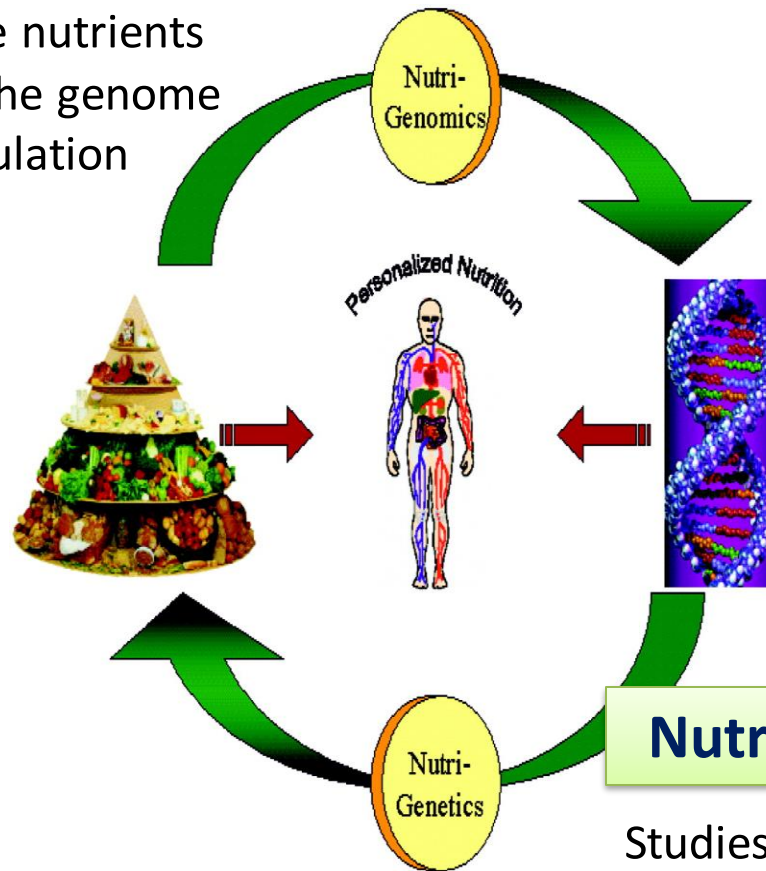


The new era of Nutritional Medicine

Nutrigenomics

Studies the effects that the nutrients has on the genome regulation



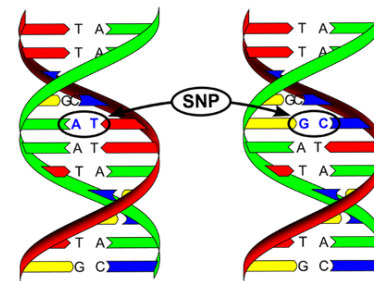
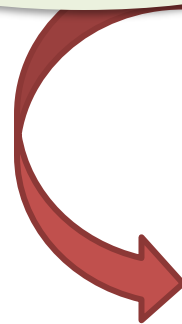
Nutrigenetics

Studies the effect of genetic variants on the metabolism of food

DIET



NUTRIENTS



SNPs



PHENOTYPE

Male subjects undergoing ART

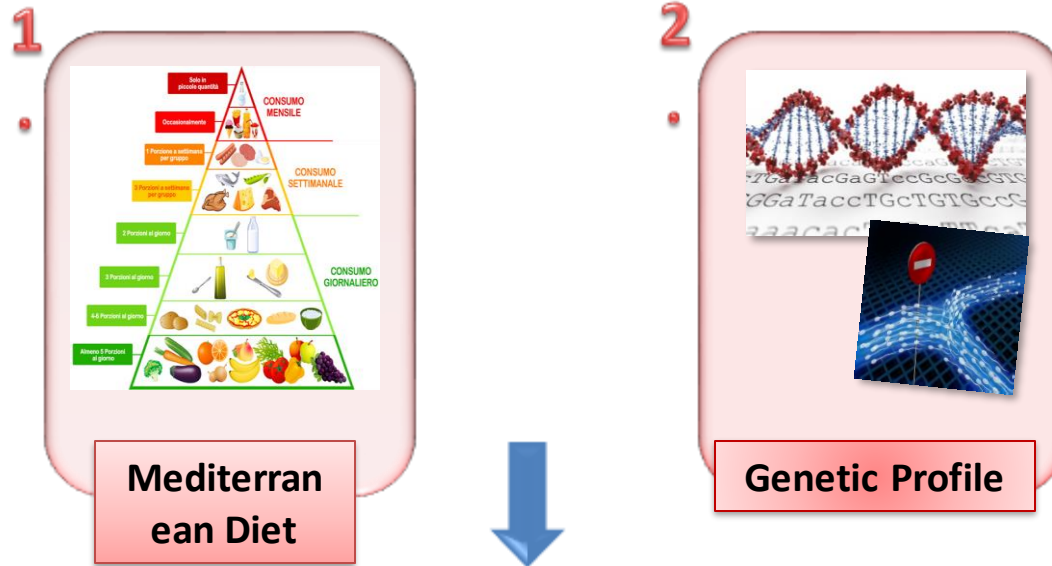
Cases:

- Males with impaired spermatogenesis (mild oligozoospermia/asthenozoospermia/teratozoospermia)

Controls:

- Males with normal sperm count

Aim of the project



- ◆ To understand if nutrigenetics variants are related to male infertility;
 - ◆ Quality of the male sperm →
 - ◆ Outcome ART and Epigenetics modification in AFCs
- ◆ To set up personalized diet improving fertility

- Count
- Motility
- Morphology
- Epigenetic changes

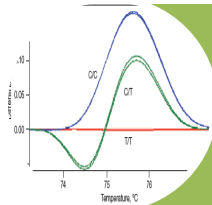
Study design



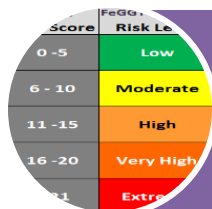
1. Calculation of adherence to the Mediterranean diet with MedDietScore



2. Calculation of BMI and collected information on lifestyle (smoking, drugs, sports, blood analysis)



3. Genotyping analyzes of 9 SNPs



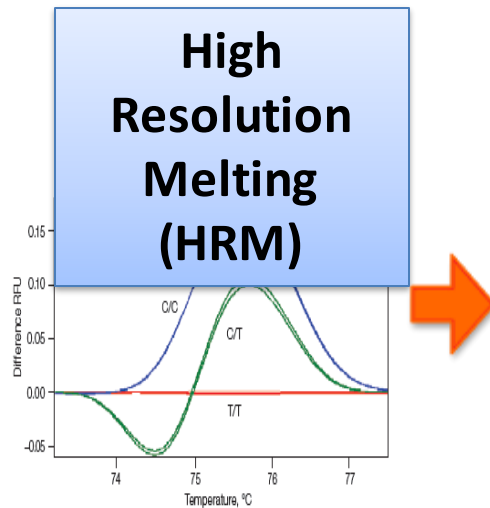
4. Calculation of Genetic Risk Score (GRS), Diet Risk Score (DRS) and Cumulative Score (CS)



5. Statistical analysis (Odds Ratio, Hardy-Weinberg Equilibrium and p -value...)



3. Genotyping analysis



CARBOHYDRATES METABOLISM	SNPs
TCF7L2	rs7903146
PPAR γ	rs1801282
PGC1 α	rs8192678
LIPIDS METABOLISM	SNPs
APOA5	rs662799
FTO	rs9939609
MC4R	rs17782313
GCKR	rs1260326
LDLR	rs2228671
FOLATE METABOLISM	SNPs
MTHFR	rs1801133

NORMAL WEIGHT (BMI 18,5-24,99)

CODICE	Patologia	BMI	%	TCF7L2	PPARG 2	PPARG C1a	APOA5	MC4R	LDLR	GCKR	FTO	MTHFR	GRS	DRS	CS
FC-369-15	Oligoastenozoospermia	19,6	49,1	CC	CC	CT	TT	TT	CC	TT	AT	CT	5	5,1	10,1
FC-56-16	Terato/Astenozoospermia	20,8	58,2	CT	CG	CC	CT	TT	TT	TT	TT	TT	7	4,2	11,2
499	Astenozoospermia	21,3	47,3	CT	CG	CT	CC	CT	CT	TT	AT	CC	9	5,3	14,3
FC-338-15/Y-48-15	Oligoteratozoospermia	21,7	56,4	CC	CC	CC	TT	TT	CC	CT	AT	CT	3	4,4	7,4
450	Oligoastenozoospermia	22,1	69,1	CC	CC	CT	TT	TT	CC	CC	AT	CT	3	3,1	6,1
FC-417-15	Oligozoospermia	22,4	36,4	CC	CC	CT	CT	CC	TT	CT	TT	CT	6	6,4	12,4
FC-106-16, Y-13-16	Oligozoospermia	22,8	58,2	TT	CC	TT	TT	TT	CC	CT	AA	CT	8	4,2	12,2
471	Oligozoospermia	23,37	63,6	TT	CC	CT	TT	TT	CC	CT	AA	CT	7	3,6	10,6
FC-377-15	Oligoastenozoospermia	24	63,6	CT	CC	CC	TT	TT	CC	CC	TT	CT	2	3,6	5,6
493	Oligozoospermia	24,34	45,5	CT	CC	CT	TT	TT	CC	TT	AT	TT	7	5,5	12,5
FC-155-15	Astenozoospermia	24,57	50,9	CT	CC	CC	CT	TT	CC	CC	TT	CC	2	4,9	6,9
467	Astenozoospermia	24,62	58,2	CC	CC	CT	TT	TT	CC	CT	AT	CT	5	4,2	9,2
452	OAT	24,76	83,6	CT	CC	CC	TT	TT	CC	TT	AA	CT	6	1,6	7,6
FC-115-16	Oligozoospermia	24,9	67,3	CT	CC	CT	TT	TT	CT	CT	AT	CT	5	3,3	8,3
437	Oligoastenozoospermia	24,9	67,3	CC	CC	CC	CT	TT	CC	CT	AA	CT	5	3,3	8,3
FC-291-15	Normospermia	19,1	74,5	TT	CC	CC	TT	TT	CC	TT	AA	CC	6	2,6	8,6
FC-129-15	Normospermia	20,3	65,5	CT	CC	CC	CT	CT	CC	CT	AT	CT	6	3,5	9,5
492	Normospermia	20,45	63,6	CT	CC	TT	TT	CT	CC	CT	AT	CC	6	3,6	9,6
460	Normospermia	20,91	63,6	CT	CC	CT	TT	TT	CC	CT	TT	CC	3	3,6	6,6
430	Normospermia	20,96	52,7	CC	CC	CC	TT	TT	CT	CC	AT			4,7	
FC-251-15	Normospermia	21	61,8	CT	CC	CC	CT	TT	CC	CC	AA	CT	5	3,8	8,8
FC-152-15	Normospermia	21,1	60	CC	CC	CC	TT	TT	CC	TT	AT	CC	3	4	7
490	Normospermia	21,11	72,7	TT	CG	TT	TT	TT	CC	CC	AT	CC	6	2,7	8,7
476	Normospermia	21,68	60	CT	CC	CT	CT	TT	CC	CT	AT	CT	6	4	10
Y-49-15	Normospermia	21,8	65,5	TT	CC	CC	TT	TT	CT	TT	AT	TT	10	3,5	13,5
FC-26-16	Normospermia	21,9	54,5	CC	CG	CT	TT	CT	CC	CC	TT	CT	4	4,6	8,6
494	Normospermia	21,91	49,1	CC	CC	CC	TT	CC	CC	TT	AT	CC	5	5,1	10,1
FC-374-15	Normospermia	22,7	78,2	TT	CG	CC	CT	CT	CC	CC	AA	CT	8	2,2	10,2
504	Normospermia	22,72	50,9	CT	CC	CT	TT	CT	CC	TT	AT	CT	7	4,9	11,9
484	Normospermia	22,72	56,4	CT	CC	CC	CC	CT	CC	TT	AA	CT	7	4,4	11,4
500	Normospermia	22,9	52,7	CT	CG	CC	CC	CC	CC	TT	AT	TT	11	4,7	15,7
495	Normospermia	23,3	54,5	CT	CC	CC	TT	CT	CC	CC	AA	CC	4	4,6	8,6
439	Normospermia	23,36	67,3	CT	CC	CC	TT	TT	CC	CC	AA	TT	5	3,3	8,3
505	Normospermia	23,39	52,7	CT	CC	CC	TT	TT	CC	TT	AT	CT	5	4,7	9,7
457	Normospermia	23,41	45,5	CT	CG	CT	TT	TT	CC	CT	TT	CT	5	5,5	10,5
488	Normospermia	23,46	36,4	CC	CC	CC	TT	TT	CC	CT	AT	CC	2	6,4	8,4
FC-79-16	Normospermia	23,5	60	CT	CC	CT	TT	CT	CC	TT	AA	CT	8	4	12
470	Normospermia	23,51	67,3	TT	CC	CT	TT	CT	CC	CT	AT	CC	6	3,3	9,3
474	Normospermia	23,67	30,9	CC	CC	CC	TT	CT	CC	CC	AT	CT	3	6,9	9,9
475	Normospermia	23,67	49,1	CT	CG	CC	TT	CT	CC	CT	AT	CC	5	5,1	10,1
FC-246-15	Normospermia	23,7	52,7	CC	CC	CC	CT	CT	CC	CT	TT	CT	6	4,7	10,7
468	Normospermia	23,73	45,5	CT	CG	CT	CT	CT	CC	CT	TT	CC	6	5,5	11,5
FC-267-15	Normospermia	24,1	47,3	CC	CC	CT	TT	TT	CC	CT	AA	CC	6	5,3	11,3
FC-35-16	Normospermia	24,3	67,3	TT	CG	CC	TT	CT	CT	TT	AA	CC	8	3,3	11,3
FC-406-15	Normospermia	24,4	47,3	CT	CG	TT	CT	TT	CC	CT	AA	TT	10	5,3	15,3
435	Normospermia	24,57	61,8	CC	CC	CC	TT	TT	CC	CC	TT			3,8	
FC-149-15	Normospermia	24,7	58,2	CT	CG	CT	TT	CT	CT	CT	TT	CT	6	4,2	10,2
487	Normospermia	24,72	74,5	TT	CC	CT	TT	CT	CT	CT	AT	CT	8	2,6	10,6
461	Normospermia	24,93	65,5	CT	CG	CC	CT	TT	CC	CT	AA	CC	6	3,5	9,5

TOT. 49

IMPAIRED SPERMATOGENESIS:

15 (30,61%)

NORMOSPERMIC: 34 (69,39%)

OVERWEIGHT (BMI 25-29,99)

CODICE	SPERMIOGRAMMA	BMI	%	TCF7L2	PPARG2	PPARGC1a	APOA5	MC4R	LDLR	GCKR	FTO	MTHFR	GRS	DRS	CS
FC-103-16, Y-12-16	Oligozoospermia	25,1	78,2	CC	CC	CT	TT	CT	CC	TT	AT	CT	6	2,2	8,2
Y-11-15	Oligozoospermia	25,3	63,6	CT	CC	CT	TT	TT	CT	CC	AT	TT	5	3,6	8,6
Y-52-15	Oligoastenozoospermia	25,4	49,1	CC	CG	CT	CT	TT	CC	TT	AT	CT	7	5,1	12,1
FC-130-16, Y-18-16	Oligoastenozoospermia	25,5	52,7	CC	CC	CT	CT	TT	CC	CT	TT	CT	4	4,7	8,7
FC-190-15	Oligozoospermia lieve	25,54	60	CT	CC	CT	TT	TT	CC	TT	AT	TT	7	4	11
FC-361-15	Oligoastenozoospermia	25,6	67,3	CC	CC	CT	TT	TT	CC	TT	AT	CC	4	3,3	7,3
FC-12-16, Y-1-16	Oligozoospermia	26	52,7	CC	CC	CC	CT	CC	CC	CC	AA	TT	7	4,7	11,7
469	oligoastenozoospermia	26,01	38,2	CC	CG	CC	TT	CC	CC	CT	AT	CT	6	6,2	12,2
FC-101-15 / Y-16-15	Oligozoospermia	26,1	50,9	CC	CC	TT	CT	CT	CT	CC	TT	CT	5	4,9	9,9
Y-17-15	Oligozoospermia idiopatica	26,2	47,3	CT	CC	CT	TT	CT	CT	CT	TT	CT	5	5,3	10,3
FC-128-15	Oligospermia di rid d (4 ML di spermatozoi)	26,2	74,5	CT	CC	CT	CT	CC	CC	CC	AA	CC	7	2,6	9,6
486	oligozoospermia	26,23	54,5	TT	CC	CT	TT	CT	CC	CC	TT	CT	5	4,6	9,6
502	astenozoospermia	26,58	67,3	CC	CC	CT	CC	TT	CC	CC	TT	CC	3	3,3	6,3
FC-320-15 / Y-43-15	Oligozoospermia	26,9	56,4	CT	CC	CT	TT	TT	CC	TT	TT	CT	5	4,4	9,4
FC-350-15	Astenozoospermia	26,95	70,9	CC	CC	CC	CT	TT	CC	CC	AT	CC	2	2,9	4,9
FC-20-16, Y-2-16	Oligozoospermia (5 ML di spz)	27,1	58,2	TT	CG	CT	TT	TT	CC	TT	AA	CT	9	4,2	13,2
483	teratooligozoospermia	27,1	50,9	CC	CC	CT	TT	CT	CT	TT	AT	CC	5	4,9	9,9
433	oligozoospermia	27,38	50,9	CT	CC	CC	TT	CT	CT	CC	AT	CT	4	4,9	8,9
FC-105-15	Oligoastenoospermico	27,7	61,8	TT	CC	CT	TT	TT	CC	CT	AT	CT	6	3,8	9,8
Y-18-15	Oligospermia idiopatica	27,7	45,5	CC	CC	CT	CT	TT	CC	CC	AA	TT	6	5,4	11,4
FC-77-16	Teratozoospermia	27,8	50,9	CT	CC	CT	TT	TT	CC	TT	TT	CT	5	4,9	9,9
FC-313-15	Oligoteratozoospermia	28	58,2	CT	CC	CT	TT	TT	CC	CT	AT	CT	5	4,2	9,2
434	oligoastenozoospermia grave	28,08	58,2	CT	CC	CC	TT	TT	CC	CC	AT	CC	2	4,2	6,2
Y-27-15	Oligozoospermia	28,4	50,9	CT	CC	CC	TT	TT	CC	CT	AT	CC	3	4,9	7,9
479	teratooligoastenozoospermia	29,32	70,9	CT	CG	CC	TT	CT	CC	CT	AA	CT	7	2,9	9,9
FC-156-15	Oligozoospermia	29,41	60	CT	CG	CC	TT	TT	CC	CC	AT	CT	4	4	8
FC-126-16	Oligoastenozoospermia	29,41	61,8	TT	CG	TT	TT	TT	CC	CC	AA	CC	7	3,8	10,8
464	oligozoospermia	29,41	56,4	CT	CG	CT	CT	TT	CT	CC	AA	CT	7	4,4	11,4
503	oligozoospermia	29,84	54,5	CT	CC	CC	CT	TT	CC	CT	AT	CT	5	4,6	9,6
443	Normozoospermia	25,06	67,3	CT	CC	CC	TT	TT	CC	TT	AT	CC	4	3,3	7,3
FC-359-15	Normozoospermia	25,1	60	TT	CG	CT	TT	CT	CC	CC	AT	CC	6	4	10
FC-224-15	Normozoospermia	25,5	50,9	CT	CC	TT	TT	CT	CC	TT	AT	CC	9	4,9	13,9
432	Normozoospermia	25,68	63,6	CC	CG	CT	CT	CT	CC	CC	AT	CT	6	3,6	9,6
473	Normozoospermia	25,73	58,2	CT	CC	CT	TT	CT	CT	CC	TT	CT	4	4,2	8,2
472	Normozoospermia	25,77	56,4	TT	CC	TT	CT	CT	CC	CC	AT	TT	9	4,4	13,4
446	Normozoospermia	25,8	63,6	CT	CC	CC	TT	CT	CT	TT	AT	CT	6	3,6	9,6
FC-25-16	Normozoospermia	25,8	41,8	TT	CG	CT	CT	CT	CC	CC	AT	CC	7	5,8	12,8
FC-212-15	Normozoospermia	25,95	60	TT	CC	TT	CT	CT	CC	TT	TT	CT	9	4	13
FC-266-15	Normozoospermia	26	49,1	CT	CC	CT	TT	CT	CC	CT	AT	CT	6	5,1	11,1
FC-97-16	Normozoospermia	26,1	47,3	CT	CG	CC	TT	CT	CC	TT	AT	CT	7	5,3	12,3
454	Normozoospermia	26,15	58,2	CC	CG	CC	TT	TT	CT	TT	AT	CT	5	4,2	9,2
453	Normozoospermia	26,2	43,6	CT	CC	CC	TT	CT	CT	TT	AA	CT	7	5,6	12,6
478	Normozoospermia	26,53	50,9	CC	CG	CT	TT	TT	CT	CT	AA	CT	6	4,9	10,9
501	Normozoospermia	26,75	56,4	CC	CC	CC	CC	TT	CT	CT	AT	CT	5	4,4	9,4
FC-82-16	Normozoospermia	26,9	52,7	CT	CC	CT	CC	TT	CC	CT	AT	CT	5	4,7	9,7
442	Normozoospermia	27,72	67,3	CC	CC	CC	TT	TT	CC	TT	AT	CT	4	3,3	7,3
465	Normozoospermia	27,77	47,3	CC	CG	CT	TT	CT	CT	CT	AA	CC	6	5,3	11,3
FC-281-15	Normozoospermia	27,8	60	CC	CC	CC	CT	TT	CT	CT	TT	CT	2	4	6
456	Normozoospermia	27,92	54,5	CT	CC	TT	TT	TT	CC	CT	AT	TT	7	4,6	11,6
438	Normozoospermia	28,07	47,3	CT	CC	TT	TT	CT	CC	CT	TT	CT	6	5,3	11,3
FC-171-15	Normozoospermia	28,3	67,3	CT	CG	TT	TT	TT	CT	TT	TT	CT	7	3,3	10,3
FC-214-15	Normozoospermia	28,33	61,8	CT	CC	CT	CT	TT	CC	TT	TT	TT	7	3,8	10,8
482	Normozoospermia	28,38	56,4	CC	CC	CT	TT	CT	CC	CC	AT	CT	4	4,4	8,4
FC-220-15	Normozoospermia	28,4	65,5	CC	CC	CT	CT	CT	CC	TT	TT	CC	5	3,5	8,5
FC-108-15	Normozoospermia	29	60	TT	CC	CT	TT	CT	CT	TT	AT	CT	10	4	14
FC-367-15	Normozoospermia	29,7	56,4	CC	CC	TT	TT	CT	CC	TT	AT	TT	11	4,4	15,4

TOT. 56

IMPAIRED SPERMATOGENESIS:

29 (51,79%)

NORMOSPERMIC: 27 (48,21%)

OBESE (BMI > 30)

CODICE	Patologia	BMI	%	TCF7L2	PPARG2	PPARGC1a	APOA5	MC4R	LDLR	GCKR	FTO	MTHFR	GRS	DRS	CS
FC-394-15	Oligozoospermia (6 ML di spz)	30,9	56,4	TT	CG	CC	TT	CT	CT	TT	AT	CC	7	4,4	11,4
FC-116-15	Varicocele	31,8	60	CC	CC	CC	CT	TT	CT	TT	TT	CC	3	4	7
444 (SIENA)	teratooligoastenozoospermia	32,08	50,9	CC	CC	CT	TT	CT	CC	CT	AT	CC	4	4,9	8,9
FC-145-16, Y-20-16	Oligozoospermia (12 milioni/ml)	33,06	69,1	CT	CC	CT	TT	CT	CC	CT	AA	CT	7	3,1	10,1
FC-419-15	Astenozoospermia	34	67,3	TT	CC	CT	TT	TT	CC	CC	AA	CT	6	3,3	9,3
Y-19-15	Oligospermia severa	53,9	47,3	CC	CC	CT	CT	TT	CC	TT	TT	CT	5	5,3	10,3
FC-157-15	Oligozoospermia	30,37	43,6	CC	CC	CC	CT	CC	CT	CT	AT	TT	7	5,6	12,6
FC-173-15	Normospermia	32,7	58,2	CT	CG	CT	CT	TT	CC	TT	AA	CT	9	4,2	13,2
FC-278-15	Normospermia	34,29	67,3	CT	CC	TT	TT	TT	CC	CC	AA	CT	6	3,3	9,3
496 (SIENA)	Normospermia	31,12	72,7	CT	CC	TT	TT	TT	CC	CT	AA	TT	8	2,7	10,7
477 (SIENA)	Normospermia	32,14	60	CC	CC	CT	CC	TT	CC	CT	TT	CT	5	4	7
447 (SIENA)	Normospermia	33,95	56,4	CT	CC	CT	TT	TT	CC	CT	TT	CC	3	4,4	7,4
FC-1-16	Normospermia	30,4	50,9	CC	CC	CC	TT	TT	CC	TT	AA	CC	4	4,9	11
FC-94-16	Normospermia	32,7	49,1	TT	CC	TT	TT	CC	CC	TT	TT	TT	10	5,1	9,2
FC-218-15	Normospermia	33,8	50,9	CT	CC	CT	TT	TT	CT	CT	TT	CT	4	4,9	9,4
TOT. 15															

☐ IMPAIRED SPERMATOGENESES: 7
☐ (46,67%)
☐ NORMOSPERMIC: 8 (53,33%)

OBESE + OVERWEIGHT (BMI>25)

CODICE	Patologia	BMI	%	TCF7L2	PPARG2	PPARGC1a	APOA5	MC4R	LDLR	GCKR	FTO	MTFR	GRS	DRS	CS
FC-103-16, Y-12-16	Oligozoospermia	25,1	78,2	CC	CC	CT	CT	CT	CT	CT	AT	CT	6	2,2	8,2
Y-11-15	Oligozoospermia	25,3	63,6	CT	CC	CT	CT	CT	CT	CT	AT	CT	5	3,6	8,6
Y-52-15	Oligoastenozoospermia	25,4	49,1	CC	CG	CT	CT	CT	CT	CT	AT	CT	7	5,1	12,1
FC-130-16, Y-18-16	Oligoastenozoospermia	25,5	52,7	CC	CC	CT	CT	CT	CT	CT	CT	CT	4	4,7	8,7
FC-190-15	Oligozoospermia lieve	25,54	60	CT	CC	CT	CT	CT	CT	CT	AT	CT	7	4	11
FC-361-15	Oligoastenozoospermia	25,6	67,3	CC	CC	CT	CT	CT	CT	CT	AT	CT	4	3,3	7,3
FC-12-16, Y-1-16	Oligozoospermia	26	52,7	CC	CC	CC	CT	CC	CC	CC	AA	CT	7	4,7	11,7
469	oligoastenozoospermia	26,01	38,2	CC	CG	CC	CT	CC	CC	CT	AT	CT	6	6,2	12,2
FC-101-15 / Y-16-15	Oligozoospermia	26,1	50,9	CC	CC	CT	CT	CT	CT	CT	CT	CT	5	4,9	9,9
Y-17-15	Oligozoospermia idiopatica	26,2	47,3	CT	CC	CT	CT	CT	CT	CT	CT	CT	5	5,3	10,3
FC-128-15	Oligospermia di nnd (4 ML di spermatozoi)	26,2	74,5	CT	CC	CT	CT	CC	CC	CC	AA	CT	7	2,6	9,6
486	oligozoospermia	26,23	54,5	CT	CC	CT	CT	CT	CC	CC	CT	CT	5	4,6	9,6
502	astenozoospermia	26,58	67,3	CC	CC	CT	CC	CT	CC	CC	CT	CT	3	3,3	6,3
FC-320-15 / Y-43-15	Oligozoospermia	26,9	56,4	CT	CC	CT	CT	CT	CT	CT	CT	CT	5	4,4	9,4
FC-350-15	Astenozoospermia	26,99	70,9	CC	CC	CC	CT	CT	CC	CC	AT	CT	2	2,9	4,9
FC-20-16, Y-2-16	Oligozoospermia (5 ML di spz)	27,1	58,2	CT	CG	CT	CT	CT	CT	CT	AA	CT	9	4,2	13,2
483	teratooligoastenozoospermia	27,1	50,9	CC	CC	CT	CT	CT	CT	CT	AT	CT	5	4,9	9,9
433	oligozoospermia	27,36	50,9	CT	CC	CC	CT	CT	CT	CT	AT	CT	4	4,9	8,9
FC-105-15	Oligoastenospermico	27,7	61,8	CT	CC	CT	CT	CT	CT	CT	AT	CT	6	3,8	9,8
Y-18-15	Oligospermia idiopatica	27,7	45,5	CC	CC	CT	CT	CT	CT	CT	AA	CT	6	5,4	11,4
FC-77-16	Teratozoospermia	27,8	50,9	CT	CC	CT	CT	CT	CT	CT	CT	CT	5	4,9	9,9
FC-313-15	Oligoteratozoospermia	28	58,2	CT	CC	CT	CT	CT	CT	CT	AT	CT	5	4,2	9,2
434	oligoastenozoospermia grave	28,08	58,2	CT	CC	CC	CT	CT	CT	CT	AT	CT	2	4,2	6,2
Y-27-15	Oligozoospermia	28,4	50,9	CT	CC	CC	CT	CT	CT	CT	AT	CT	3	4,9	7,9
479	teratooligoastenozoospermia	29,32	70,9	CT	CG	CC	CT	CT	CC	CT	AA	CT	7	2,9	9,9
FC-156-15	Oligozoospermia	29,41	60	CT	CG	CC	CT	CT	CT	CC	AT	CT	4	4	8
FC-126-16	Oligoastenozoospermia	29,41	61,8	CT	CG	CT	CT	CT	CC	CC	AA	CT	7	3,8	10,8
464	oligozoospermia	29,41	56,4	CT	CG	CT	CT	CT	CT	CT	AA	CT	7	4,4	11,4
503	oligozoospermia	29,84	54,5	CT	CC	CC	CT	CT	CT	CT	AT	CT	5	4,6	9,6
FC-157-15	Oligozoospermia	30,37	43,6	CC	CC	CC	CT	CC	CT	CT	AT	CT	7	5,6	12,6
FC-394-15	Oligozoospermia (6 ML di spz)	30,9	56,4	CT	CG	CC	CT	CT	CT	CT	AT	CT	7	4,4	11,4
FC-116-15	Varicocele	31,8	60	CC	CC	CC	CT	CT	CT	CT	CT	CT	3	4	7
444	teratooligoastenozoospermia	32,08	50,9	CC	CC	CT	CT	CT	CT	CT	AT	CT	4	4,9	8,9
FC-145-16, Y-20-16	Oligozoospermia (12 milioni/ml)	33,06	69,1	CT	CC	CT	CT	CT	CT	CT	AA	CT	7	3,1	10,1
FC-419-15	Astenozoospermia	34	67,3	CT	CC	CT	CT	CT	CT	CC	AA	CT	6	3,3	9,3
Y-19-15	Oligospermia severa	53,9	47,3	CC	CC	CT	CT	CT	CT	CT	CT	CT	5	5,3	10,3
443	Normozoospermia	25,06	67,3	CT	CC	CC	CT	CT	CT	CT	AT	CT	4	3,3	7,3
FC-359-15	Normozoospermia	25,1	60	CT	CG	CT	CT	CT	CT	CC	AT	CT	6	4	10
FC-224-15	Normozoospermia	25,5	50,9	CT	CC	CT	CT	CT	CT	CT	AT	CT	9	4,9	13,9
432	Normozoospermia	25,68	63,6	CC	CG	CT	CT	CT	CT	CC	AT	CT	6	3,6	9,6
473	Normozoospermia	25,73	58,2	CT	CC	CT	CT	CT	CT	CC	CT	CT	4	4,2	8,2
472	Normozoospermia	25,77	56,4	CT	CC	CT	CT	CT	CT	CC	AT	CT	9	4,4	13,4
446	Normozoospermia	25,8	63,6	CT	CC	CC	CT	CT	CT	CT	AT	CT	6	3,6	9,6
FC-25-16	Normozoospermia	25,8	41,8	CT	CG	CT	CT	CT	CT	CC	AT	CT	7	5,8	12,8
FC-212-15	Normozoospermia	25,95	60	CT	CC	CT	CT	CT	CT	CT	CT	CT	9	4	13
FC-266-15	Normozoospermia	26	49,1	CT	CC	CT	CT	CT	CT	CC	AT	CT	6	5,1	11,1
FC-97-16	Normozoospermia	26,1	47,3	CT	CG	CC	CT	CT	CT	CT	AT	CT	7	5,3	12,3
454	Normozoospermia	26,15	58,2	CC	CG	CC	CT	CT	CT	CT	AT	CT	5	4,2	9,2
453	Normozoospermia	26,2	43,6	CT	CC	CC	CT	CT	CT	CT	AA	CT	7	5,6	12,6
478	Normozoospermia	26,53	50,9	CC	CG	CT	CT	CT	CT	CT	AA	CT	6	4,9	10,9
501	Normozoospermia	26,75	56,4	CC	CC	CC	CC	CT	CT	CT	AT	CT	5	4,4	9,4
FC-82-16	Normozoospermia	26,9	52,7	CT	CC	CC	CT	CT	CT	CT	AT	CT	5	4,7	9,7
442	Normozoospermia	27,72	67,3	CC	CC	CC	CT	CT	CT	CT	AT	CT	4	3,3	7,3
465	Normozoospermia	27,77	42,3	CC	CG	CT	CT	CT	CT	CT	AA	CT	6	5,3	11,3
FC-281-15	Normozoospermia	27,8	60	CC	CC	CC	CT	CT	CT	CT	CT	CT	2	4	6
456	Normozoospermia	27,92	54,5	CT	CC	CT	CT	CT	CT	CT	AT	CT	7	4,6	11,6
438	Normozoospermia	28,07	47,3	CT	CC	CT	CT	CT	CT	CC	CT	CT	6	5,3	11,3
FC-171-15	Normozoospermia	28,3	67,3	CT	CG	CT	CT	CT	CT	CT	CT	CT	7	3,3	10,3
FC-214-15	Normozoospermia	28,33	61,8	CT	CC	CT	CT	CT	CT	CT	CT	CT	7	3,8	10,8
482	Normozoospermia	28,39	56,4	CC	CC	CT	CT	CT	CT	CC	AT	CT	4	4,4	8,4
FC-220-15	Normozoospermia	28,4	65,5	CC	CC	CT	CT	CT	CT	CT	CT	CT	5	3,5	8,5
FC-108-15	Normozoospermia	29	60	CT	CC	CT	CT	CT	CT	CT	AT	CT	10	4	14
FC-367-15	Normozoospermia	29,7	56,4	CC	CC	CT	CT	CT	CT	CT	AT	CT	11	4,4	15,4
FC-1-16	Normozoospermia	30,4	50,9	CC	CC	CC	CT	CT	CT	CT	AA	CT	6	4,9	10,9
496	Normozoospermia	31,12	72,7	CT	CC	CT	CT	CT	CT	CT	AA	CT	8	2,7	10,7
477	Normozoospermia	32,14	60	CC	CC	CT	CC	CT	CT	CT	CT	CT	3	4	7
FC-173-15	Normozoospermia	32,7	58,2	CT	CG	CT	CT	CT	CT	CT	AA	CT	9	4,2	13,2
FC-94-16	Normozoospermia	32,7	49,1	CT	CC	CT	CT	CT	CC	CT	CT	CT	10	5,1	15,1
FC-218-15	Normozoospermia	33,8	50,9	CT	CC	CT	CT	CT	CT	CT	CT	CT	6	4,9	10,9
447	Normozoospermia	33,95	56,4	CT	CC	CT	CT	CT	CT	CT	CT	CT	3	4,4	7,4
FC-278-15	Normozoospermia	34,29	67,3	CT	CC	CT	CT	CT	CT	CC	AA	CT	6	3,3	9,3

TOT. 71

IMPAIRED

SPERMATOGENESIS:

36 (50,7%)

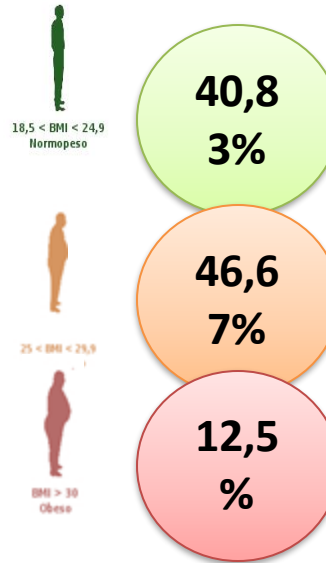
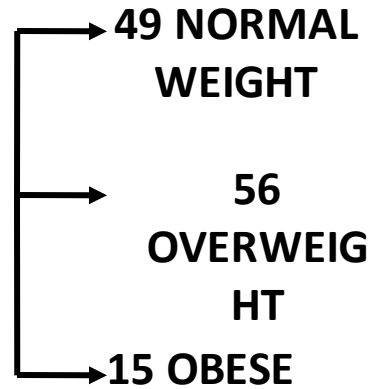
NORMOSPERMIC: 35

(49,3%)

THEREFORE

...

120
SUBJECTS

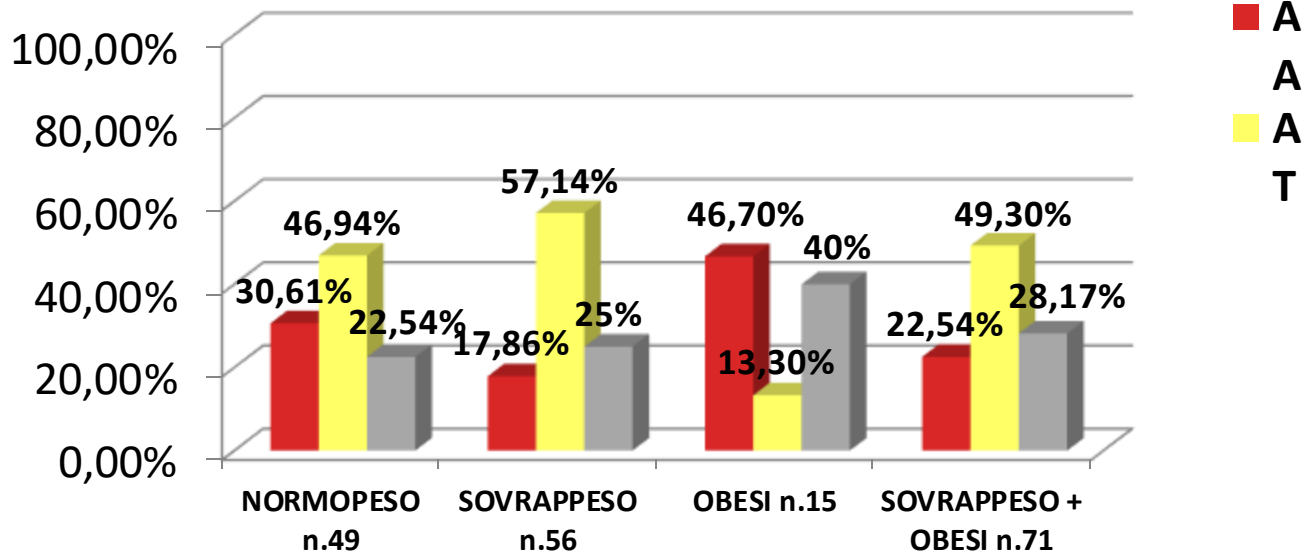


SPERMIOGRAM

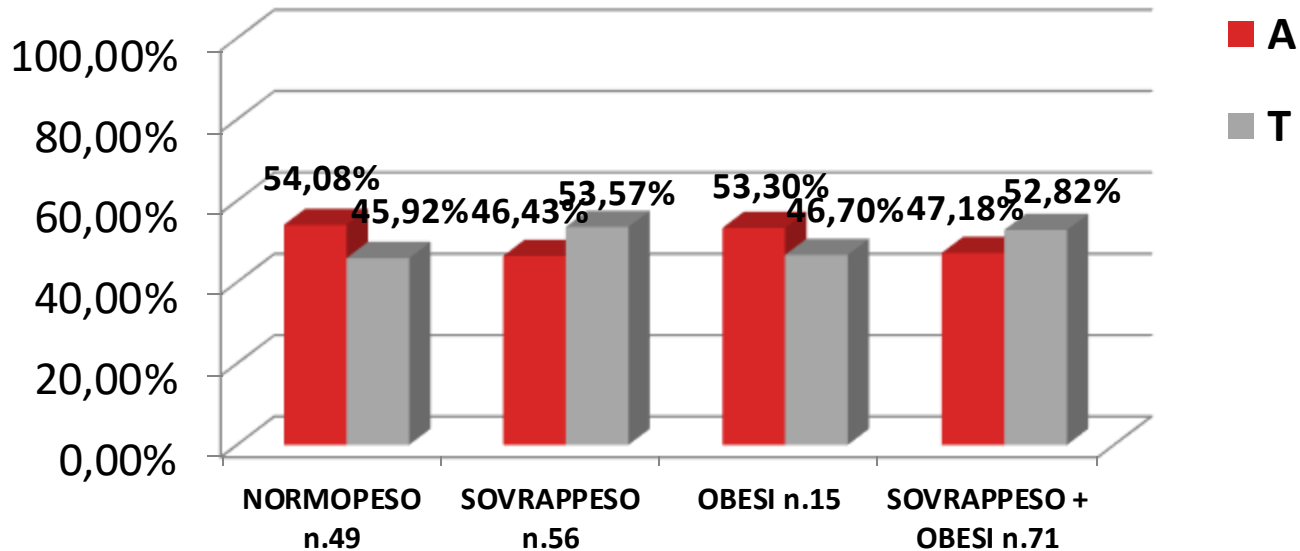
	NORMAL WEIGHT n.49	OVERWEIGHT n.56	OBESE n.15	OVERWEIGHT + OBESE n.71
IMPAIRED SPERMATOGENESIS	30,61%	51,79%	46,67%	50,7%
NORMOSPERMIC	69,39%	48,21%	53,33%	49,3%

FTO rs9939609

Risk allele 'A'

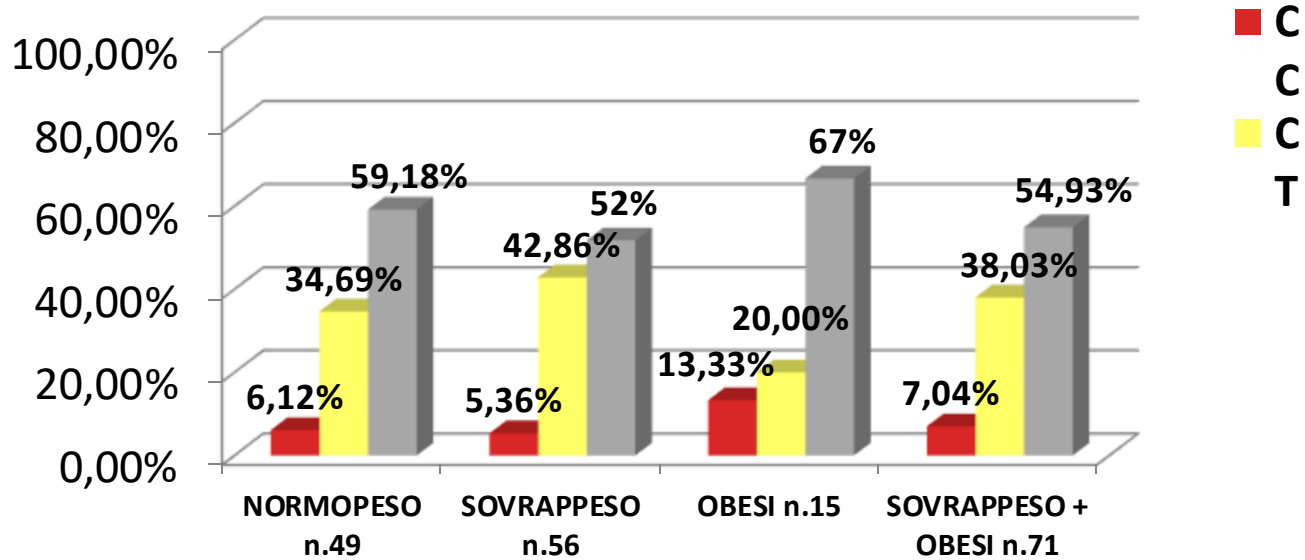


FOR ALLELE ...

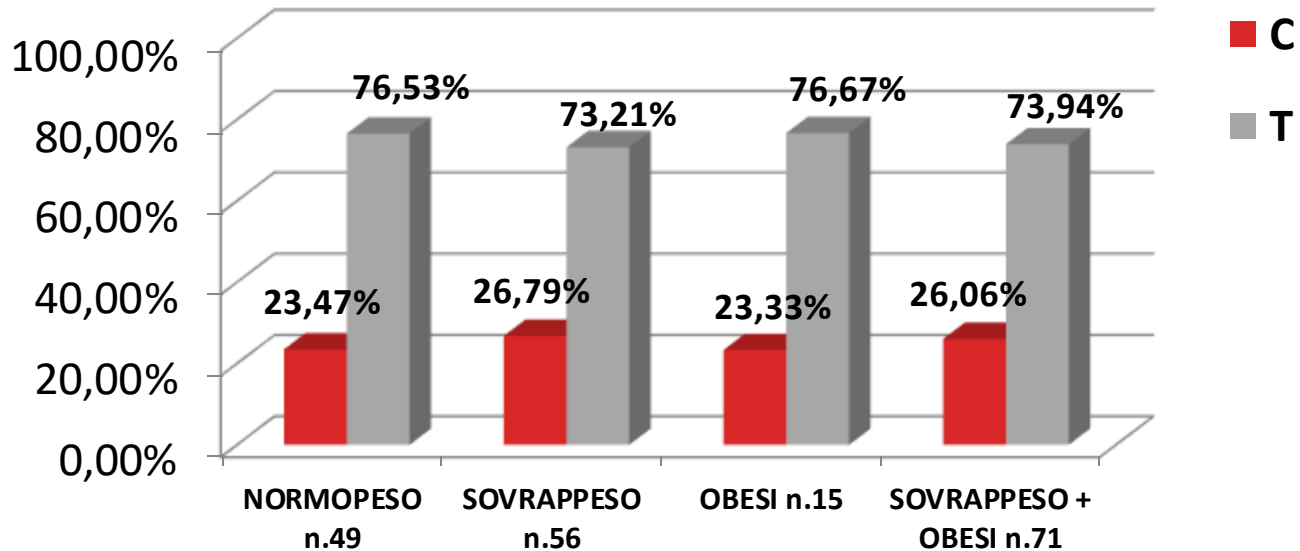


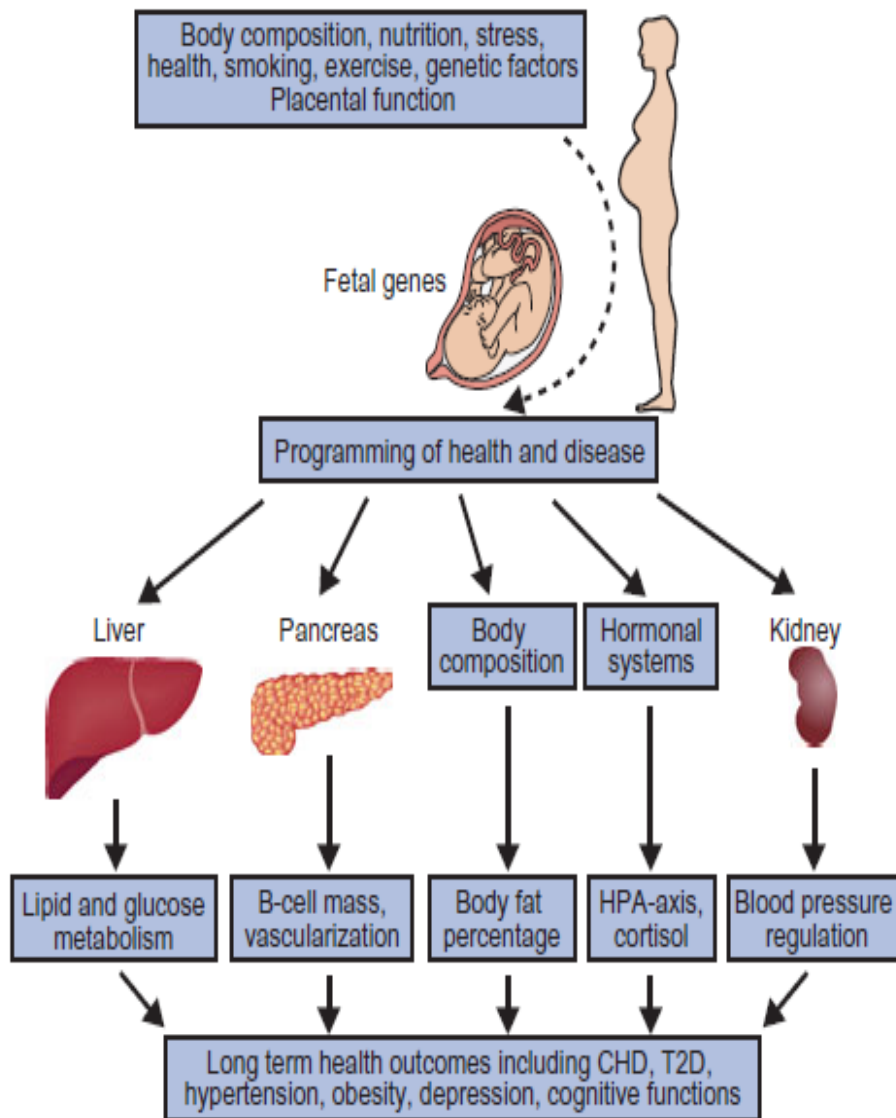
MC4R

Risk allele 'C'



FOR ALLELE ...





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Developmental Origins of Health and Disease – from a small body size at birth to epigenetics

Johan G. Eriksson

“NUTRIGENETICS APPROACH FOR THE PREDICTION OF GESTATIONAL DIABETES”

Gestational Diabetes Mellitus (GDM)

“Any degree of glucose intolerance with onset or first recognition during pregnancy”

2-18% of all pregnancies

More than 200,00 cases annually

Risk Factors

Family history of diabetes

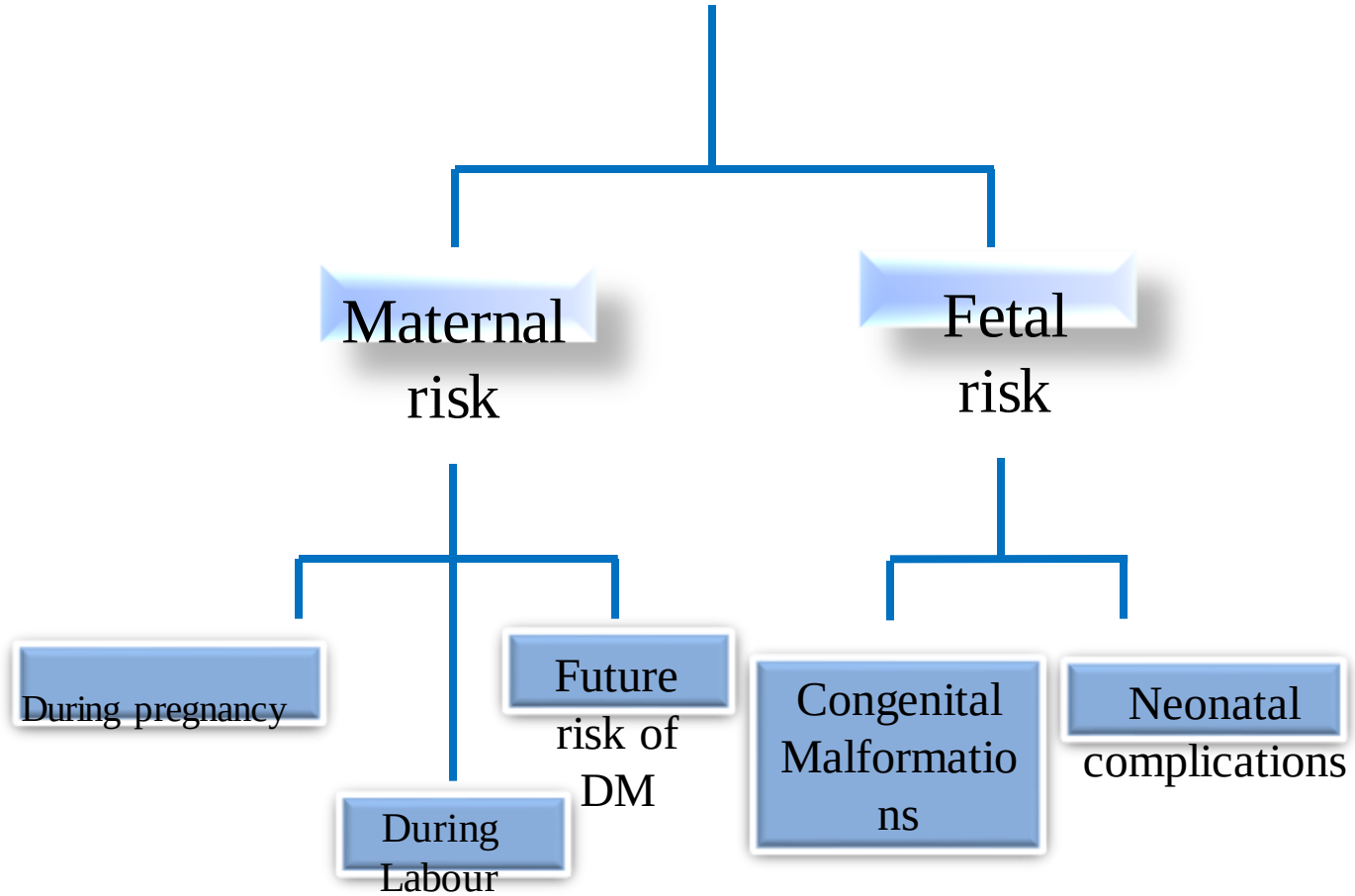
Overweight or obese before pregnancy (BMI >27 kg/m²)

Prior history of GDM

Age >35 years old

Effects of diabetes on pregnancy

WHY IS GDM A SILENT KILLER?



Flow Chart: GDM

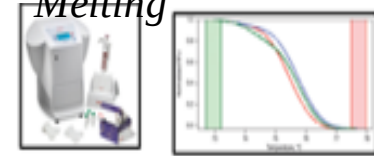
“NUTRIGENETICS APPROACH FOR THE PREDICTION OF GESTATIONAL DIABETES”



168 pregnant Caucasian women
102 healthy controls
66 with GDM

TCF7L2	rs7903146	T>C	Sugar Metabolism
PPAR-γ2	rs1801282	C>G	
PPARGC1A	rs8192678	C>T	
APOA5	rs662799	T>C	Triglycerides metabolism
GCKR	rs1260326	C>T	
LDLR	rs1260326	C>T	Cholesterol metabolism
MC4R	rs17782313	T>C	Obesity
FTO	rs9939609	T>A	
MTHFR	rs1260326	C>T	Folate metabolism

High Resolution Melting

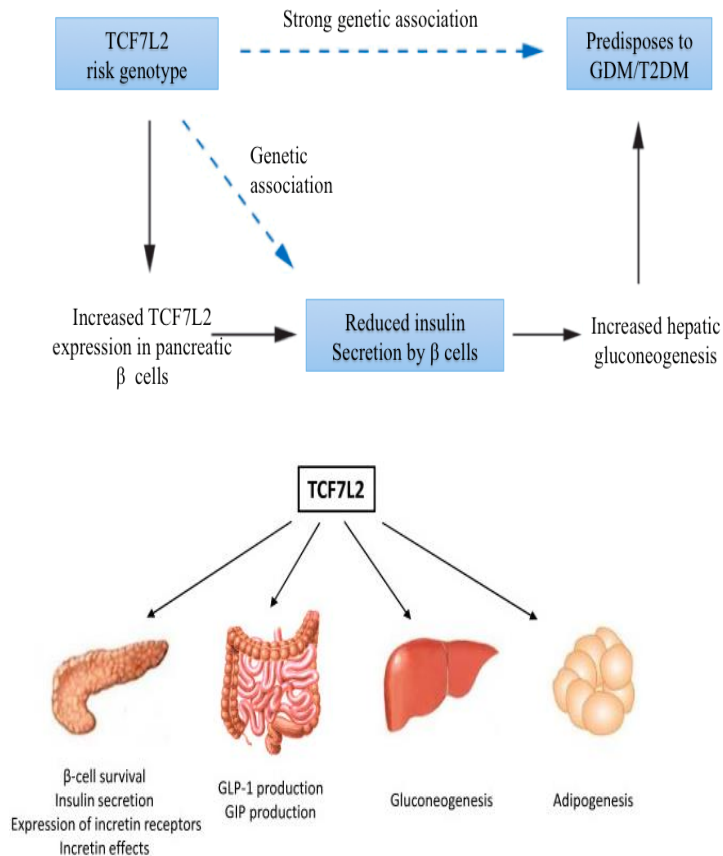


DATA ANALYSIS

- Data on socio demographic characteristics anthropometric
- Clinical and metabolic parameters

RESULTS

Genotypes distribution according to the presence of GDM



	GDM (N=102)	No GDM (N= 66)	P*
TCF7L2 rs7903146			0.02*
CC	37.3	51.5	
CT	35.3	37.9	
TT	27.4	10.6	
PPARG2 rs1801282			0.79
CC	77.3	75.5	
CG	22.7	24.5	
GG	0.0	0.0	
PPARGC1A rs8192678			0.33
CC	31.4	31.8	
CT	52.9	43.9	
TT	15.7	24.3	
APOA5 rs662799			0.22
TT	55.9	66.7	
CT	38.2	31.8	
CC	5.9	1.5	
MC4R rs17782313			0.23
TT	64.7	63.6	
CT	28.4	34.9	
CC	6.9	1.5	
LDLR rs2228671			0.92
CC	66.7	68.2	
CT	32.4	30.3	
TT	1.0	1.5	
GCKR rs1260326			0.94
CC	22.5	22.7	
CT	56.9	54.5	
TT	20.6	22.7	
FTO rs9939609			0.30
TT	32.4	24.2	
AT	38.2	50.0	
AA	29.4	25.8	

←
**OR 3.6 [95% CI 1.4
9.2]**

3rd Trimester TC, HDL-C, LDL-C and TG levels of GDM patients according to genotypes (data are mean±SD)

	TC mg/dl	P*	HDL-C mg/dl	P*	LDL-C mg/dl	P*	TG mg/dl	P*
<i>TCF7L2 rs7903146</i> CC CT-TT	263±54 263±53	0,80	68±13 72±17	0,39	133±66 130±58	0,54	230±82 237±72	0,45
<i>PPARG2 rs1801282</i> CC CG-GG	270±54 244±47	0,05	70±15 73±20	0,50	137±60 112±59	0,02*	242±76 208±70	0,09
<i>PPARGC1A rs8192678</i> CC CT-TT	255±52 268±54	0,43	68±18 72±15	0,28	133±56 125±63	0,96	219±54 239±83	0,43
<i>APOA5 rs662799</i> TT CT-CC	258±52 270±55	0,41	74±17 66±13	0,02*	132±55 130±68	0,74	222±71 251±80	0,10
<i>MC4R rs17782313</i> TT CT-CC	259±52 269±55	0,41	73±16 65±14	0,03*	133±59 129±65	0,92	226±73 249±79	0,21
<i>LDLR rs2228671</i> CC CT-TT	269±51 250±57	0,07	72±17 67±13	0,48	146±52 104±67	0,01*	234±79 235±69	0,91
<i>GCKR rs1260326</i> CC CT-TT	254±56 266±52	0,38	66±14 72±16	0,12	141±55 128±62	0,54	214±54 241±81	0,23
<i>FTO rs9939609</i> TT AT-AA	265±61 262±50	0,88	75±17 69±15	0,11	108±68 142±54	0,02*	239±72 232±78	0,60
<i>MTHFR rs1801133</i> CC CT-TT	267±49 261±55	0,51	69±15 71±16	0,87	136±70 130±59	0,50	226±72 237±77	0,57
* Mann-Whitney U Test								

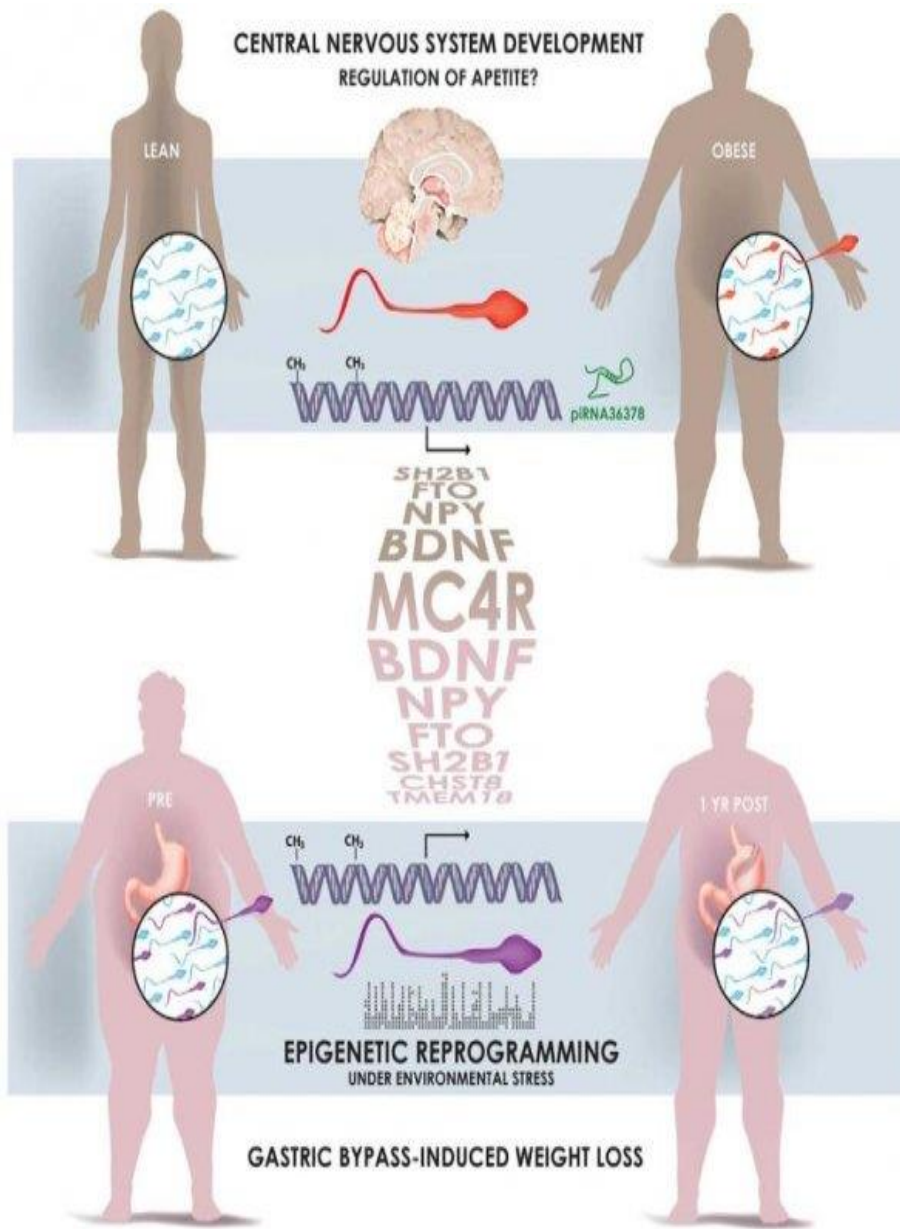
CONCLUSIONS AND FUTURE PROSPECTIVE

- GDM women are at particularly high risk of developing T2DM and require preventive measures and early screening of T2DM. Genetic information might improve our prediction of T2DM in women with a history of GDM.
- To study the use genotype risk scores in predicting T2DM in GDM women. A similar approach could also be applied in predicting GDM, as more genetic variants associated with GDM are expected to be revealed.
- Results about genotyping of SNPs provide important information in planning GDM and CHD prevention studies in the future

Short Article

Obesity and Bariatric Surgery Drive Epigenetic Variation of Spermatozoa in Humans

Ida Donkin^{1, 10}, Soetkin Versteijhe^{1, 10}, Lars R. Ingerslev¹, Kui Qian¹, Mie Mechta¹, Loa Nordkap², Brynjulf Mortensen^{3, 4, 9}, Emil Vincent R. Appel¹, Niels Jørgensen², Viggo B. Kristiansen⁵, Torben Hansen¹, Christopher T. Workman^{6, 7}, Juleen R. Zierath^{1, 8}, Romain Barrès¹,  



This figure shows how spermatozoa from obese men carry a distinct epigenetic signature compared to lean men, in particular at genes controlling brain development and function. The sperm methylome is dynamically remodeled after gastric-bypass-induced weight loss, notably at gene regions implicated in the central control of appetite.

Peri-conception parental obesity, reproductive health, and transgenerational impacts

Michelle Lane^{1,2,4}, Deirdre L. Zander-Fox^{1,3}, Rebecca L. Robker¹, and Nicole O. McPherson^{1,3,4}

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³ Repromed, Dulwich, South Australia

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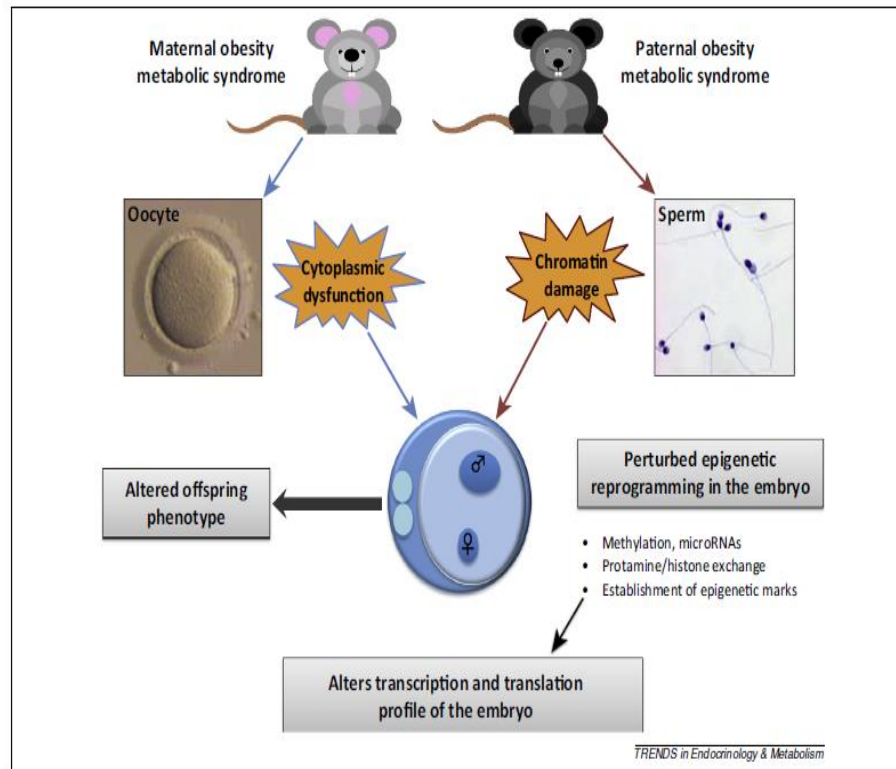


Figure 1. Hypothesis of the mechanisms for developmental programming of offspring phenotypes by parental obesity and/or metabolic syndrome. Exposure of gametes to environmental factors such as obesity results in significant alterations to the physiology of the gametes. Maternal obesity alters both the nuclear and cytoplasmic content of the oocyte, resulting in mitochondrial dysfunction and altered lipid content. By contrast, paternal obesity has been shown to alter the epigenome of the sperm, changing methylation status and miRNA content. These alterations to oocyte and sperm are not completely reset at fertilization and the history of environmental exposures to both the oocyte and the sperm appear to persist into the embryo and beyond, changing both epigenetic re-establishment, altering the transcription and translation profile of the developing embryo, and subsequently altering offspring phenotypes.

