**Supplementary Table 1.** **The Codon-optimized sequences of heterogeneous cholesterol 7-desaturase.**

|  |  |
| --- | --- |
| Gene Symbol | ORF Sequences (5’-3’) |
| NVD-BM | ATGGCCGACAGACAGCACTTCCCAAGCGCCATCACCGAGGCCGTGAGCTCCAACACAGCATGCCCAGATACCGGACCTAAGGCAGAGACCACAAACATCTTCCTGCTGCTGCAGAGGAATATCACCATCGAGTCTAGCAAGCACGTGTTTTCCTCTATCGTGGAGTATATCCTGATCCTGACACTGATGTTCGCCTTTTCCGCCATCCTGTACGTGATCTATAAGAGCTACATCTCCCCAGTGTTCTACAAGAAGGAGCTGACCGAAGTGGGCTTTGACCACATCCCACAGGGCCCCGATAAGGGCCGGAGAATCTCTCGGGCACAGGCCAGCAGGAGGATGGGCTCCAAGCTGCCACCTCCATACCCCAACGGCTGGTTTGCCGTGGCCGAGACAAGAGAGCTGAAGGTCGGCTCTGCCCTGAGCATCGACGCACTGGGCCAGAACCTGTGCGTGTACAGGGGAGAGGACGGCCTGGCCAGATGCGTGGATGCCTACTGTCCTCACCTGGGAGCAAACCTGGCAGTGGGAGGAACCGTGAGGGGCTCCTGCATCGAGTGTCCATTCCACAAGTGGCGCTTTAATGCAGCAGGAACATGCGTGAGCCTGCCTGGCTCCGACATCGCACCAAAGGGCGTGTCTATCAGGACATGGTGCGTGGTGGAGACCGACGGAGCCGTGTGGATCTGGCACGATGCAGAGGGAAGGGAGCCTCTGTGGGAGATCACCGATCCCCCTGAGCTGAAGGAGTTCGGCTATCGGGGCAGAAACGAGTTTGAGGTGTCTGCCCACATCCAGGAGATCCCAGAGAACGGAGCAGACGTGCCTCACCTGAATGCCGTGCACAGCTCCTCTCTGCTGAGCGATCTGGGAGAGCGGTACCCCGTGCTGCACGAGATCATCGGCAGACACGTGTGGAATGCCGATTGGACAAAGTCTGACGATCACACCAGCCTGATGCACATCACACAGGAGTATAAGGTGCTGAAGTACGACCTGGCCCGGATCGATGTGAAGGTGACCCAGATCGGCCCAGGCCACGTGAGACTGTTCCTGAAGACCAGCGTGGGCCCCTTTTATATCGTGCAGTCCGTGACACCTCTGGGCCCACTGCTGCAGAAAGTGATCCACAGGGTGTATAGCCCAGCATACAACGCACCAGTGGGAGCCTTCCTGGTGAGGTGCGAGGCCTACATGTTTGAGCGCGACGTGACAATCTGGAACAGCAAGCGGTTCGTGAGCGCCCCCGCCTATGTGAAGACCGATAAGACAATCAGGACCTTCCGCAACTGGTTCGGCCAGTTTTACTCCGAGCACTCTCTGGGCTTTCGGGACGCCCTGCAGAATCCTCTGGATTGGTGA |
| DAF-36 | ATGCTGCTGGAGCAGATCTGGGGCTTCCTGACCGCCCACCCTATCAGCGTGGTGACCACAATCCTGATCGTGTACCTGATCCACATCACACTGAAGCCACTGAATCGCGTGCGGAGACTGGGCGACGTGGGACTGTTCTTTGGCAAGCCCGAGCTGAAGGGCTTCTACAGGGAGAGGCAGCTGGAGCGGCTGAAGCTGCTGAGGCGCGTGGGCGATATGCCACCCGTGTTCCCAAACGGCTGGTATTGCGTGTGCGAGAGCGAGAAGCTGGCCAACAATCAGATCATGGAGATCACCGTGCTGGGCCAGTTCCTGTCCCTGATCCGCTCTGAGAGCGGCGCCGTGTACATCACAGACTCTTATTGCCCCCACATCGGCGCCAACTTCAACATCGGCGGCAGAGTGGTGCGGGATAATTGCATCCAGTGTCCTTTCCACGGCTGGATCTTTTCCGCCGAGACCGGCAAGTGCGTGGAGGTGCCATATGACGAGGGCAGAATCCCCGAGCAGGCCAAGGTGACCACATGGCCATGCATCGAGAGGAACAATAACATCTACCTGTGGTATCACTGTGACGGAGCAGAGCCAGAGTGGGAGATCCCTGAGATCACCGAGATCACAGATGGCTTCTGGCACCTGGGCGGCAGAACCGAGCACGAAGTGATGTGCCACATCCAGGAGATCCCCGAGAATGGCGCCGACATCGCCCACCTGAACTACCTGCACAAGTCCGCCCCACCCGTGACCAAGGGCTCTGATATCATCAAGACAGACCTGAGCGATCCTCAGCCAGCAGTGCAGCACGTGTGGGACGGCAAGTGGGAGGTGAAGTCTGAGGAGGATAGGCACTGTGGCGTGATGCACCTGAATCAGTTCATGACCTTTTGGGGCTATAAGGTGCCCCTGACAAGCTCCAAGCTGGTGGCAGAGCAGCACGGACCTGGCATCGTGCACATGCTGTTCGATTTTGGCATCTGGGGCAAGGGCGTGGTGTTCCAGACCGTGACACCTGAGGAGGCCCTGCTGCAGCGGGTGAGATTCAGGATCTTTAGCAACATCCCATGGTTCTTTGTGAAGTTCTTTATGACCGTGGAGGCCATGCAGTTCGAGCGGGACGTGTTTATCTGGAGCAATAAGAAGTACATCAAGTCCCCTCTGCTGGTGAAGAACGATGGCCCAATCCAGAAGCACCGGAGATGGTTCTCTCAGTTTTATACAGAGAATAGCCCCAAGATGCTGAAGGACGGCTCCCTGTCTAACCAGGCCAAGTCCATCTTTGATTGGTGA |
| NVD-DR | ATGGAGAACACCCGGGCCTCCCTGATGTTCAAGACACTGGCCGTGGCAGCAATCGGACTGAGCGCCACCTTCGTGATGCTGGTGAGAGACCCTTCCGATACACTGTTTGGAGGAGGATACCCAGAGCTGTGGAGGAGAACCGGCCTGGCCGGAGCACCAACAAGGGCTGCCGCCTGCATCTTCGCAGGCGTGTTTCTGCTGGCCATGGGCTGGCTGTACAGGCTGCTGTTTGCACCCCTGGAGCTGCTGAGGGGAGTGGACGAAGTGGGCTATATCGCAGAGGATGGCCGGAGCCGGGCACAGGCCGCCAACGAGGTGAGGCGCCGGAGAAAGACCGGAGAGCTGCCACCCGTGTACCCTAATGGCTGGTATAGGGTGCTGGACTCCCACATGCTGGAGCGCGGCGATGTGAAGTCTGTGACAGTGCTGGGACAGCAGGTGGCCGTGTTCAGGGGACAGGACGGCAAGGCATACGTGGTGGATGCCTATTGTCCTCACCTGGGAGCAAACCTGGCAGTGGGCGGCAGAGTGGTGGGCGGCTGCATCGAGTGTCCATTCCACGGATGGCAGTTTAGGGGAGTGGACGGCCGCTGCGTGAAGATCCCATATGCCGATAAGGTGCCAGAGTTCGCAAAGGTGCGGTGCTGGCCCAGCTGTGAGATCAATGGCCTGGTGCTGGTGTGGTTTCACTGTGACGGCCTGGAGCCATCCTGGAGGGTGCCTGAGCAGTCTCAGATCACCAGAGGCGAGTGGGTGTACAGGGGCCGCACAGAGCACTTTATCAACGCCCACATCGAGGAGATCCCAGAGAATGCAGCAGATATCGCACACCTGGCACACCTGCACACCCCAGGAATCGTGAGCGGAGTGGACCTGCGGTATACCAACTCCAAGACATGGGAGTTCATCAGACACGATTGGAAGGTGGAGTGGAAGCCTGAGCCAGAGCCCAATAAGCACTGCTCCCAGATGCTGGTGAAGCACGCCCTGACCGTGTTTGGCAGGCACTGGCCACTGCTGGACCTGGATGTGCTGGCCAGGCAAGTGGGACCTGGAGTGGTGTTCCTGCTGTTTGAGCACTCTTTCCTGGGCAGAGGCGTGATCATGCACTGCGTGACCCCTGTGGAGCCACTGCTGCAGTGCGTGAGCCACACAATCTTTTACCAGAGCTCCATCCCACCCCTGGTGCCCAAGTTCATCCTGCGGGCCGAGTGTATCCAGTTTGAGAGAGACGTGATGATCTGGAACAATAAGACCTATATCTCTAAGCCCATGCTGGTGAAGGAGGATAGCGCCATCCAGAAGCACAGGCGCTGGTTCAGCCAGTTTTACTCTGAGAATAGCCCTCGGCTGAGATATCAGCACGACACACTGGATTTCTGA |
| TTHERM\_00310640 | ATGATCGAGTTCAACAAGGAGTGCCTGATGGATATCCTGAAGAATCAGGACTACCACTTCTATATGGTCATCCCCCTGATCTTTATCGGCCTGTACGCCCTGTACATCAAGAAGTTTAAGTACTACAACCCTATCGAGAAGCAGGAGTGGGACGATCGGAGATCCAACGTGAAGCGGGGCAATCCCCCTCCATCTTACCCTAACGGCTGGTTCAGAGTGTGCCACAAGAATGAGCTGCAGATCGGCCAGTCTAAGTTCTTTAAGCTGAATGGCCGGCACATCACCGTGTTTAGAGGAGAGGACGGCATCCCCTACGCACTGCACGCCTATTGTAGCCACATGGGAGCAAACCTGGGAATCGGAGGCAAGGTGAAGTGGAACAGCTGCATCGAGTGTCCTTTCCACGGCTGGAGCTTTGACGGCAAGTCCGGCAAGTGCGTGAACTCCGAGCACCTGGATGAGAAGCAGTGTACCCACCACACATACCACGATATCAAGAAGATGACCAAGGGCTCTGACAATAGGTATATCAAGACATGCGAGAGCGGCTCCCCCTCTCAGATCCAGAAGTTCCACGTGCGCCAGCAGAACAATCTGATCTACGTGTGGTTCCACGCCAAGAACGTGGACCCCTACTATGAGCCTTTTGAGATCAATGAGATCCCATACCTGGAGGATCGGGGCGAGACCGCCGACTATGTGAACTGTCAGATCCAGGAGATCCCCGAGAATGGCGCCGACTTCAAGCACTTTGAGTACGTGCACTATGCCTGGATCGAGATCCTGTTCCCTTGGATCAAGTTTAAGTGGGTGCCAAAGGATAGGAAGCCCACCGACAAGGATTTCGACGAAGTGATGCGCACACACCCAAACAAGAAGGTGCAGGCCTTCAGCAATAAGCTGTTTGATAAGTACACCAACGAGCAGAATAAGACACACATCAACAATCTGGTGCTGGATGCCTACCTGGTGTTCTTTGACAAGTTCGAGTTTTATATCCAGACCGCCACAGTGTTCCAGCTGGGCTCTGGCACCGTGTTCCTGTTTCTGAAGTTTCCTCTGTGGGAGGCAGTGGTGGTGCAGAGCGTGACCCCAGTGGGCAAGTTCAACCAGCTGGTGCACCACAAGATGTATACATCTTGGTGGCTGCCATACTGGGTGAGCGCCTATCTGCTGGCCGGCTTCAGAAAGCAGTTTATCAGCGATAAGATCGTGTGGAACAATAAGATCTTCGCCGACAAGCTGACATACAACCCCAAGGCCGTGTTTGATGAGAGGCTGCTGAATTGGCGCGAGTGGTATTCCCAGTACTATGAGGGCTGTGATGAGTTCGAGAAGAACCAGGAGGCCTTTGACTGGTGA |
| MGC154819 | ATGGAGTCCGTGGGCCACTCTCTGCTGACACTGTCTGTGCTGTGCCCAGTGGGCGCCCTGCTGCTGTGCTGGGTGGGCAGCGTGCTGCTGGGAGCAGGACTGCTGCCAAGCCTGACCCTGTCCACAAGAGACCCCTCTACCACACTGAGCAGGACCCCATGGCTGGTGGTGCTGGTGCCTCTGCTGGTGCTGTGGGGCTGGAGATGGCTGAGCAGGCCAATGGAGCTGCTGCGGTCCCCAGAGGAAGTGGGATACATCCCTGAGAGGGGCCGCTCTCGGGCACAGACAGCCAACCTGGTGCGGAGAAGGCGCATGAAGGGCGAGCTGCCCCCTATCTACCCCAATGGCTGGTATAGAGCCCTGGACAGCCACCTGCTGCCACCAGGAACCGTGCAGGATTGCACACTGCTGGGCGAGCAGCTGGCCGTGTACAGGACCCTGGAGGGCAAGGTGTACGTGGTGGACGCCTATTGTCCACACCTGGGAGCAAACCTGGCAGTGGGAGGCAAGGTGGTGGGCGATTGCATCGAGTGTCCCTTCCACGGATGGCAGTTTCGCGGAGAGGACGGCAAGTGCACAAGAATCCCCTACGCCGAGAAGGTGCCAGATTTCGCCAAGATCAAGACCCGCCCTAGCTGCGAGCTGAATGGCATGGTGTTCGTGTGGTATCACTGTGACGGCATCGAGCCAACCTGGTCCGTGCCCGAGCAGGAGGAGATCACAAAGAAGGAGTGGGTGTACCACGGCCGGACCGAGCACTATGTGAACGCCCACATCGAGGAGATCCCCGAGAATGCCGCCGACATCGCCCACCTGGATTTCCTGCACACACCTGGCATCCTGTCTGGCGTGGACCTGCGCTACACCAAGAGCCGGATCTGGGATTTTGTGAAGCACTCCTGGAAGGTGCAGTGGATTCCCGAGCCAGCCCCCTATAAGCACTGTTCCCAGATGCTGCTGGCCCACTCTATCCTGCTGTTCGGCAAGCACTTTCCTCTGCTGGATGTGAACGTGGTGGCCAGACAAGTGGGCCCAGGCATCGTGTTCCTGCACTTTAAGCACGCCTTCCTGGGCGAGGGCGTGATCGTGCACTGCGTGACACCTGTGGAGCCACTGCTGCAGAAGGTGAGCCACTCCATCTACTATCAGAAGAATATCCCCGCCCTGATCCCTAAGTTCATCCTGAAGGCCGAGTGTATCCAGTTTGAGAGGGACGTGATGATCTGGAACAATAAGAAGTACATCTCCAAGCCTATGCTGGTGAAGGAGGATGCCGCCATCCAGAAGCACCGGAGATGGTTCTCTCAGTTTTATTCTAACAATAGCCCACAGATCACCTTTCAGCAGGAGGGCCTGGATTGGTGA |