ONLINE APPENDIX

Supplementary Table 1. Clinical and biological characteristics of the lean controls, obese diabetic and non diabetic subjects before gastric surgery.

	Control n = 13	OB/nD n = 23	OB/D n = 7
Age (years)	36 ± 3 (A)	42 ± 2 (A, B)	49 ± 5 (B)
Adiposity markers			
Body Weight (kg)	59.0 ± 1.9 (A)	127.4 ± 4.3 (B)	121.5 ± 11.6 (B)
BMI (kg/m²)	21.7 ± 0.4 (A)	48.3 ± 1.6 (B)	45.4 ± 3.5 (B)
Adipocyte diameter (µm)	nd	115.6 ± 1.7 (A)	120.1 ± 3.4 (B)
REE (kcal)	nd	1830.3 ± 65.2 (A)	1762.1 ± 85.9 (A)
Fat mass%	26.5 ± 1.4 (A)	48.2 ± 1.1 (B)	46.6 ± 2.1 (B)
Fat-free mass%	69.5 ± 1.3 (A)	49.7 ± 1.1 (B)	50.9 ± 1.9 (B)
Leptin (ng/ml)	9.24 ± 1.46 (A)	50.5 ± 4.1 (B)	52.2 ± 8.3 (B)
Plasma glucose homeostasis and insulin sensitivity			
Glycaemia (mmol/l)	4.3 ± 0.2 (A)	5.4 ± 0.2 (A)	9.4 ± 1.4 (B)
Insulinemia (µU/ml)	3.8 ± 0.3 (A)	16.6 ± 1.8 (B)	19.4 ± 10.9 (B)
Adiponectin (µg/ml)	13 ± 1.43 (A)	6.8 ± 0.6 (B)	5.4 ± 0.8 (B)
Plasma lipid homeostasis			
Total cholesterol (mmol/l)	4.8 ± 0.3 (A)	4.5 ± 0.2 (A)	4.6 ± 0.3 (A)
Total triglycerides (mmol/l)	0.8 ± 0.1 (A)	1.5 ± 0.2 (B)	1.8 ± 0.5 (B)
HDL cholesterol (mmol/l)	1.8 ± 0.1 (A)	1.2 ± 0.1 (B)	1.3 ± 0.1 (B)
Inflammatory markers			
Plasma hsCRP (mg/dl)	nd	2.7 ± 0.8 (A)	4.4 ± 2.4 (A)
Plasma IL-6 (pg/ml)	nd	4 ± 0.4 (A)	5.8 ± 1.3 (A)
Plasma orosomucoid (g/l)	nd	1.05 ± 0.05 (A)	0.95 ± 0.08 (A)

All values are expressed as mean ± SEM; nd: not determined. Fat mass%, Fat-free mass%: values expressed as a percentage of body weight. REE: resting energy expenditure. Wilcoxon Rank Sum tests for changes between the groups. Data not sharing the same letter within a horizontal line are significantly different ($P<0.05$).

Supplementary Table 2. **Evolution of the clinical and biological characteristics of diabetic (OB/D) and non-diabetic (OB/nD) subjects before surgery, 3 months and 6 months after surgery**

	OB/nD (n = 23)			OB/D (n=7)		
	Basal	**3 months**	**6 months**	**Basal**	**3 months**	**6 months**
Food intake						
Food intake (kcal)	2118 ± 111 [A]	1171 ± 99 [A]	1406 ± 55 [B]	1469 ± 69 [A]	784 ± 94 [B]	1192 ± 131 [C]
Adiposity markers						
Body Weight (kg)	127.4 ± 4.3 [A]	108.0 ± 4.0 [B]	98.0 ± 3.8 [C]	121.5 ± 11.6 [A]	105.3 ± 11.0 [B]	99.3 ± 10.7 [C]
BMI (kg/m²)	48.3 ± 1.6 [A]	40.9 ± 1.4 [B]	37.2 ± 1.4 [C]	45.4 ± 3.5 [A]	39.3 ± 3.4 [B]	36.9 ± 3.2 [C]
Adipocyte diameter (μm)	115.6 ± 1.7 [A]	111.2 ± 1.2 [B]	101.6 ± 3.9 [C]	120.1 ± 3.4 [A]	107.4 ± 1.3 [A]	109.3 ± 3.7 [A]
REE (kcal)	1830.3 ± 65.2 [A]	1830.3 ± 55.7 [A]	1566.4 ± 49.3 [B]	1762.1 ± 85.9 [A]	1887.3 ± 152.1 [B]	1492.2 ± 80.1 [C]
Fat mass%	48.2 ± 1.1 [A]	44.9 ± 1.1 [B]	41.3 ± 1.4 [C]	46.6 ± 2.1 [A]	43.3 ± 2.5 [B]	41.4 ± 2.3 [C]
Fat-free mass%	49.7 ± 1.1 [A]	52.7 ± 1.0 [B]	56.0 ± 1.3 [C]	50.9 ± 1.9 [A]	53.9 ± 2.3 [B]	55.6 ± 2.0 [C]
Leptin (ng/ml)	50.5 ± 4.1 [A]	24.1 ± 2.5 [B]	23.0 ± 2.6 [B]	52.2 ± 8.3 [A]	30.0 ± 6.4 [B]	30.4 ± 8.6 [B]
Plasma glucose homeostasis and insulin sensitivity						
Glycaemia (mmol/l)	5.4 ± 0.2 [A]	4.8 ± 0.1 [B]	4.6 ± 0.1 [B]	9.6 ± 1.7 [A]	5.6 ± 0.6 [B]	5.5 ± 0.6 [B]
HbA1C (%)	5.8 ± 0.1 [A]	5.6 ± 0.1 [B]	5.6 ± 0.1 [B]	8.5 ± 1.3 [A]	6.4 ± 0.3 [B]	6.4 ± 0.2 [B]
Insulinemia (mmol/l)	16.6 ± 1.8 [A]	9.5 ± 1.0 [B]	6.3 ± 0.8 [C]	8.4 ± 1.7 [A]	8.0 ± 1.4 [A]	5.6 ± 0.7 [A]
HOMA-B%	67.0 ± 2.8 [A]	77.3 ± 2.6 [B]	89.8 ± 6.0 [C]	40.3 ± 8.4 [A]	65.8 ± 7.7 [A]	74.2 ± 15.0 [A]
HOMA-S%	145.4 ± 6.3 [A]	168.6 ± 5.7 [B]	180.3 ± 21.3 [B]	81.5 ± 20.7 [A]	142.7 ± 17.3 [A]	148.7 ± 25.7 [A]
HOMA-IR	0.7 ± 0.04 [A]	0.6 ± 0.02 [B]	0.8 ± 0.11 [A]	1.6 ± 0.40 [A]	0.8 ± 0.10 [A]	0.7 ± 0.10 [A]
Adiponectin (μg/ml)	6.8 ± 0.6 [A]	7.5 ± 0.7 [A]	8.4 ± 0.7 [B]	5.4 ± 0.8 [A]	8.7 ± 1.9 [A]	8.4 ± 2.3 [A]
Plasma lipid homeostasis						
Total cholesterol (mmol/l)	4.53 ± 0.18 [A]	4.23 ± 0.19 [A]	4.31 ± 0.17 [A]	4.59 ± 0.31 [A,B]	4.23 ± 0.23 [A]	4.47 ± 0.26 [B]
Triglycerides (mmol/l)	1.50 ± 0.19 [A]	1.47 ± 0.18 [A]	1.42 ± 0.16 [A]	1.81 ± 0.52 [A]	1.77 ± 0.47 [A]	1.70 ± 0.55 [A]
HDL cholesterol (mmol/l)	1.21 ± 0.06 [A,B]	1.15 ± 0.06 [A]	1.28 ± 0.06 [B]	1.27 ± 0.1 [A]	1.23 ± 0.18 [A]	1.36 ± 0.2 [A]
Inflammatory markers						
hsCRP (mg/dl)	2.7 ± 0.8 [A]	2.9 ± 1.2 [A]	2.9 ± 1.0 [A]	4.4 ± 2.4 [A]	1.2 ± 0.6 [A]	1.9 ± 0.7 [A]
IL-6 (pg/ml)	4 ± 0.4 [A]	4.3 ± 0.4 [A]	3.7 ± 0.4 [A]	5.8 ± 1.3 [A]	3.8 ± 0.6 [A]	2.7 ± 0.5 [A]
Orosomucoide (g/l)	1.05 ± 0.05 [A]	0.94 ± 0.04 [A,B]	0.88 ± 0.04 [B]	0.95 ± 0.08 [A]	0.92 ± 0.09 [A]	0.81 ± 0.05 [A]

All values are expressed as mean ± SEM. Fat mass%, Fat-free mass%: values expressed as a percentage of body weight. REE: resting energy expenditure). HOMA: homeostasis model assessment; HOMA-B%: estimate the pancreatic β-cell function; HOMA-S%: evaluate the insulin sensitivity and HOMA-IR: represent the insulin resistance. Paired wilcoxon tests for changes in these parameters between various time points.

[†] Comparison in 5 diabetic subjects without insulin injection, exogenous insulin may introduce a wrong interpretation of the HOMA test. Data not sharing the same letter within a horizontal line are significantly different (P<0.05).

Supplementary Table 3. **Composition of microbiota compared in diabetic (OB/D) and non-diabetic (OB/nD) subjects before surgery, and 3 months and 6 months after surgery.**

| | | Firmicutes | | | | | Bacteroidetes | |
	All-Bacteria [*]	Clostridium coccoides group [†]	Lactobacillus/ Leuconostoc/ Pediococcus group [†]	Clostridium leptum group [†]	Fecalibacterium prausnitzii species [†,‡]	Bifido-bacterium genus [†]	Bacteroides / Prevotella group [†]	E. coli species [†]
OB/nD								
M0 (23)	11.29 ± 0.1	- 1.58 ± 0.2[A]	- 2.75 ± 0.3[A]	- 0.86 ± 0.3[A]	- 1.45 ± 0.2[A]	- 2.37 ± 0.2[A]	- 1.61 ± 0.1[A]	- 3.42 ± 0.3[A]
M3 (20)	11.00 ± 0.2	- 1.90 ± 0.1[A]	- 3.26 ± 0.2[B]	- 1.04 ± 0.3[A]	- 1.85 ± 0.2[B]	- 3.10 ± 0.2[B]	- 0.91 ± 0.1[B]	- 1.76 ± 0.2[B]
M6 (11)	11.09 ± 0.2	- 1.50 ± 0.3[A]	- 3.57 ± 0.3[B]	- 0.37 ± 0.2[A]	- 1.40 ± 0.1[A]	- 2.85 ± 0.3[B]	- 1.02 ± 0.2[B]	- 2.13 ± 0.3[A]
OB/D								
M0 (7)	11.17 ± 0.1	- 1.46 ± 0.4[A]	- 2.62 ± 0.5[A]	- 1.63 ± 0.8[A]	- 2.79 ± 0.5[B]	- 2.22 ± 0.4[A]	- 1.61 ± 0.2[A]	- 2.49 ± 0.3[A]
M3 (6)	10.73 ± 0.4	- 1.92 ± 0.7[A]	- 2.81 ± 0.3[A]	- 0.69 ± 0.5[A]	- 1.78 ± 0.7[B]	- 2.45 ± 0.2[A]	- 0.86 ± 0.4[A]	- 1.18 ± 0.3[A]
M6 (4)	10.99 ± 0.2	- 1.70 ± 0.2[A]	- 3.63 ± 0.4[A]	- 0.57 ± 0.3[A]	- 1.82 ± 0.4[B]	- 3.06 ± 0.7[A]	- 0.75 ± 0.1[A]	- 1.27 ± 0.2[A]

Number in parentheses represents the numbers of studied samples.

Control: healthy female volunteers, OB/nD: obese subjects without diabetes, OB/D: obese subjects with diabetes,

Data not sharing the same letter within a column are significantly different (P<0.05) to the human population.

[*]All-Bacteria results obtained by qPCR were expressed as mean of the log10 value ± SEM.

[†]Results were expressed as mean of the log10 value ± SEM of normalized data, calculated as the log no. of targeted bacteria minus the log of all-bacteria number.

[‡]*Faecalibacterium prausnitzii* is the major component of the *Clostridium leptum* group.

Supplementary Table 4. Correlation between clinical parameters and microbiota before and after gastric surgery.
A Correlation before gastric surgery.
B Dynamic correlation during the follow-up after gastric surgery.

A

	Body weight	BMI	Body fat mass	Adipocyte diameter	Leptin	Fasting glucose	HbA1C	Insulin	HOMA-IR	hs CRP	IL-6	orosomucoid
Bacteroides /Prevotella												
OB/nD + OB/D	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
OB/nD	NS	NS	NS	Rs 0.52*	NS	NS	NS	NS	NS	Rs -0.43*	NS	NS
C. leptum												
OB/nD + OB/D	NS	NS	NS	NS	NS	Rs -0.39*	NS	NS	Rs -0.39*	Rs -0.44*	NS	NS
OB/nD	NS	NS	NS	NS	NS	NS	NS	NS	NS	Rs -0.43*	NS	NS
C.coccoides												
OB/nD + OB/D	NS	NS	NS	Rs 0.39*	NS	NS	NS	NS	NS	NS	NS	NS
OB/nD	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
E. coli												
OB/nD + OB/D	NS	NS	NS	NS	NS	NS	Rs 0.36*	NS	NS	NS	NS	NS
OB/nD	NS	NS	NS	NS	NS	NS	NS	Rs 0.52*	NS	NS	NS	NS
Faecalibacterium prausnitzii												
OB/nD + OB/D	NS	NS	NS	NS	NS	Rs -0.47*	Rs -0.39*	NS	Rs -0.47*	Rs -0.54†	Rs -0.65‡	NS
OB/nD	NS	NS	NS	NS	NS	NS	NS	NS	NS	Rs -0.58†	Rs -0.60†	NS

* p< 0.05, † p< 0.01, ‡ p< 0.001

B

	Body weight	BMI	Body fat mass	Leptin	Calorie intake	Fasting glucose	Insulin	Adipo-nectin	hsCRP	Il-6	Orosom ucoid
Bacteroides /Prevotella											
OB/nD + OB/D	Rs -0.33†	Rs -0.35†	Rs -0.32†	Rs -0.43†	Rs -0.33*	Rs -0.28*	NS	NS	Rs -0.27*	NS	Rs -0.31*
OB/nD	Rs -0.3*	Rs -0.3*	NS	Rs -0.39†	Rs -0.39*	Rs -0.36*	NS	NS	Rs -0.32*	NS	
C.leptum											
OB/nD + OB/D	NS	NS	NS	NS	NS	NS	NS	NS	Rs -0.31*	NS	NS
OB/nD	NS	NS	NS	NS	NS	NS	NS	NS	Rs -0.29*	NS	NS
Faecalibacterium prausnitzii											
OB/nD + OB/D	NS	NS	NS	NS	NS	NS	NS	NS	Rs -0.39†	Rs -0.35†	Rs -0.32*
OB/nD	NS	NS	NS	NS	NS	NS	NS	NS	Rs -0.37†	Rs -0.34†	Rs -0.30*
E. coli											
OB/nD + OB/D	Rs -0.42‡	Rs -0.47§	Rs -0.41‡	Rs -0.53¶	Rs -0.47‡	NS	NS	NS	NS	NS	Rs -0.38†
OB/nD	Rs -0.41†	Rs -0.47‡	Rs -0.45‡	Rs -0.55§	Rs -0.44†	Rs -0.35*	Rs -0.22*	Rs -0.33*	NS	NS	Rs -0.37*
Bifidobacterium											
OB/nD + OB/D	Rs 0.19†	Rs 0.17†	NS	Rs 0.34†	Rs 0.28*	NS	Rs 0.30*	NS	Rs 0.29*	NS	Rs 0.36†
OB/nD	NS	NS	NS	NS	NS	NS	Rs 0.29*	NS	NS	NS	Rs 0.36*
Lactobacillus/Leuconostoc/Pediococcus											
OB/nD + OB/D	NS	NS	NS	NS	Rs 0.29*	Rs 0.24*	Rs 0.28*	NS	NS	NS	NS
OB/nD	NS	NS	NS	NS	Rs 0.30†	NS	Rs 0.30*	NS	NS	NS	NS

* $p < 0.05$, † $p < 0.01$, ‡ $p < 0.001$, §$p < 0.0001$, ¶$p < 0.00001$

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Supplementary Table 5. Day to day variations for 7 bacterial groups from 5 lean subjects

	E.coli	Bacteroides/Prevotella	Bifidobacterium	Lactobacillus/Pediococcus	F. prausnitzii	C leptum	C coccoides
D1	-4.01±0.86	-1.1±0.25	-2.35±0.17	-4.04±0.37	-0.8±0.32	0.27±0.53	-1.49±0.33
D2	-3.8±0.54	-0.94±0.42	-2.55±0.37	-4±0.5	-0.87±0.25	-0.11±0.33	-1.81±0.2
p value	1	0.8125	0.8125	0.625	1	0.3125	0.0625

Values are expressed as mean ± SEM; (n=5). D1: first day, D2: second day. Paired Wilcoxon stands for analyzing parameters changes between various time points.

Supplementary Table 6. **Group and species-specific 16S rRNA-targeted primers and probes.**

Target organism	Primer and probe	Sequence 5'- 3'
All-Bacteria (*)	F_Bact 1369	CGG TGA ATA CGT TCC CGG
	R_Prok1492	TAC GG**C** TAC CTT GTT ACG ACT T
	P_TM1389F	**6FAM-CTT GTA CAC ACC GCC CGT C**
C. leptum	F_Clept 09	CCT TCC GTG CCG SAG TTA
	R_Clept 08	GAA TTA AAC CAC ATA CTC CAC TGC TT
	P-Clep 01	**6FAM-CAC AAT AAG TAA TCC ACC**
Bifidobacterium	F_Bifid 09c	CGG GTG AGT AAT GCG TGA CC
	R_Bifid 06	TGA TAG GAC GCG ACC CCA
	P_Bifid	**6FAM-CTC CTG GAA ACG GGT G**
C. coccoides	F_Ccoc 07	GAC GCC GCG TGA AGG A
	R_Ccoc 14	AGC CCC AGC CTT TCA CAT C
	P_Erec482(*)	**VIC-CGG TAC CTG ACT AAG AAG**
Bacteroides/ Prevotella	F_Bacter 11	CCT WCG ATG GAT AGG GGT T
	R_Bacter 08	CAC GCT ACT TGG CTG GTT CAG
	P_Bac303(*)	**VIC-AAG GTC CCC CAC ATT G**
E. coli	E.coli F	CAT GCC GCG TGT ATG AAG AA
	E.coli R	CGG GTA ACG TCA ATG AGC AAA
Lactobacillus/ Leuconostoc/ Pediococcus	F_Lacto 05	AGC AGT AGG GAA TCT TCC A
	R_Lacto 04	CGC CAC TGG TGT TCY TCC ATA TA
F. prausnitzii	Fprau 07	CCA TGA ATT GCC TTC AAA ACT GTT
	Fprau 02	GAG CCT CAG CGT CAG TTG GT

(*) modified from reference
Primers and probes used in this study are as previously described (16;17). Probe sequences are in bold.

Supplementary Figure 1: Dynamic evolution of *F. prausnitzii* population levels from M0 to M3 and M6 after gastric surgery in obese diabetic (OB/D) and non-diabetic (OB/nD) subjects.
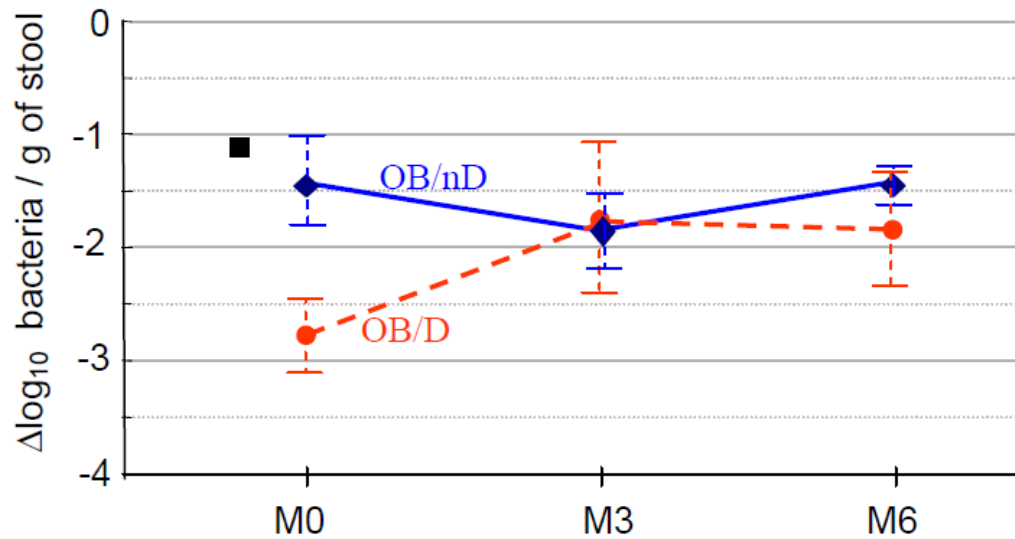
■ Average *F. prausnitzii* population levels in control subjects.

Results were expressed as mean ± SEM of the $\Delta\log10$ value of normalized data, calculated as the log number of targeted bacteria minus the log number of All-Bacteria.