Supplementary Material

Supplementary Figure 1. Minimum inhibitory concentration (MIC) values of (A) nalidixic acid and (B) ciprofloxacin in *Campylobacter coli* isolates arranged according to aerotolerance levels at each swine group. MIC values are expressed as log2 MICs (μg/mL). Dotted lines indicate break points, expressed as the log value, for resistance to each antibiotic in *C. coli* isolates. Dashed lines indicate break points, expressed as the log value, for high-level resistance to each antibiotic in *C. coli* isolates. OS, oxygen-sensitive (green); AT, aerotolerant (blue); HAT, hyper-aerotolerant (red).



Supplementary Table 1. Prevalence of *Campylobacter coli* according to the swine groups at six swine farms.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Swine groups** | **Farm 1** | **Farm 2** | **Farm 3** | **Farm 4** | **Farm 5** | **Farm 6** |
| Prevalence (Number of isolates\*/Number of samples\*\*) | Prevalence (Number of isolates/Number of samples) | Prevalence (Number of isolates/Number of samples) | Prevalence (Number of isolates/Number of samples) | Prevalence (Number of isolates/Number of samples) | Prevalence (Number of isolates/Number of samples) |
| Weaning pigs | 83.3% (5/6) | 60% (3/5) | 16.7% (1/6) | 50% (3/6) | 0% (0/5) | 60% (3/5) |
| Growing pigs | 90.9% (10/11) | 100% (8/8) | 63.6% (7/11) | 27.3% (3/11) | 66.7% (6/9) | 70% (7/10) |
| Fattening pigs | 100% (11/11) | 87.5% (7/8) | 90.9% (10/11) | 45.5% (5/11) | 60% (6/10) | 70% (7/10) |
| Pregnant sows | 83.3% (5/6) | 80% (4/5) | 50% (3/6) | 33.3% (2/6) | 100% (5/5) | 60% (3/5) |
| Total | 91.2% (31/34) | 84.6% (22/26) | 61.8% (21/34) | 38.2% (13/34) | 58.6% (17/29) | 66.7% (20/30) |

\*The number of *C. coli* isolates from swine fecal samples at each swine group in each farm.

\*\*The number of swine fecal samples obtained at each swine group in each farm.

Supplementary Table 2. Primers for identification of *Campylobacter coli* and its virulence genes.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Primers** | | **Primer Sequence (5'–3')** | **Annealing Temperature (°C)** | **References** |
| *Campylobacter* 16S rDNA | F | GGA TGA CAC TTT TCG GAG C | 57 | (Linton, Owen et al. 1996) |
| R | CAT TGT AGC ACG TGT GTC |
| *ask* | F | GGT ATG ATT TCT ACA AAG CGA G | 57 | (Linton, Lawson et al. 1997) |
| R | ATA AAA GAC TAT CGT CGC GTG |
| *flaA* | F | GGATTTCGTATTAACACAAATGGTGC | 55 | (Nachamkin, Ung et al. 1996) |
| R | CTGTAGTAATCTTAAAACATTTTG |
| *cadF* | F | TTGAAGGTAATTTAGATATG | 45 | (Konkel, Gray et al. 1999) |
| R | CTAATACCTAAAGTTGAAAC |
| *pldA* | F | AAGCTTATGCGTTTTT | 45 | (Datta, Niwa et al. 2003) |
| R | TATAAGGCTTTCTCCA |
| *iamA* | F | GCACAAAATATATCATTACAA | 52 | (Müller, Schulze et al. 2006) |
| R | TTCACGACTACTATGAGG |
| *ceuE* | F | ATGAAAAAATATTTAGTTTTTGCA | 57 | (Gonzalez, Grant et al. 1997) |
| R | ATTTTATTATTTGTAGCAGCG |
| *cdtA* | F | GGAAATTGGATTTGGGGCTATACT | 42 | (Bang, Scheutz et al. 2001, Bang, Nielsen et al. 2003) |
| R | ATCACAAGGATAATGGACAAT |
| *wlaN* | F | TGCTGGGTATACAAAGGTTGTG | 60 | (Müller, Schulze et al. 2006) |
| R | AATTTTGGATATGGGTGGGG |
| *hcp* | F | CAAGCGGTGCATCTACTGAA | 55 | (Bleumink-Pluym, van Alphen et al. 2013, Corcionivoschi, Gundogdu et al. 2015) |
| R | TAAGCTTTGCCCTCTCTCCA |
| *virB11* | F | GAACAGGAAGTGGAAAAACTAGC | 50 | (Bacon, Alm et al. 2000) |
| R | TTCCGCATTGGGCTATATG |

Supplementary Table 3. Distribution of aerotolerance levels in *Campylobacter coli* isolates from swine feces at farm levels.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Aerotolerance levels†** | **Farm 1** | **Farm 2** | **Farm 3** | **Farm 4** | **Farm 5** | **Farm 6** |
| Prevalence (Number of isolates\*/Number of samples\*\*) | Prevalence (Number of isolates/Number of samples) | Prevalence (Number of isolates/Number of samples) | Prevalence (Number of isolates/Number of samples) | Prevalence (Number of isolates/Number of samples) | Prevalence (Number of isolates/Number of samples) |
| OS | 55.9% (19/34) | 53.8% (14/26) | 41.2% (14/34) | 11.8% (4/34) | 31.0% (9/29) | 40.0% (12/30) |
| AT | 23.5% (8/34) | 19.2% (5/26) | 17.6% (6/34) | 17.6% (6/34) | 17.2% (5/29) | 16.7% (5/30) |
| HAT | 11.8% (4/34) | 11.5% (3/26) | 2.9% (1/34) | 8.8% (3/34) | 10.3% (3/29) | 10.0% (3/30) |
| Total | 91.2% (31/34) | 84.6% (22/26) | 61.8% (21/34) | 38.2% (13/34) | 58.6% (17/29) | 66.7% (20/30) |

\*The number of *C. coli* isolates at each aerotolerance level in each farm.

\*\*The number of swine fecal samples obtained from each farm.

**†**OS, oxygen-sensitive; AT, aerotolerant; HAT, hyper-aerotolerant.

Supplementary Table 4. Distribution of multilocus sequence typing (MLST) genotypes in *Campylobacter coli* isolates from swine feces at farm levels.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **MLST STs** | **Farm 1** | **Farm 2** | **Farm 3** | **Farm 4** | **Farm 5** | **Farm 6** |
| Prevalence (Number of isolates\*/Number of samples\*\*) | Prevalence (Number of isolates/Number of samples) | Prevalence (Number of isolates/Number of samples) | Prevalence (Number of isolates/Number of samples) | Prevalence (Number of isolates/Number of samples) | Prevalence (Number of isolates/Number of samples) |
| 827 | 0% (0/34) | 0% (0/26) | 0% (0/34) | 20.6% (7/34) | 0% (0/29) | 0% (0/30) |
| 830 | 0% (0/34) | 0% (0/26) | 0% (0/34) | 0% (0/34) | 0% (0/29) | 10% (3/30) |
| 854 | 17.6% (6/34) | 0% (0/26) | 2.9% (1/34) | 2.9% (1/34) | 3.4% (1/29) | 13.3% (4/30) |
| 887 | 8.8% (3/34) | 15.4% (4/26) | 8.8% (3/34) | 0% (0/34) | 0% (0/29) | 6.7% (2/30) |
| 890 | 0% (0/34) | 0% (0/26) | 0% (0/34) | 0% (0/34) | 3.4% (1/29) | 0% (0/30) |
| 1016 | 0% (0/34) | 0% (0/26) | 8.8% (3/34) | 0% (0/34) | 0% (0/29) | 0% (0/30) |
| 1058 | 0% (0/34) | 7.7% (2/26) | 5.9% (2/34) | 0% (0/34) | 0% (0/29) | 0% (0/30) |
| 1068 | 0% (0/34) | 0% (0/26) | 0% (0/34) | 2.9% (1/34) | 10.3% (3/29) | 0% (0/30) |
| 1096 | 0% (0/34) | 11.5% (3/26) | 0% (0/34) | 0% (0/34) | 0% (0/29) | 0% (0/30) |
| 1122 | 17.6% (6/34) | 0% (0/26) | 0% (0/34) | 0% (0/34) | 0% (0/29) | 10% (3/30) |
| 1142 | 2.9% (1/34) | 26.9% (7/26) | 2.9% (1/34) | 2.9% (1/34) | 0% (0/29) | 3.3% (1/30) |
| 1450 | 0% (0/34) | 7.7% (2/26) | 0% (0/34) | 0% (0/34) | 0% (0/29) | 0% (0/30) |
| 1556 | 2.9% (1/34) | 0% (0/26) | 0% (0/34) | 0% (0/34) | 27.6% (8/29) | 0% (0/30) |
| 2699 | 5.9% (2/34) | 3.8% (1/26) | 2.9% (1/34) | 5.9% (2/34) | 0% (0/29) | 0% (0/30) |
| 2733 | 0% (0/34) | 0% (0/26) | 8.8% (3/34) | 0% (0/34) | 0% (0/29) | 10% (3/30) |
| 4172 | 0% (0/34) | 0% (0/26) | 2.9% (1/34) | 0% (0/34) | 0% (0/29) | 3.3% (1/30) |
| 4606 | 0% (0/34) | 0% (0/26) | 0% (0/34) | 0% (0/34) | 0% (0/29) | 3.3% (1/30) |
| 8517 | 0% (0/34) | 3.8% (1/26) | 17.6% (6/34) | 2.9% (1/34) | 0% (0/29) | 3.3% (1/30) |
| 10668 | 0% (0/34) | 0% (0/26) | 0% (0/34) | 0% (0/34) | 0% (0/29) | 3.3% (1/30) |
| 10826 | 0% (0/34) | 0% (0/26) | 0% (0/34) | 0% (0/34) | 3.4% (1/29) | 0% (0/30) |
| 10873 | 2.9% (1/34) | 0% (0/26) | 0% (0/34) | 0% (0/34) | 0% (0/29) | 0% (0/30) |
| 10874 | 8.8% (3/34) | 0% (0/26) | 0% (0/34) | 0% (0/34) | 0% (0/29) | 0% (0/30) |
| 10876 | 0% (0/34) | 3.8% (1/26) | 0% (0/34) | 0% (0/34) | 0% (0/29) | 0% (0/30) |
| 10877 | 0% (0/34) | 3.8% (1/26) | 0% (0/34) | 0% (0/34) | 0% (0/29) | 0% (0/30) |
| 10879 | 0% (0/34) | 0% (0/26) | 0% (0/34) | 0% (0/34) | 6.9% (2/29) | 0% (0/30) |
| 10927 | 2.9% (1/34) | 0% (0/26) | 0% (0/34) | 0% (0/34) | 0% (0/29) | 0% (0/30) |
| 10928 | 0% (0/34) | 0% (0/26) | 0% (0/34) | 0% (0/34) | 3.4% (1/29) | 0% (0/30) |
| 11645 | 20.6% (7/34) | 0% (0/26) | 0% (0/34) | 0% (0/34) | 0% (0/29) | 0% (0/30) |
| Total | 91.2% (31/34) | 84.6% (22/26) | 61.8% (21/34) | 38.2% (13/34) | 58.6% (17/29) | 66.7% (20/30) |

\*The number of *C. coli* isolates belonging to each MLST STs in each farm.

\*\*The number of swine fecal samples obtained from each farm.

**†**MLST STs, MLST sequence types.

Supplementary Table 5. *Campylobacter coli* isolates from swine feces according to the swine groups.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Strain IDs** | **Swine groups** | **MLST STs** | **MLST CCs\*** | **Aerotolerance levels\*\*** | **Swine farms** |
| CC001 | Weaning pigs | 4172 | 828 | AT | Farm 3 |
| CC002 | 854 | 828 | HAT | Farm 4 |
| CC003 | 1142 | 828 | OS | Farm 4 |
| CC004 | 827 | 828 | AT | Farm 4 |
| CC005 | 887 | 828 | OS | Farm 6 |
| CC006 | 887 | 828 | OS | Farm 6 |
| CC007 | 1142 | 828 | AT | Farm 6 |
| CC008 | 10873 | ND | AT | Farm 1 |
| CC009 | 1122 | 828 | OS | Farm 1 |
| CC010 | 1122 | 828 | OS | Farm 1 |
| CC011 | 1122 | 828 | OS | Farm 1 |
| CC012 | 1122 | 828 | AT | Farm 1 |
| CC013 | 887 | 828 | OS | Farm 2 |
| CC014 | 1450 | ND | OS | Farm 2 |
| CC015 | 1450 | ND | OS | Farm 2 |
| CC016 | Growing pigs | 1142 | 828 | OS | Farm 3 |
| CC017 | 1016 | 828 | OS | Farm 3 |
| CC018 | 1058 | 828 | OS | Farm 3 |
| CC019 | 8517 | 828 | OS | Farm 3 |
| CC020 | 1016 | 828 | OS | Farm 3 |
| CC021 | 1016 | 828 | OS | Farm 3 |
| CC022 | 887 | 828 | AT | Farm 3 |
| CC023 | 827 | 828 | AT | Farm 4 |
| CC024 | 827 | 828 | HAT | Farm 4 |
| CC025 | 2699 | 828 | OS | Farm 4 |
| CC026 | 830 | 828 | AT | Farm 6 |
| CC027 | 830 | 828 | HAT | Farm 6 |
| CC028 | 2733 | 828 | AT | Farm 6 |
| CC029 | 1122 | 828 | OS | Farm 6 |
| CC030 | 4172 | 828 | OS | Farm 6 |
| CC031 | 830 | 828 | HAT | Farm 6 |
| CC032 | 2733 | 828 | OS | Farm 6 |
| CC033 | 1556 | 828 | OS | Farm 1 |
| CC034 | 11645 | ND | AT | Farm 1 |
| CC035 | 1122 | 828 | OS | Farm 1 |
| CC036 | 11645 | ND | OS | Farm 1 |
| CC037 | 10874 | 828 | OS | Farm 1 |
| CC038 | 11645 | ND | OS | Farm 1 |
| CC039 | 854 | 828 | OS | Farm 1 |
| CC040 | 854 | 828 | OS | Farm 1 |
| CC041 | 11645 | ND | OS | Farm 1 |
| CC042 | 10874 | 828 | HAT | Farm 1 |
| CC043 | 1142 | 828 | OS | Farm 2 |
| CC044 | 887 | 828 | AT | Farm 2 |
| CC045 | 1142 | 828 | AT | Farm 2 |
| CC046 | 10876 | ND | HAT | Farm 2 |
| CC047 | 1142 | 828 | OS | Farm 2 |
| CC048 | 1096 | 828 | AT | Farm 2 |
| CC049 | 1096 | 828 | OS | Farm 2 |
| CC050 | 1556 | 828 | AT | Farm 5 |
| CC051 | 1556 | 828 | AT | Farm 5 |
| CC052 | 1556 | 828 | AT | Farm 5 |
| CC053 | 1556 | 828 | OS | Farm 5 |
| CC054 | 1556 | 828 | OS | Farm 5 |
| CC055 | 10928 | 828 | OS | Farm 5 |
| CC056 | 10877 | ND | OS | Farm 2 |
| CC057 | Fattening pigs | 8517 | 828 | OS | Farm 3 |
| CC058 | 887 | 828 | AT | Farm 3 |
| CC059 | 2733 | 828 | OS | Farm 3 |
| CC060 | 854 | 828 | OS | Farm 3 |
| CC061 | 2733 | 828 | HAT | Farm 3 |
| CC062 | 8517 | 828 | OS | Farm 3 |
| CC063 | 2733 | 828 | AT | Farm 3 |
| CC064 | 1058 | 828 | OS | Farm 3 |
| CC065 | 8517 | 828 | AT | Farm 3 |
| CC066 | 8517 | 828 | AT | Farm 3 |
| CC067 | 827 | 828 | AT | Farm 4 |
| CC068 | 1068 | 828 | HAT | Farm 4 |
| CC069 | 8517 | 828 | OS | Farm 4 |
| CC070 | 827 | 828 | AT | Farm 4 |
| CC071 | 2699 | 828 | OS | Farm 4 |
| CC072 | 1122 | 828 | HAT | Farm 6 |
| CC073 | 2733 | 828 | AT | Farm 6 |
| CC074 | 4606 | ND | OS | Farm 6 |
| CC075 | 10668 | ND | OS | Farm 6 |
| CC076 | 854 | 828 | OS | Farm 6 |
| CC077 | 1122 | 828 | AT | Farm 6 |
| CC078 | 854 | 828 | OS | Farm 6 |
| CC079 | 10874 | 828 | OS | Farm 1 |
| CC080 | 887 | 828 | HAT | Farm 1 |
| CC081 | 11645 | ND | OS | Farm 1 |
| CC082 | 11645 | ND | OS | Farm 1 |
| CC083 | 1142 | 828 | OS | Farm 1 |
| CC084 | 854 | 828 | OS | Farm 1 |
| CC085 | 854 | 828 | AT | Farm 1 |
| CC086 | 1122 | 828 | OS | Farm 1 |
| CC087 | 854 | 828 | OS | Farm 1 |
| CC088 | 854 | 828 | HAT | Farm 1 |
| CC089 | 11645 | ND | AT | Farm 1 |
| CC090 | 1142 | 828 | OS | Farm 2 |
| CC091 | 1142 | 828 | OS | Farm 2 |
| CC092 | 2699 | 828 | OS | Farm 2 |
| CC093 | 1142 | 828 | OS | Farm 2 |
| CC094 | 1142 | 828 | OS | Farm 2 |
| CC095 | 887 | 828 | AT | Farm 2 |
| CC096 | 887 | 828 | AT | Farm 2 |
| CC097 | 1556 | 828 | OS | Farm 5 |
| CC098 | 10826 | ND | OS | Farm 5 |
| CC099 | 890 | 828 | AT | Farm 5 |
| CC100 | 10879 | 828 | OS | Farm 5 |
| CC101 | 1068 | 828 | OS | Farm 5 |
| CC102 | 1556 | 828 | OS | Farm 5 |
| CC103 | Pregnant sows | 8517 | 828 | OS | Farm 3 |
| CC104 | 2699 | 828 | OS | Farm 3 |
| CC105 | 887 | 828 | OS | Farm 3 |
| CC106 | 827 | 828 | AT | Farm 4 |
| CC107 | 827 | 828 | AT | Farm 4 |
| CC108 | 854 | 828 | OS | Farm 6 |
| CC109 | 854 | 828 | OS | Farm 6 |
| CC110 | 8517 | 828 | OS | Farm 6 |
| CC111 | 2699 | 828 | AT | Farm 1 |
| CC112 | 2699 | 828 | HAT | Farm 1 |
| CC113 | 10927 | 828 | AT | Farm 1 |
| CC114 | 887 | 828 | AT | Farm 1 |
| CC115 | 887 | 828 | OS | Farm 1 |
| CC116 | 1058 | 828 | HAT | Farm 2 |
| CC117 | 1058 | 828 | OS | Farm 2 |
| CC118 | 1096 | 828 | OS | Farm 2 |
| CC119 | 8517 | 828 | HAT | Farm 2 |
| CC120 | 1068 | 828 | HAT | Farm 5 |
| CC121 | 1068 | 828 | HAT | Farm 5 |
| CC122 | 10879 | 828 | HAT | Farm 5 |
| CC123 | 1556 | 828 | OS | Farm 5 |
| CC124 | 854 | 828 | AT | Farm 5 |

\*ND, not determined.

\*\*OS, oxygen-sensitive; AT, aerotolerant; HAT, hyper-aerotolerant.

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