**Table S2** Oligonucleotide primers used in this study

| Primer name | Primer sequence (5’-3’) | Purpose |
| --- | --- | --- |
| Gene knockout and complementation |
| Kan01 | tgtctcaaaatctctgatgttac | To amplify kanamycin resistance gene from pTnMod-Okm for gene knockout |
| Kan02 | ttagaaaaactcatcgagcatc |
| ndpALupFa | atgattacgaattcgggcaatcagcctgtgcggttcg | To amplify upstream fragment of *ndpAL* for gene knockout |
| ndpALupR | agagattttgagacaagcggccatcgacttcagaagg |
| ndpALdownF | gatgagtttttctaaagccggagatgtcgagcgcccg | To amplify downstream fragment of *ndpAL* for gene knockout |
| ndpALdownR | ggccagtgccaagctgtgctgcatgccctgcagatgc |
| ndpBupF | atgattacgaattcgcggcattctcaatcccta | To amplify upstream fragment of *ndpB* for gene knockout |
| ndpBupR | gatgagtttttctaaccgctcgcccagcccccgcg |
| ndpBdownF | agagattttgagacactcctgcctcccttccgaacct | To amplify downstream fragment of *ndpB* for gene knockout |
| ndpBdownR | ggccagtgccaagctatcagaggtatcaggttctacgc |
| ndpCupF | atgattacgaattcgcatcccggcatggtgcat | To amplify upstream fragment of *ndpC* for gene knockout |
| ndpCupR | atgattacgaattcgcatcccggcatggtgcat |
| ndpCdownF | agagattttgagacagatgtcaaacccggcccgttt | To amplify downstream fragment of *ndpC* for gene knockout |
| ndpCdownR | ggccagtgccaagctatgccgcgtgttcgcaaatg |
| ndpDupF | atgattacgaattcggagccgatcacctacacgat | To amplify upstream fragment of *ndpD* for gene knockout |
| ndpDupR | agagattttgagacatccctctccgtcctggtcga |
| ndpDdownF | gatgagtttttctaagcggtgaaccgtcctacgac | To amplify downstream fragment of *ndpD* for gene knockout |
| ndpDdownR | ggccagtgccaagctactttctcgggcttctcctg |
| pEX18Tc-VF | gcacgacaggtttcccgactg | For the verification of the pEX18Tc-related constructions by PCR or sequencing |
| pEX18Tc-VR | ccgcttctgcgttctgattta |
| ndpAL-VF | ctgccgaaggtcatctccc | For the verification of strain TYΔ*ndpAL* by PCR or sequencing |
| ndpAL-VR | ctctggctggaacttggagg |
| ndpB-VF | ttcacgttatagtcaagcac | For the verification of strain TYΔ*ndpB* by PCR or sequencing |
| ndpB-VR | ctaggacaggatcagtcatg |
| ndpC-VF | atcgtggtgagccactcgat | For the verification of strain TYΔ*ndpC* by PCR or sequencing |
| ndpC-VR | agcgatactccgcttcgatc |
| ndpD-VF | tacgcgtgcaccgaccaacc | For the verification of strain TYΔ*ndpD* by PCR or sequencing |
| ndpD-VR | gacctcgtcgaacagctgct |
| ndpAL-CF | tgattacgccaagcttcgtgtcggccggcgtggtgttcc | To amplify *ndpAL* for gene complementation |
| ndpAL-CR | gacggccagtgaattctcaggtgaacgagaggtcgtgg |
| ndpB-CF | tgattacgccaagcttcatgggcagcatgacgatgagtg | To amplify *ndpB* for gene complementation |
| ndpB-CR | gacggccagtgaattctcatccattgctgctcttctcc |
| ndpC-CF | tgattacgccaagcttcttgtccatgcgcgatccccg | To amplify *ndpC* for gene complementation |
| ndpC-CR | gacggccagtgaattctcactcgacggacgtcccgt |
| ndpD-CF | tgattacgccaagcttcatgatggccaagcatgtgatcg | To amplify *ndpD* for gene complementation |
| ndpD-CR | gacggccagtgaattctcagaagtgcgtctccatctg |
| ndpA-F | tgattacgccaagcttcgtgaatgtcgacgtcgacg | To amplify *ndpA* for heterologously expression  |
| ndpA-R | gacggccagtgaattcctgcggacgtctacgcgat |
| ndpAplus-F | tgattacgccaagcttttggatcggcgacgacgta | To amplify *ndpAplus* for heterologously expression |
| ndpAplus-R | gacggccagtgaattcctgcggacgtctacgcgat |
| pRK415-VF | gcccaatacgcaaaccgcct | For the verification of the pRK415 related plasmids by PCR or sequencing |
| pRK415-VR | gctctcctgttccgaccctg |
| Gene expression |
| 28ndpB-EF | aggagatataccatgggcagcatgacgatgagtgag | To amplify *ndpB* for expression with pET-28a(+) |
| 28ndpB-ER | gtgcggccgcaagctttccattgctgctcttctcctt |
| 28ndpD-EF-C | aggagatataccatgatggccaagcatgtgatc | To amplify *ndpD* for expression with pET-28a(+) |
| 28ndpD-ER-C | gtgcggccgcaagcttgaagtgcgtctccatctgct |
| 28ndpD-EF-N | cgcgcggcagccatatggccaagcatgtgatcgtc | To amplify *ndpD* for expression with pET-28a(+) |
| 28ndpD-ER-N | ggtggtggtgctcgatcagaagtgcgtctccatct |  |
| pET28a-VF | ccatacccacgccgaaacaa | For the verification of the pET-28a(+) relatedconstructions by PCR or sequencing |
| pET28a-VR | aagggaagaaagcgaaaggagc |
| 22ndpB-EF | ccggcgatggccatgggcagcatgacgatgagtga | To amplify *ndpB* for expression with pET-22b(+) |
| 22ndpB-EF | gtgcggccgcaagctttccattgctgctcttctcct |
| pET22b-VF | ccatacccacgccgaaacaa | For the verification of the pET-22b(+) relatedconstructions by PCR or sequencing |
| pET22b-VR | aagggaagaaagcgaaaggagc |
| ndpB-R | gacggccagtgaattctcagtggtggtggtggtggtgctcgagtgcggccgcaagctttccattgctgctcttctccttc | Paired with ndpCF to amplify *ndpB* for hetereologous expression |
|  |
|  |
| RT-qPCR |
| RT-ndpALF | actactcgtacccgttta | To amplify 167 bp fragment in *ndpAL* for RT-qPCR |
| RT-ndpALR | gttgaactggaccttctc |
| RT-ndpASF | ctcgacatcaccacaatc | To amplify 147 bp fragment in *ndpAS* for RT-qPCR  |
| RT-ndpASR | gaatgccttcttggacag |
| RT-ndpBF | catcaagcagaacatcgg | To amplify 151 bp fragment in *ndpB* for RT-qPCR |
| RT-ndpBR | gtcctggtcgttaatgtc |
| RT-ndpCF | gtagtcaactcgatgaac | To amplify 111 bp fragment in *ndpC* for RT-qPCR |
| RT-ndpCR | gttctctcttccatccag |  |
| RT-ndpHF | atcatgtcgatgggcaat | To amplify 175 bp fragment in *ndpH* for RT-qPCR  |
| RT-ndpHR | tcagcggcttcatgtaag |
| RT-ndpFF | ggtggatacgggtacaac | To amplify 219 bp fragment in *ndpF* for RT-qPCR  |
| RT-ndpFR | gagcgagtagtcgagatc |
| RT-ndpEF | catcttcctgctcttctc | To amplify 174 bp fragment in *ndpE* for RT-qPCR  |
| RT-ndpER | gtgatgtgcatcgttctc |
| RT-ndpGF | ttcactgacactcgctac | To amplify 185 bp fragment in *ndpG* for RT-qPCR  |
| RT-ndpGR | acaaggagtgccttcatg |
| RT-ndpDF | catgctggaattctacga | To amplify 187 bp fragment in *ndpD* for RT-qPCR  |
| RT-ndpDR | cttggtgaagctgagttc |

a: 15bp overlap (5’) in the sequences of the primers for in-fusion cloning is underlined.