Supplementary material

Table S1. List of primers, forward primer (F) and reverse primer (R), used for amplification using qPCR and site-directed mutagenesis.

Table S2. The differences of bacterial taxa in caecum microbiota between groups with mean proportions.

Figure S1. The Total Ion Chromatorgraphy of GF95.

Figure S2. The SAF score of different groups. SAF criteria: S_0:<5%, had no steatosis; S_1: 5%-33%, mild; S_2: 34%-66%, moderate; S_3:>67%, marked; A_0: had no activity; A_1: A=1, mild activity; A_2: A=2, moderate activity; A_3: A⩾3, severe activity; F_0: stage of none fibrosis; F_1: 1a or 1b perisinusoidal zone 3 or 1c portal fibrosis; F_2: perisinusoidal and periportal fibrosis without bridging; F_3: bridging fibrosis; F_4: cirrhosis. $S_0A_0F_0$ (green): NFD (100%), GF95 (75%); $S_0A_1F_0$ (yellow): GF95 (25%); $S_1A_1F_0$ (orange): HFD (25%); $S_2A_1F_1$ (red): HFD (62.5%); $S_2A_2F_1$ (black): HFD (12.5%), (n = 8).

Table S1

Name	Sequence(5′-3′)
β-actin F	GGCACCACACTTTCTACAAT
β-actin R	AGGTCTCAAACATGATCTGG
ACC F	CAACCACTACGGCATGACTCA
ACC R	CGCAGAAGCAGCCCATTACTT
CYP7A1 F	AAAGCGGGAAAGCAAAGACCA
CYP7A1 R	AGTTCAAAGCAGGAGAGCATCAGG
FAS F	CGGCGTGTGATGGGGCTGGTA
FAS R	AGGAGTAGTAGGCGGTGGTGTAGA
IL1β F	CCTCTGTGACTCGTGGGATG
IL1β R	GGGTGTGCCGTCTTTCATCA
SREBP-1c F	AGGAGGCCATCTTGTTGCTT
SREBP-1c R	GTTTTGACCCTTAGGGCAGC
α-AMPK F	GGCTGAGAAGCAGAAGCACGAC
α-AMPK R	CCAACAACATCTAAACTGCGAATC

Table S2

Taxon	GF95: Mean	GF95: SD	HFD: Mean	HFD:SD	NFD: Mean	NFD: SD	p-values (GF95VSHFD)	p-values (HFDVSNFD)	p-values (GF95VSNFD)
Acetanaerobacterium	0.02166	0.018949786	0.0021	0.002909295	0.0338	0.011833681	0.107725117	0.004737868	0.314635799
Acetatifactor	0.13882	0.122254675	0.0615	0.023905146	0.29826	0.077288229	0.277803064	0.002432691	0.064657915
Aerococcaceae	0	0	0	0	0.02382	0.031282609	1	0.202451001	0.202451001
Aerococcus	0.07054	0.130548314	0.08304	0.159524476	0.0032	0.00401796	0.906574122	0.373552021	0.360628182
Akkermansia	0.01874	0.026597113	0.10036	0.126548403	0.0581	0.114755497	0.270221464	0.634195029	0.537194114
Alistipes	0.1673	0.087480764	0.0638	0.058919844	0.63424	0.146094101	0.090415649	0.000626823	0.001156362
Allobaculum	0.98572	0.954129866	3.4395	4.061155249	0.2484	0.494902188	0.298632067	0.19174572	0.219107012
Alloprevotella	3.93452	2.396637507	1.89982	2.164865806	2.38996	1.625275441	0.243525832	0.727354602	0.321299572
Anaerofilum	0	0	0.00744	0.008748166	0.00702	0.006081579	0.164176301	0.939325221	0.082157559
Anaerofustis	0.0058	0.004297441	0.06156	0.087072558	0.0008	0.0016	0.26967752	0.235336683	0.080096986
Anaeroplasma	0	0	0	0	0.05918	0.055171783	1	0.098499856	0.098499856
Anaerostipes	0.12554	0.243703292	0.21028	0.417865234	0	0	0.737251338	0.371141217	0.361101493
Anaerotruncus	0.02542	0.012175451	0.01288	0.009603833	0.037	0.011142531	0.14651844	0.011537119	0.198426086
Asaccharobacter	0.05296	0.023842282	0.36828	0.289367015	0.02774	0.014402583	0.09467937	0.078127371	0.115813974
Atopostipes	0.01018	0.02036	0.0348	0.0696	0.35714	0.320723467	0.529244802	0.114846117	0.096421748
Bacillaceae	0	0	0	0	0.07358	0.091713083	1	0.183856957	0.183856957
Bacillales_Incertae	0.00132	0.001676186	0.0099	0.012175385	0.0007	0.0014	0.232679891	0.205874603	0.586243081
Bacteria	0.02678	0.019078092	0.05172	0.070928651	0.10952	0.046485843	0.529884979	0.215642937	0.019794547

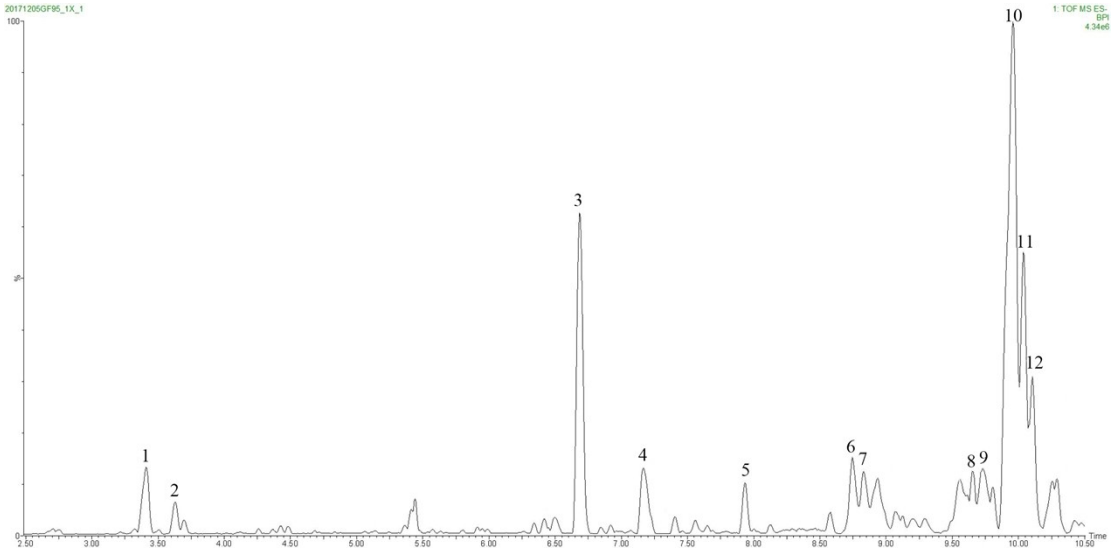
Bacteroidales	0.02732	0.033525596	0.00408	0.004997359	0	0	0.239344537	0.177835163	0.178477042
Bacteroides	2.1789	1.649210785	1.50754	1.790712103	0.6341	0.400720626	0.596421134	0.390425168	0.135227074
Barnesiella	0.8185	0.317604817	0.30784	0.394380398	1.17908	0.648927936	0.080042596	0.057644017	0.357921017
Bifidobacterium	0.09042	0.047930007	1.54164	1.643343135	0.09728	0.184617306	0.152127403	0.153822557	0.945718348
Blautia	1.97128	2.312929534	2.62536	1.490599009	0.0056	0.00485716	0.649313562	0.024559282	0.164406687
Butyricicoccus	0.1565	0.156307402	0.32392	0.189326864	0.09374	0.073667377	0.21103722	0.070917536	0.496356753
Butyricimonas	0.01956	0.010849258	0.00314	0.003523407	0.02178	0.015196105	0.036019589	0.06896407	0.818633192
Christensenella	0.02896	0.02023834	0.02336	0.005611987	0.00784	0.005657773	0.618518911	0.004576769	0.105290374
Clostridia	0.00508	0.003135857	0.01852	0.018790998	0.20384	0.121734902	0.227503287	0.037296971	0.030892908
Clostridiaceae	0.0078	0.008083564	0.00524	0.00402522	0.17636	0.147552507	0.591735449	0.081165193	0.084266291
Clostridiales	1.99302	0.618206061	3.77878	2.503165825	3.31282	1.480730084	0.2309065	0.758703835	0.157015967
Clostridiales_Incertae	0.05166	0.045809283	0.02518	0.020341524	0.0855	0.028409083	0.334734233	0.01008884	0.251399954
Clostridium_IV	0.56216	0.41612632	0.70432	0.608450768	1.16166	0.518657863	0.711056368	0.286477321	0.110786219
Clostridium_XlVa	0.96388	1.061530313	1.25304	0.914099862	0.4766	0.427252338	0.690806816	0.177584883	0.431432923
Clostridium_XlVb	0.32438	0.255724894	0.25216	0.264723385	0.27526	0.072173003	0.705002271	0.873449927	0.727882131
Clostridium_XVIII	0.06742	0.093610051	0.34046	0.175744401	0.0047	0.005625656	0.033060127	0.018722705	0.251538722
Collinsella	0	0	0.0236	0.0472	0	0	0.373900966	0.373900966	1
Coprobacillus	0.03968	0.048689687	0.2647	0.224282777	0	0	0.1153198	0.077627932	0.178453013
Coprococcus	0.44332	0.444138048	1.50184	0.994491707	0.03818	0.038940334	0.103976198	0.042175316	0.142221253
Coriobacteriaceae	0.03544	0.016409583	0.39592	0.337678406	0.09636	0.03527314	0.099599149	0.150858543	0.021947992
Corynebacterium	0.0191	0.0382	0.34758	0.69196444	0.64522	0.603469189	0.396520834	0.535247541	0.10656381
Defluviitalea	0.01102	0.012783802	0	0	0.058	0.020920229	0.159789676	0.005174046	0.007154895
Deltaproteobacteria	0.64424	1.158679127	0.12548	0.079411772	0.02086	0.010836162	0.421727613	0.057239353	0.342500208
Desulfovibrio	0.34012	0.303118046	0.31616	0.294291574	0.1318	0.116681052	0.912490079	0.294524627	0.25417505
Desulfovibrionaceae	3.83576	1.609139074	1.92582	0.999177961	2.53762	0.180299134	0.085448744	0.290792196	0.182367055

Desulfovibrionales	0.02674	0.017002659	0.03092	0.033916981	0.03566	0.027980393	0.833038	0.834880322	0.60375205
Dorea	0.09328	0.095431722	0.15136	0.116668858	0.08134	0.068115978	0.463902378	0.337259091	0.844220189
Enterorhabdus	0.00262	0.001615426	0.00522	0.006022757	0.00358	0.003333107	0.445688906	0.649947596	0.623435027
Erysipelotrichaceae	0.27488	0.158089562	1.03446	0.698812005	0.08498	0.101623863	0.094900445	0.052364158	0.084068423
Erysipelotrichaceae_incertae_sedis	0.0176	0.020229978	0.04312	0.073040575	0.0096	0.009312572	0.5329397	0.412559242	0.501235126
Escherichia/Shigella	0.02074	0.01788425	0.17904	0.219372328	0.0079	0.003209361	0.222803621	0.193720939	0.2263273
Facklamia	0.00144	0.00288	0.10256	0.20512	0.09332	0.098088376	0.379993171	0.937980713	0.13430242
Faecalibacterium	0.0185	0.013298271	0.01206	0.004538987	0.01178	0.003806521	0.402039973	0.927079603	0.379007989
Firmicutes	0.49676	0.448636983	1.098	0.337010077	0.4494	0.077525841	0.067104259	0.016617553	0.844811448
Flavonifractor	0.50964	0.278499125	0.17718	0.204210719	0.75566	0.236269986	0.093659684	0.006225311	0.215760118
Fusicatenibacter	0.12048	0.235871027	0.00132	0.001621604	0	0	0.369471655	0.17885159	0.364737808
Gemmiger	0	0	0.00126	0.00252	0.03126	0.026554894	0.373900966	0.086521477	0.078141689
Globicatella	0.00272	0.00544	0.02748	0.021307783	0.00444	0.003304905	0.079783687	0.09625979	0.606644754
Helicobacter	2.02602	1.072982565	0.68304	0.689441022	0.40774	0.254446848	0.074251473	0.487010898	0.037392784
Holdemania	0.05924	0.067267752	0.1774	0.130053451	0.0018	0.0036	0.157679868	0.054039922	0.162918074
Hydrogenoanaerobacterium	0.00214	0.001749971	0.00292	0.002694736	0.0026	0.001409965	0.642424605	0.840250452	0.693478233
Intestinimonas	0.83856	0.225386198	0.43104	0.15380582	0.69762	0.079841528	0.0201059	0.021711358	0.291604184
Jeotgalicoccus	0.05092	0.097111202	0.03472	0.060131137	0.18418	0.156902637	0.785266245	0.133666284	0.19390288
Lachnospiracea_incertaesedis	0.3327	0.240603508	0.42014	0.300192496	1.33096	1.3545349	0.662057997	0.253592245	0.216256638
Lachnospiraceae	29.37104	16.35124147	30.34332	5.771702571	33.94168	5.41566973	0.915088601	0.389873708	0.618933467
Lactobacillales	0.00116	0.00232	0.009	0.008378783	0.0007	0.0014	0.136094318	0.118624579	0.744805812
Lactobacillus	0.54666	0.713902796	1.76986	1.141132235	2.25784	2.110490883	0.113782126	0.69793943	0.186246574

Megamonas	0.00968	0.00671041	0.00442	0.003577373	0.00064	0.00128	0.215013404	0.103195579	0.053213725
Methanosphaera	0.02868	0.028872506	0.16036	0.119634119	0.03256	0.023270806	0.091934791	0.099102067	0.839706402
Nosocomiicoccus	0	0	0	0	0.09286	0.164923189	1	0.323112094	0.323112094
Odoribacter	0	0	0	0	0.06532	0.11715394	1	0.327275627	0.327275627
Oligella	0	0	0	0	0.19842	0.263463458	1	0.206471445	0.206471445
Olsenella	0.07722	0.038056978	0.36182	0.564049244	0.0208	0.0416	0.370495194	0.293640225	0.080628122
Oscillibacter	1.30968	0.878330128	0.69898	0.56022683	7.46814	3.272839505	0.280505234	0.01348063	0.017504092
Parabacteroides	0.32004	0.298941122	0.25998	0.289797808	0.05546	0.03987684	0.780300263	0.232108679	0.151723658
Paraprevotella	2.04894	2.070673101	0.31948	0.380324695	3.1713	0.958783385	0.171224787	0.002302274	0.365553503
Parasutterella	0.12526	0.148074611	0.01946	0.020578882	0.0365	0.028085583	0.22734752	0.358853309	0.300069318
Parvibacter	0.0043	0.001369671	0.03552	0.039559444	0.00184	0.002398833	0.189661081	0.163903476	0.122402544
Peptococcaceae	0.08772	0.109862558	0.10636	0.024704137	0.16684	0.163105666	0.755757636	0.502387431	0.447444049
Phascolarctobacterium	2.32444	2.053346167	3.21832	1.068719412	0.29768	0.351885432	0.469160237	0.003797345	0.119617059
Porphyromonadaceae	8.14034	3.501297764	3.64526	3.835596164	11.22014	3.899434867	0.1219918	0.024311614	0.27402447
Prevotella	13.5163	13.01661485	7.01464	7.74702834	1.39352	0.881096411	0.421091292	0.221066245	0.136002191
Pseudoflavonifractor	0.03152	0.021255907	0.07106	0.053008588	0.0671	0.030475958	0.222080427	0.900925096	0.096161825
Rhodospirillaceae	0.003	0.004609121	0.00198	0.002844222	0.00094	0.00188	0.718138508	0.561260111	0.443544941
Rhodospirillales	0.0066	0.008791132	0.00776	0.008499788	0.00464	0.00928	0.854255771	0.633429882	0.766954558
Romboutsia	1.4617	0.77733116	5.45948	3.051525437	1.13504	0.34128964	0.057078246	0.046646813	0.473375321
Roseburia	1.72708	1.507263217	2.29288	2.331940313	0.79886	0.369938106	0.69605318	0.271317945	0.291075533
Rothia	0.0022	0.001901578	0.03908	0.049456664	0.00592	0.005778373	0.210192099	0.251965032	0.277326272
Ruminococcaceae	10.39514	1.292156778	11.2387	5.229791997	14.09744	2.507588661	0.768171423	0.36390168	0.039424671
Ruminococcus	1.44122	1.033044747	1.57238	1.387382886	2.45412	0.653353697	0.883517164	0.296183082	0.142945912
Ruminococcus2	0.03724	0.031479619	0.05406	0.055182555	0.2241	0.121936672	0.614434627	0.046994337	0.035297265

Saccharibacteria_genera_incertae_sedis	0.00744	0.007115785	0.00128	0.001572768	0.09032	0.019829312	0.159800107	0.000812811	0.000526327
Sporobacter	0.00492	0.00984	0.02348	0.029875569	0	0	0.292493555	0.19108434	0.373900966
Sporosarcina	0	0	0.00124	0.00248	0.02658	0.024966089	0.373900966	0.112135287	0.100288167
Staphylococcus	0.8056	1.274482893	0.69452	0.664117747	0.38352	0.352818987	0.882198322	0.439369357	0.553600191
Stomatobaculum	0.24592	0.253660643	0.1714	0.211755264	0.19498	0.050986877	0.664302679	0.838125695	0.712414981
Streptococcus	0.02812	0.029129943	0.11968	0.109818512	0.00506	0.001588207	0.173527386	0.105130919	0.188638882
Sutterella	0.24136	0.457470142	0.12832	0.174687863	0	0	0.663184822	0.215727402	0.350853438
Turicibacter	0.53368	0.388436396	1.51808	0.316826245	0.24274	0.09968626	0.004726034	0.000725816	0.212387227
Vampirovibrio	0	0	0.00194	0.002595072	0.02592	0.047750954	0.209197532	0.37234865	0.338691289

Figure S1.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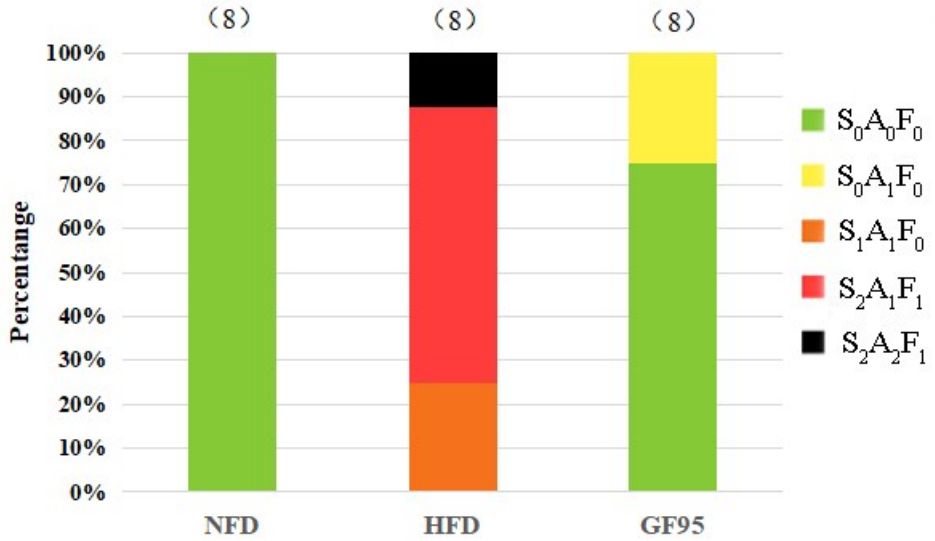
Time

Figure S2.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