Protein sequence	Additional Information	Reference
2GGD	*Agrobacterium* (CP4)	II	Sensitve	Ala100Gly	MSHGASSRPATARKSSGLSGTVRIPGDKSISHRSFMFGGLASGETRITGLLEGEDVIN TGKAMQAMGARIRKEGDTWIIDGVGNGGLLAPEAPLDFGNAGTGCRLTMGLVGV YDFDSTFIGDASLTKRPMGRVLNPLREMGVQVKSEDGDRLPVTLRGPKTPTPITYRV PMASAQVKSAVLLAGLNTPGITTVIEPIMTRDHTEKMLQGFGANLTVETDADGVRTI RLEGRGKLTGQVIDVPGDPSSTAFPLVAALLVPGSDVTILNVLMNPTRTGLILTLQEM GADIEVINPRLAGGEDVADLRVRSSTLKGVTVPEDRAPSMIDEYPILAVAAAFAEGAT VMNGLEELRVKESDRLSAVANGLKLNGVDCDEGETSLVVRGRPDGKGLGNASGAA VATHLDHRIAMSFLVMGLVSENPVTVDDATMIATSFPEFMDLMAGLGAKIELSDTK AA	Classe II, sensibility to glyphosate	Funke T, Han H, Healy-Fried ML, Fischer M, Schönbrunn E. Molecular basis for the herbicide resistance of Roundup Ready crops. Proc Natl Acad Sci U S A. 2006 Aug 29;103(35):13010-5. doi: 10.1073/pnas.0603638103. Epub 2006 Aug 17. PMID: 16916934; PMCID: PMC1559744. https://pubmed.ncbi.nlm.nih.gov/16916934/
1MI4	*Escherichia coli*	I	Resistant	Gly96Ala	MESLTLQPIARVDGTINLPGSKSVSNRALLLAALAHGKTVLTNLLDSDDVRHMLNALT ALGVSYTLSADRTRCEIIGNGGPLHAEGALELFLGNAATAMRPLAAALCLGSNDIVLT GEPRMKERPIGHLVDALRLGGAKITYLEQENYPPLRLQGGFTGGNVDVDGSVSSQFL TALLMTAPLAPEDTVIRIKGDLVSKPYIDITLNLMKTFGVEIENQHYQQFVVKGGQSY QSPGTYLVEGDASSASYFLAAAAIKGGTVKVTGIGRNSMQGDIRFADVLEKMGATIC WGDDYISCTRGELNAIDMDMNHIPDAAMTIATAALFAKGTTTLRNIYNWRVKETDR LFAMATELRKVGAEVEEGHDYIRITPPEKLNFAEIATYNDHRMAMCFSLVALSDTPVT ILDPKCTAKTFPDYFEQLARISQAA	Classe I, resistant to glyphosate	Eschenburg S, Healy ML, Priestman MA, Lushington GH, Schönbrunn E. How the mutation glycine96 to alanine confers glyphosate insensitivity to 5-enolpyruvyl shikimate-3-phosphate synthase from Escherichia coli. Planta. 2002 Nov;216(1):129-35. doi: 10.1007/s00425-002-0908-0. Epub 2002 Nov 12. PMID: 12430021. https://pubmed.ncbi.nlm.nih.gov/12430021/
1Q36	*Escherichia coli*	I	Sensitve	Asp313Ala	MESLTLQPIARVDGTINLPGSKSVSNRALLLAALAHGKTVLTNLLDSDDVRHMLNALT ALGVSYTLSADRTRCEIIGNGGPLHAEGALELFLGNAGTAMRPLAAALCLGSNDIVLT GEPRMKERPIGHLVDALRLGGAKITYLEQENYPPLRLQGGFTGGNVDVDGSVSSQFL TALLMTAPLAPEDTVIRIKGDLVSKPYIDITLNLMKTFGVEIENQHYQQFVVKGGQSY QSPGTYLVEGDASSASYFLAAAAIKGGTVKVTGIGRNSMQGDIRFADVLEKMGATIC WGDDYISCTRGELNAIDMDMNHIPAAAMTIATAALFAKGTTTLRNIYNWRVKETDR LFAMATELRKVGAEVEEGHDYIRITPPEKLNFAEIATYNDHRMAMCFSLVALSDTPVT ILDPKCTAKTFPDYFEQLARISQAA	Classe I, sensitive to glyphosate	Eschenburg S, Kabsch W, Healy ML, Schonbrunn E. A new view of the mechanisms of UDP-N-acetylglucosamine enolpyruvyl transferase (MurA) and 5-enolpyruvylshikimate-3-phosphate synthase (AroA) derived from X-ray structures of their tetrahedral reaction intermediate states. J Biol Chem. 2003 Dec 5;278(49):49215-22. doi: 10.1074/jbc.M309741200. Epub 2003 Sep 16. PMID: 13129913. https://pubmed.ncbi.nlm.nih.gov/13129913/
3FK1	*Escherichia coli*	I	Resistant	Thr97Ile Pro101Ser	MESLTLQPIARVDGTINLPGSKSVSNRALLLAALAHGKTVLTNLLDSDDVRHMLNALT ALGVSYTLSADRTRCEIIGNGGPLHAEGALELFLGNAGIAMRSLAAALCLGSNDIVLTG EPRMKERPIGHLVDALRLGGAKITYLEQENYPPLRLQGGFTGGNVDVDGSVSSQFLT ALLMTAPLAPEDTVIRIKGDLVSKPYIDITLNLMKTFGVEIENQHYQQFVVKGGQSYQ SPGTYLVEGDASSASYFLAAAAIKGGTVKVTGIGRNSMQGDIRFADVLEKMGATICW GDDYISCTRGELNAIDMDMNHIPDAAMTIATAALFAKGTTTLRNIYNWRVKETDRLF AMATELRKVGAEVEEGHDYIRITPPEKLNFAEIATYNDHRMAMCFSLVALSDTPVTIL DPKCTAKTFPDYFEQLARISQAA	Classe I, resistant to glyphosate	Funke T, Yang Y, Han H, Healy-Fried M, Olesen S, Becker A, Schönbrunn E. Structural basis of glyphosate resistance resulting from the double mutation Thr97 -> Ile and Pro101 -> Ser in 5-enolpyruvylshikimate-3-phosphate synthase from Escherichia coli. J Biol Chem. 2009 Apr 10;284(15):9854-60. doi: 10.1074/jbc.M809771200. Epub 2009 Feb 11. PMID: 19211556; PMCID: PMC2665107. https://pubmed.ncbi.nlm.nih.gov/19211556/
3FK0	*Escherichia coli*	I	Resistant	Thr97Ile Pro101Ser	MESLTLQPIARVDGTINLPGSKSVSNRALLLAALAHGKTVLTNLLDSDDVRHMLNALT ALGVSYTLSADRTRCEIIGNGGPLHAEGALELFLGNAGIAMRSLAAALCLGSNDIVLTG EPRMKERPIGHLVDALRLGGAKITYLEQENYPPLRLQGGFTGGNVDVDGSVSSQFLT ALLMTAPLAPEDTVIRIKGDLVSKPYIDITLNLMKTFGVEIENQHYQQFVVKGGQSYQ SPGTYLVEGDASSASYFLAAAAIKGGTVKVTGIGRNSMQGDIRFADVLEKMGATICW GDDYISCTRGELNAIDMDMNHIPDAAMTIATAALFAKGTTTLRNIYNWRVKETDRLF AMATELRKVGAEVEEGHDYIRITPPEKLNFAEIATYNDHRMAMCFSLVALSDTPVTIL DPKCTAKTFPDYFEQLARISQAA	Classe I, resistant to glyphosate	Funke T, Yang Y, Han H, Healy-Fried M, Olesen S, Becker A, Schönbrunn E. Structural basis of glyphosate resistance resulting from the double mutation Thr97 -> Ile and Pro101 -> Ser in 5-enolpyruvylshikimate-3-phosphate synthase from Escherichia coli. J Biol Chem. 2009 Apr 10;284(15):9854-60. doi: 10.1074/jbc.M809771200. Epub 2009 Feb 11. PMID: 19211556; PMCID:

							PMC2665107. https://pubmed.ncbi.nlm.nih.gov/19211556/
3FJZ	*Escherichia coli*	I	Resistant	Thr97Ile	MESLTLQPIARVDGTINLPGSKSVSNRALLLAALAHGKTVLTNLLDSDDVRHMLNALT ALGVSYTLSADRTRCEIIGNGGPLHAEGALELFLGNAGIAMRPLAAALCLGSNDIVLT GEPRMKERPIGHLVDALRLGGAKITYLEQENYPPLRLQGGFTGGNVDVDGSVSSQFL TALLMTAPLAPEDTVIRIKGDLVSKPYIDITLNLMKTFGVEIENQHYQQFVVKGGQSY QSPGTYLVEGDASSASYFLAAAAIKGGTVKVTGIGRNSMQGDIRFADVLEKMGATIC WGDDYISCTRGELNAIDMDMNHIPDAAMTIATAALFAKGTTTLRNIYNWRVKETDR LFAMATELRKVGAEVEEGHDYIRITPPEKLNFAEIATYNDHRMAMCFSLVALSDTPVT ILDPKCTAKTFPDYFEQLARISQAA	Classe I, tolerance to low concentrations of glyphosate	Funke T, Yang Y, Han H, Healy-Fried M, Olesen S, Becker A, Schönbrunn E. Structural basis of glyphosate resistance resulting from the double mutation Thr97 -> Ile and Pro101 -> Ser in 5-enolpyruvylshikimate-3-phosphate synthase from Escherichia coli. J Biol Chem. 2009 Apr 10;284(15):9854-60. doi: 10.1074/jbc.M809771200. Epub 2009 Feb 11. PMID: 19211556; PMCID: PMC2665107. https://pubmed.ncbi.nlm.nih.gov/19211556/
3FJX	*Escherichia coli*	I	Resistant	Thr97Ile	MESLTLQPIARVDGTINLPGSKSVSNRALLLAALAHGKTVLTNLLDSDDVRHMLNALT ALGVSYTLSADRTRCEIIGNGGPLHAEGALELFLGNAGIAMRPLAAALCLGSNDIVLT GEPRMKERPIGHLVDALRLGGAKITYLEQENYPPLRLQGGFTGGNVDVDGSVSSQFL TALLMTAPLAPEDTVIRIKGDLVSKPYIDITLNLMKTFGVEIENQHYQQFVVKGGQSY QSPGTYLVEGDASSASYFLAAAAIKGGTVKVTGIGRNSMQGDIRFADVLEKMGATIC WGDDYISCTRGELNAIDMDMNHIPDAAMTIATAALFAKGTTTLRNIYNWRVKETDR LFAMATELRKVGAEVEEGHDYIRITPPEKLNFAEIATYNDHRMAMCFSLVALSDTPVT ILDPKCTAKTFPDYFEQLARISQAA	Classe I, tolerance to low concentrations of glyphosate	Funke T, Yang Y, Han H, Healy-Fried M, Olesen S, Becker A, Schönbrunn E. Structural basis of glyphosate resistance resulting from the double mutation Thr97 -> Ile and Pro101 -> Ser in 5-enolpyruvylshikimate-3-phosphate synthase from Escherichia coli. J Biol Chem. 2009 Apr 10;284(15):9854-60. doi: 10.1074/jbc.M809771200. Epub 2009 Feb 11. PMID: 19211556; PMCID: PMC2665107. https://pubmed.ncbi.nlm.nih.gov/19211556/
2QFS	*Escherichia coli*	I	Sensitve	Pro101Ser	MESLTLQPIARVDGTINLPGSKSVSNRALLLAALAHGKTVLTNLLDSDDVRHMLNALT ALGVSYTLSADRTRCEIIGNGGPLHAEGALELFLGNAGTAMRSLAAALCLGSNDIVLT GEPRMKERPIGHLVDALRLGGAKITYLEQENYPPLRLQGGFTGGNVDVDGSVSSQFL TALLMTAPLAPEDTVIRIKGDLVSKPYIDITLNLMKTFGVEIENQHYQQFVVKGGQSY QSPGTYLVEGDASSASYFLAAAAIKGGTVKVTGIGRNSMQGDIRFADVLEKMGATIC WGDDYISCTRGELNAIDMDMNHIPDAAMTIATAALFAKGTTTLRNIYNWRVKETDR LFAMATELRKVGAEVEEGHDYIRITPPEKLNFAEIATYNDHRMAMCFSLVALSDTPVT ILDPKCTAKTFPDYFEQLARISQAA	Classe I, tolerance to low concentrations of glyphosate	Healy-Fried ML, Funke T, Priestman MA, Han H, Schönbrunn E. Structural basis of glyphosate tolerance resulting from mutations of Pro101 in Escherichia coli 5-enolpyruvylshikimate-3-phosphate synthase. J Biol Chem. 2007 Nov 9;282(45):32949-55. doi: 10.1074/jbc.M705624200. Epub 2007 Sep 12. PMID: 17855366. https://pubmed.ncbi.nlm.nih.gov/17855366/
2QFU	*Escherichia coli*	I	Sensitve	Pro101Leu	MESLTLQPIARVDGTINLPGSKSVSNRALLLAALAHGKTVLTNLLDSDDVRHMLNALT ALGVSYTLSADRTRCEIIGNGGPLHAEGALELFLGNAGTAMRLLAAALCLGSNDIVLT GEPRMKERPIGHLVDALRLGGAKITYLEQENYPPLRLQGGFTGGNVDVDGSVSSQFL TALLMTAPLAPEDTVIRIKGDLVSKPYIDITLNLMKTFGVEIENQHYQQFVVKGGQSY QSPGTYLVEGDASSASYFLAAAAIKGGTVKVTGIGRNSMQGDIRFADVLEKMGATIC WGDDYISCTRGELNAIDMDMNHIPDAAMTIATAALFAKGTTTLRNIYNWRVKETDR LFAMATELRKVGAEVEEGHDYIRITPPEKLNFAEIATYNDHRMAMCFSLVALSDTPVT ILDPKCTAKTFPDYFEQLARISQAA	Classe I, tolerance to low concentrations of glyphosate	Healy-Fried ML, Funke T, Priestman MA, Han H, Schönbrunn E. Structural basis of glyphosate tolerance resulting from mutations of Pro101 in Escherichia coli 5-enolpyruvylshikimate-3-phosphate synthase. J Biol Chem. 2007 Nov 9;282(45):32949-55. doi: 10.1074/jbc.M705624200. Epub 2007 Sep 12. PMID: 17855366. https://pubmed.ncbi.nlm.nih.gov/17855366/
2QFT	*Escherichia coli*	I	Sensitve	Pro101Ser	MESLTLQPIARVDGTINLPGSKSVSNRALLLAALAHGKTVLTNLLDSDDVRHMLNALT ALGVSYTLSADRTRCEIIGNGGPLHAEGALELFLGNAGTAMRSLAAALCLGSNDIVLT GEPRMKERPIGHLVDALRLGGAKITYLEQENYPPLRLQGGFTGGNVDVDGSVSSQFL TALLMTAPLAPEDTVIRIKGDLVSKPYIDITLNLMKTFGVEIENQHYQQFVVKGGQSY QSPGTYLVEGDASSASYFLAAAAIKGGTVKVTGIGRNSMQGDIRFADVLEKMGATIC WGDDYISCTRGELNAIDMDMNHIPDAAMTIATAALFAKGTTTLRNIYNWRVKETDR LFAMATELRKVGAEVEEGHDYIRITPPEKLNFAEIATYNDHRMAMCFSLVALSDTPVT ILDPKCTAKTFPDYFEQLARISQAA	Classe I, tolerance to low concentrations of glyphosate	Healy-Fried ML, Funke T, Priestman MA, Han H, Schönbrunn E. Structural basis of glyphosate tolerance resulting from mutations of Pro101 in Escherichia coli 5-enolpyruvylshikimate-3-phosphate synthase. J Biol Chem. 2007 Nov 9;282(45):32949-55. doi: 10.1074/jbc.M705624200. Epub 2007 Sep 12. PMID: 17855366. https://pubmed.ncbi.nlm.nih.gov/17855366/

2QFQ	*Escherichia coli*	I	Sensitve	Pro101Leu	MESLTLQPIARVDGTINLPGSKSVSNRALLLAALAHGKTVLTNLLDSDDVRHMLNALT ALGVSYTLSADRTRCEIIGNGGPLHAEGALELFLGNAGTAMRLLAAALCLGSNDIVLT GEPRMKERPIGHLVDALRLGGAKITYLEQENYPPLRLQGGFTGGNVDVDGSVSSQFL TALLMTAPLAPEDTVIRIKGDLVSKPYIDITLNLMKTFGVEIENQHYQQFVVKGGQSY QSPGTYLVEGDASSASYFLAAAAIKGGTVKVTGIGRNSMQGDIRFADVLEKMGATIC WGDDYISCTRGELNAIDMDMNHIPDAAMTIATAALFAKGTTTLRNIYNWRVKETDR LFAMATELRKVGAEVEEGHDYIRITPPEKLNFAEIATYNDHRMAMCFSLVALSDTPVT ILDPKCTAKTFPDYFEQLARISQAA	Classe I, tolerance to low concentrations of glyphosate	Healy-Fried ML, Funke T, Priestman MA, Han H, Schönbrunn E. Structural basis of glyphosate tolerance resulting from mutations of Pro101 in Escherichia coli 5-enolpyruvylshikimate-3-phosphate synthase. J Biol Chem. 2007 Nov 9;282(45):32949-55. doi: 10.1074/jbc.M705624200. Epub 2007 Sep 12. PMID: 17855366. https://pubmed.ncbi.nlm.nih.gov/17855366/

(*) EPSPS Class I enzymes are potentially senstitive to glyphosate; EPSPS Class II enzymes are potentially resistant to glyphosate