Table S1. Associated SNP for milk fatty acid concentration on first test-day, ketosis and interval from calving to first insemination with positional candidate genes.

BTA	SNP	SNP position (bp)	Trait[1]	Positional candidate genes[2]
1	rs43682200	45350130	SFA, C16:0, C18:0	*ENSBTAG00000026836, ADGRG7, TFG, ENSBTAG00000053387*
2	rs109328804	50669137	KET	*ENSBTAG00000054108*
3	rs110239426	48613050	PUFA	*SLC44A3, CNN3, ALG14*
3	rs109621977	48432235	PUFA	*ALG14, SLC44A3, CNN3, TLCD4, RWDD3*
3	rs42945878	46563516	PUFA	*DPYD, PTBP2*
4	rs41593945	117293280	PUFA	*CNPY1, INSIG1, EN2, RBM33, SHH*
4	rs41664795	117389110	PUFA	*RBM33, EN2, SHH, CNPY1*
4	rs43387397	38051191	KET	*PCLO, CACNA2D1*
5	rs41625419	51366141	UFA, MUFA, C18:0	*USP15, ENSBTAG00000053892*
5	rs29018280	57356420	ICF	*DGKA, PMEL, RAB5B, CDK2, PYM1, SUOX, RNF41, SMARCC2, MYL6, MYL6B, ESYT1, ZC3H10, PA2G4, ERBB3, RPS26, IKZF4, MMP19, ENSBTAG00000009049, DNAJC14, ORMDL2, SARNP, GDF11, CD63, RDH5, BLOC1S1, ITGA7, METTL7B*
5	rs108956573	57282611	ICF	*RPS26, IKZF4, ERBB3, SUOX, RAB5B, CNPY2, CS, COQ10A, ANKRD52, ENSBTAG00000052361, SLC39A5, NABP2, RNF41, SMARCC2, MYL6, MYL6B, ESYT1, ZC3H10, PA2G4, CDK2, PMEL, DGKA, PYM1, MMP19, ENSBTAG00000009049, DNAJC14, ORMDL2, SARNP, GDF11, CD63*
5	rs109366282	103500479	KET	*PHB2, PTPN6, LPCAT3, EMG1, ATN1, ENO2, LRRC23, C1S, C1R, C1RL, ENSBTAG00000037743, RBP5, CLSTN3, SPSB2, USP5, TPI1, CDCA3, GNB3, P3H3, GPR162, CD4, ENSBTAG00000051680, LAG3, PTMS, MLF2, COPS7A, PIANP*
5	rs109896020	114222945	KET	*MPPED1, ENSBTAG00000053264, SCUBE1, EFCAB6*
5	rs109046936	103549759	KET	*LRRC23, ENO2, ATN1, PTPN6, SPSB2, TPI1, USP5, CDCA3, ENSBTAG00000037743, C1R, C1S, LPCAT3, EMG1, PHB2, GNB3, P3H3, GPR162, CD4, ENSBTAG00000051680, LAG3, PTMS, MLF2, COPS7A, PIANP, ZNF384, ING, ACRBP, LPAR5*
5	rs41657085	118894255	KET	*no gene*
6	rs109163865	60520292	C16:0	*LIMCH1, ENSBTAG00000051208, PHOX2B*
6	rs41654962	88739008	KET	*ALB, AFP, AFM, ENSBTAG00000049436, RASSF6, CXCL8, ENSBTAG00000027534, CXCL5, ENSBTAG00000011961, CXCL2, ENSBTAG00000051891*
8	rs110176023	111284112	UFA, MUFA, C18:0	*ADI1, TRAPPC12, EIPR1, ENSBTAG00000049154, ENSBTAG00000052608*
8	rs42263449	26696264	C18:0	*SH3GL2, CNTLN*
8	rs42263474	26763145	C18:0	*SH3GL2, CNTLN*
8	rs43138756	83720729	KET	*ENSBTAG00000009764, CTSV, ZNF484, IARS1, NOL8, CENPP*

8	rs110717374	17138381	KET	*TEK, IFT74, MOB3B, EQTN, LRRC19, PLAA, CAAP1*
9	rs109137030	6218345	MUFA	*no gene*
9	rs109316317	101969365	KET	*TTLL2*
10	rs43619534	31707885	UFA, MUFA	*no gene*
10	rs109974787	5565263	ICF	*SFXN1, HRH2, DRD1*
10	rs41586492	17746328	KET	*LRRC49, THAP10, LARP6, UACA*
10	rs42231661	68291765	KET	*KTN1, PELI2*
10	rs110844686	34985737	KET	*THBS1, FSIP1*
10	rs43710033	43625368	KET	*NIN, MAP4K5, ATL1, SAV1, ENSBTAG00000054530, ABHD12B, PYGL, ENSBTAG00000048395, TRIM9*
11	rs41659401	39446852	ICF	*no gene*
11	rs109882205	41992469	KET	*no gene*
11	rs29022274	41971708	KET	*no gene*
11	rs109038300	47378387	KET	*RPIA, ENSBTAG00000054154, ENSBTAG00000050329, ENSBTAG00000047029, ENSBTAG00000051611, ENSBTAG00000003408, ENSBTAG00000051342, ENSBTAG00000045514, ENSBTAG00000045659, EIF2AK3, TEX37, FOXI3*
11	rs42587069	30352564	KET	*MSH6, FBXO11*
11	rs110926908	44431373	KET	*SH3RF3, SEPTIN10, EDAR, CCDC138, RANBP2, ENSBTAG00000054181*
12	rs41577805	28834261	UFA, C18:0	*FRY, N4BP2L2, N4BP2L1, BRCA2, ZAR1L*
12	rs110539543	82719169	KET	*FAM155A*
12	rs41629862	82277331	KET	*EFNB2, ARGLU1*
12	rs41672734	81142776	KET	*no gene*
12	rs111012814	20111148	KET	*DLEU7, ENSBTAG00000049315, RNASEH2B*
13	rs43705561	70050255	PUFA	*CHD6, PLCG1, ZHX3, LPIN3, EMILIN3*
14	rs109421300	609870	SFA, UFA, MUFA, C16:0, C18:0	*DGAT1, HSF1, TMEM249, SCRT1, BOP1, ADCK5, SLC52A2, FBXL6, ARHGAP39, C14H8orf82, LRRC24, LRRC14, RECQL4, MFSD3, GPT, PPP1R16A, FOXH1, KIFC2, CYHR1, TONSL, VPS28, ENSBTAG00000053637, SLC39A4, CPSF1, SCX, MROH1, ENSBTAG00000039978, HGH1, WDR97, MAF1, ENSBTAG00000051469, SHARPIN, CYC1, GPAA1, EXOSC4, OPLAH, SPATC1, GRINA, PARP10, PLEC*
14	rs110701587	63925324	PUFA	*SNX31, ANKRD46, ENSBTAG00000054554, RNF19A, ENSBTAG00000050156, SPAG1*
14	rs41630566	46570537	PUFA	*EXT1, MED30*
15	rs110508416	37224652	C18:0, KET	*INSC*
15	rs109138685	37720295	KET	*INSC, CALCB, CALCA, CALCB, ENSBTAG00000048777, CYP2R1, PDE3B*
15	rs41632691	83673161	KET	*GLB1L2, B3GAT1, GLB1L3, ENSBTAG00000053675, NCAPD3, ENSBTAG00000046088, VPS26B, THYN1, ACAD8 , ENSBTAG00000012229*
15	rs109932511	83710700	KET	*GLB1L2, B3GAT1, NCAPD3, ENSBTAG00000046088,VPS26B, THYN1, ACAD8 , ENSBTAG00000012229, GLB1L3,*
15	rs110944919	78017138	KET	*ENSBTAG00000054640, ENSBTAG00000052223, ENSBTAG00000055007,*

				ENSBTAG00000031119, ENSBTAG00000024788, ENSBTAG00000031030, OR4C3, PTPRJ, ENSBTAG00000051670, ENSBTAG00000049550, ENSBTAG00000031025, ENSBTAG00000053247, OR4X1, ENSBTAG00000031032, ENSBTAG00000053761, ENSBTAG00000053438, ENSBTAG00000054267, ENSBTAG00000048640, ENSBTAG00000050306, ENSBTAG00000053824, ENSBTAG00000053261, ENSBTAG00000051253
15	rs110351063	65323234	C16:0	*EHF, APIP, PDHX*
17	rs41599470	36317694	ICF	*FSTL5, SNORA72*
18	rs110942910	27440587	KET	*no gene*
18	rs109499402	18077073	KET	*ZNF423, ENSBTAG00000051062, ENSBTAG00000052469, C18H16orf78*
18	rs109375227	24203949	KET	*AMFR, NUDT21, OGFOD1, CES1, ENSBTAG00000001851, MT1A, MT1E, MT2A, MT3, ENSBTAG00000049147, ENSBTAG00000049538, MT4, BBS2, GNAO1*
18	rs110198858	33625498	KET	*no gene*
18	rs29021918	42703808	KET	*ZNF507, DPY19L3*
18	rs41632433	28333748	KET	*no gene*
18	rs110600398	27938774	KET	*no gene*
19	rs109477972	29784751	SFA, C16:0	*PIRT, MYH2, MYH3, SCO1, ADPRM, TMEM220*
19	rs41644917	40381198	PUFA, C18:0	*THRA, MED24, NR1D1, CSF3, ENSBTAG00000045067, MSL1, IKZF3, ZPBP2, GSDMB, ORMDL3, LRRC3C, ENSBTAG00000050854, GSDMA, PSMD3, CASC3, RAPGEFL1, WIPF2, CDC6, RARA, ENSBTAG00000052844, TOP2A*
19	rs110933534	40505729	PUFA, C18:0	*WIPF2, CDC6, RAPGEFL1, ORMDL3, LRRC3C, GSDMA, PSMD3, CSF3, MED24, THRA, NR1D1, MSL1, CASC3, RARA, ENSBTAG00000052844, TOP2A, IGFBP4, TNS4*
20	rs109946603	9419987	KET	*MAP1B, MRPS27, ZNF366, PTCD2, ENSBTAG00000053736*
21	rs109823489	56044735	PUFA	*CCDC88C, GPR68, FRMD5, ENSBTAG00000050803, PPP4R3A*
22	rs41993977	5531843	SFA, C16:0	*GADL1*
22	rs41994020	5499054	KET	*GADL1*
22	rs41994761	5476277	KET	*GADL1*
24	rs41570441	49057452	PUFA	*DYM, C24H18orf32, RPL17, LIPG*
27	rs110519353	36466414	SFA, C16:0	*GINS4, GOLGA7, SFRP1, GPAT4, NKX6-3, ENSBTAG00000027629, ENSBTAG00000054394, ENSBTAG00000003275*
27	rs109734522	36747901	C16:0	*ENSBTAG00000052888, GPAT4, NKX6-3, ENSBTAG00000027629, ENSBTAG00000054394, ENSBTAG00000003275, KAT6A,*
27	rs42138713	41773014	C16:0	*THRB, ENSBTAG00000050025, NR1D2*
27	rs41647957	8009249	KET	*VEGFC, ASB5, SPCS3*
28	rs42854990	2669298	PUFA	*ENSBTAG00000048153*

28	rs109278212	45261673	UFA, MUFA	*CXCL12*
28	rs110222344	43155287	UFA	*WDFY4, ARHGAP22, LRRC18, VSTM4, FAM170B*
28	rs109839180	19620469	UFA, MUFA, PUFA	*REEP3, JMJD1C*
28	rs41586819	16074091	KET	*ENSBTAG00000050189*
29	rs29026721	28190477	KET	*SPA17, SIAE, NRGN, VSIG2, ESAM, ENSBTAG00000054187, ENSBTAG00000051944, ENSBTAG00000051107, ENSBTAG00000054033, ENSBTAG00000048913, PANX3, TBRG1, MSANTD2, ROBO3, ROBO4, HEPACAM, CCDC15*
29	rs109868969	17135246	KET	*TENM4*

[1] SFA = saturated fatty acids, UFA = unsaturated fatty acids, MUFA = monounsaturated fatty acids, PUFA = polyunsaturated fatty acids, C16:0 = palmitic acid, C18:0 = stearic acid, KET = ketosis, ICF = interval from calving to first insemination

[2] Positional candidate genes located in the interval of 250 kb surrounding associated SNP were retrieved from Ensembl release 102 (Zerbino et al., 2018)

Figure S1. Quantile-Quantile plots for first test-day (**A**) saturated, (**B**) unsaturated, (**C**) monounsaturated, (**D**) polyunsaturated, palmitic (**E**) and stearic (**F**) fatty acid concentration in first lactation Holstein cows.

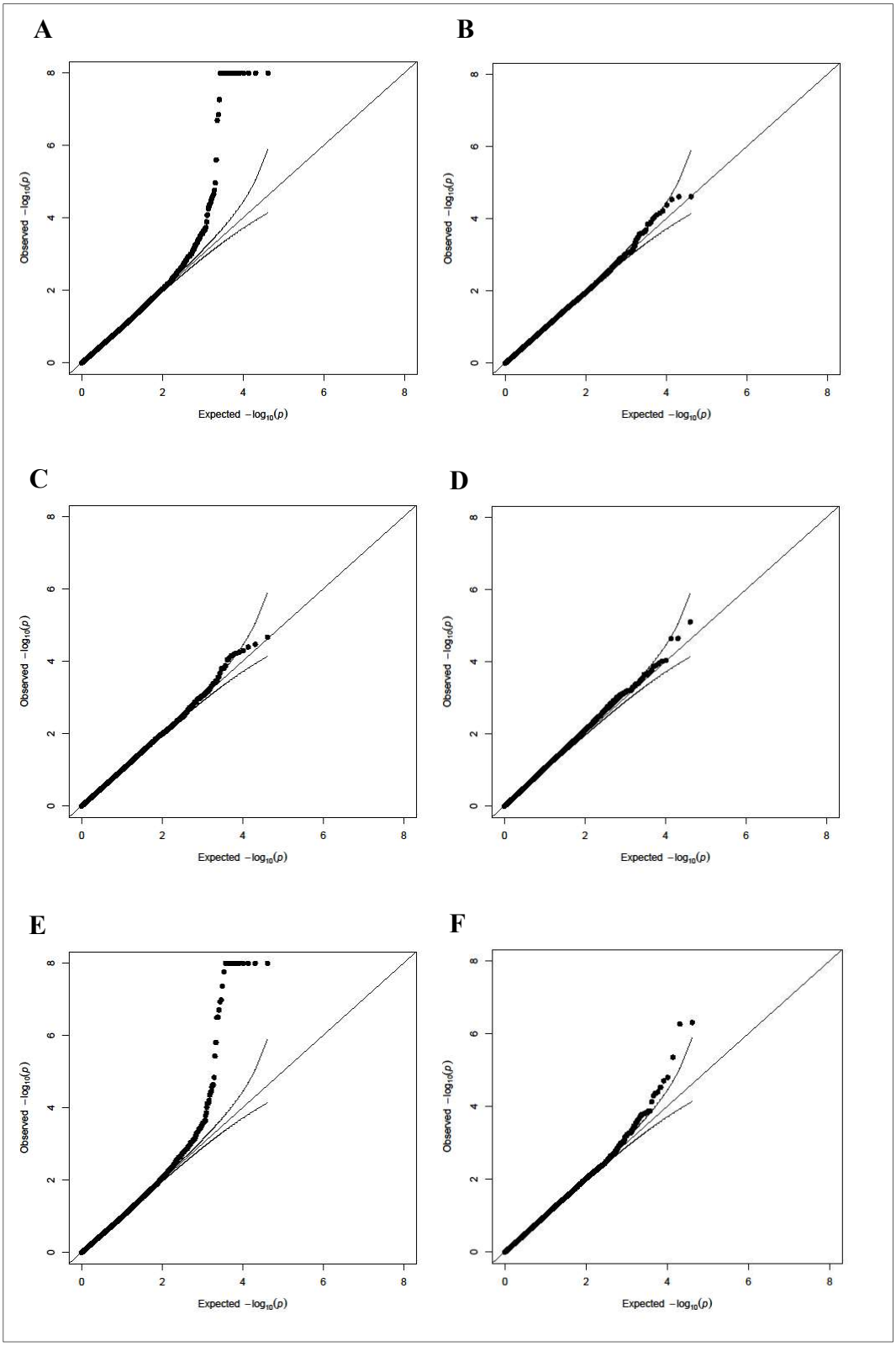

Figure S2. Quantile-Quantile plots for (**A**) ketosis and (**B**) interval from calving to first insemination in first lactation Holstein cows.