

THE EFFECTS OF SHORT – TERM ENERGY RESTRICTION IN OVERWEIGHT / OBESE FEMALES ON REPRODUCTIVE OUTCOMES

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TABLE OF CONTENTS

Thesis Abstract	i
Statement	iii
Acknowledgements	iv
Publications	vi
Abbreviations	vii

CHAPTER ONE

Literature Review

1. Introduction	1
1.1 Biological and physiological processes of human reproduction	4
1.1.1 Human reproduction	4
1.1.2 Oogenesis	7
1.1.3 Abnormal gamete development	10
1.1.4 Ovarian / Menstrual cycle	14
1.1.5 Role of hormones in ovarian function	16
1.1.6 ‘Ovarian reserve’ as a predictor projector of reproductive endurance	17
1.2 Embryology	18
1.2.1 Fertilisation and embryo morphology	18
1.2.2 Embryo quality	20
1.2.3 Embryonic metabolism	20
1.2.4 Embryonic abnormalities	22
1.3 Implantation	23
1.2.6 Intrauterine environment	25
1.2.7 Endometrial receptivity	26
1.4 Implantation and Assisted Reproductive Technology (ART)	27
1.5 Postimplantation period	29
1.5.1 Age and miscarriage	29
1.5.2 BMI and miscarriage	29
1.5.3 Nutrition, miscarriage and birth defects	30
1.6 Infertility and ART	30
1.6.1 Implication of ART	31
1.7 Influence of lifestyle factors on fecundity	32
1.7.1 Negative effect of smoking on female’s fertility	32

1.7.2	Alcohol intake and fertility	33
1.7.3	Negative influence of caffeine, emotional and physical stress on reproduction	34
1.7.4	Detrimental effects of abnormal body weight on woman's fertility	34
1.7.4.1	BMI and ART success	35
1.7.4.2	BMI a predictor of general healthy issues	36
1.8	Polycystic Ovary Syndrome (PCOS)	38
1.8.1	Relationship between PCOS, obesity and insulin resistance	39
1.8.2	Weight loss and insulin resistance	40
1.8.3	Insulin lowering drugs, dietary interventions and woman's fecundity	41
1.9	Role of weight loss for overweight / obese women undergoing ART	42
1.9.1	Weight loss and reproduction	43
1.9.2	Energy restriction and effects on reproductive outcomes	43
1.9.3	Outcomes of using a very low calorie diet	44
1.10	Thesis Hypotheses	45
1.11	Thesis Aims and Significance	46
1.12	References	47

CHAPTER TWO

2.	Effect of a very low calorie diet on in vitro fertilization outcomes	70
2.1	References	79

CHAPTER THREE

3.	Mechanisms of obesity and short term weight loss on reproductive processes	81
3.1	Introduction	82
3.2	Schematic study design	84
3.3	Material and methods	85
3.3.1	Experimental animals maintenance and handling	85
3.3.2	Animal Ethics	85
3.3.3	Chemicals and solutions	86
3.3.4	Biological materials	86
3.3.5	Equipment	86

3.4 Study protocol and general procedures	87
3.4.1 Mice feeding protocol	87
3.4.2 Weight assessment	88
3.4.3 Mating	88
3.4.4 Tissue collection	88
3.4.5 Animal length assessment	88
3.5 Embryo collection and in vitro culture	89
3.5.1 Embryo zygote collection and culture	89
3.5.2 Assessment of the developmental stage of the cultured embryos	89
3.6 Embryo quality assessment	90
3.6.1 Blastocyst quality assessment	90
3.7 Statistical analyses	90
3.8 Results	90
3.9 Discussion / Conclusion	93
3.10 Image capture	95
3.11 Tables and Figures	99
3.12 References	111

CHAPTER FOUR **Summary and future work**

4. Summary and suggestions for future work	113
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CHAPTER FIVE **Appendices**

Appendix I – Chemicals, solution, mediums and procedures	116
I.I General solutions	116
I.II Embryo culture media	116
i.ii.i G 1 and G 2 mediums	116
i.ii.ii G-MOPS wash medium without protein	117
i.ii.iii G-MOPS medium with protein	117
I.III Solutions for differential nuclear staining	118
Appendix II – Dietary food	119
II.I Atherogenic dry food for mice	119
ii.i.i SF00 – 219	119
ii.i.ii SF04 – 057	120
ii.i.iii Animal Joint Stock II	121

II.II	Dietary product and CSIRO booklet	121
ii.ii.i	Optifast VLCD	121
ii.ii.ii	'The Total Wellbeing Diet'	121
	Appendix III – Protocols	122
III.I	Blastocyst differential staining	122
III.II	Embryo culturing and daily assessment protocol	123
	Appendix IV - Patient Information Sheet	124
IV.I	Clinical pilot study	124
	Appendix V - Clinical Randomised Controlled study	134
V.I	Introduction	134
V.II	Study aims	134
V.III	Primary and Secondary outcomes	134
V.IV	Study population / Inclusion criteria	135
V.V	Exclusion criteria	135
V.VI	Human Ethics	135
V.VI	Informed consent	136
V.VIII	Withdrawal of consent	137
V.IX	Recruitment and randomisation	137
V.X	Schematic study design	138
V.XI	Study design	139
V.XII	Total number of subjects and power analyses	141
V.XIII	Questionnaires	141
V.XIV	Randomisation method	142

Thesis abstract

In the general population, one in five couples experiences difficulty in conceiving a child. The role of obesity on women's fecundity has become a focus of attention in recent years.

Successful treatment of infertility through Assisted Reproductive Technology (ART) is also compromised by the presence of obesity, which occurs in 30 % of women seeking treatment. A negative correlation exists between increased body mass index (BMI) and the number of collected oocytes and a lower birth rate after ART. Furthermore, a number of studies have established that weight loss improves natural conception rates in overweight women. Whether weight management can improve success rates in overweight / obese women undergoing in vitro fertilisation (IVF) has not been studied.

The purpose of this project was to explore the role of short-term weight loss on potential pregnancy outcomes in overweight / obese women undergoing IVF programme. However, to establish this relationship, we proposed to carry out two studies to assess the following:

- (I) The feasibility of very low calorie diet (VLCD) during IVF treatment with respect to duration, level of restriction and tolerability of the diet during hormonal down regulation in women (Chapter 2).
- (II) How energy restriction may affect the quality of an early embryo in diet - induced obese mice with respect to various body weight and caloric intake (Chapter 3).

In study (I), women preferred a shorter dietary intervention with greater energy restriction (456 kcal per day) to gradual energy restriction (1200 kcal / day for the first week, and afterward, 456 kcal / day) prior to oocyte transfer. Women were able to comply with the VLCD during IVF treatment and both dietary groups achieved a significant weight loss (mean 6.3 %).

In study (II), by using obese mice, the effect of rapid weight loss (mean 12 %) was observed after 5 days of energy restriction. Ovulation rate was greater in the Obese group (HFD) (55.6%) and equal in both Control (CD) and Energy Restricted (HF / ER) (44.4 %) groups. The HF / ER group showed higher fertilisation rate (80 %) than HFD and CD (55% and 45.5%, correspondingly). The blastocyst stage was reached by half of the cultured embryos in both HF / ER and HFD groups and 33 % in the CD group. The quality of embryos that completed blastocyst formation did not differ between groups. However, postfertilisation development in females fed a high fat diet was slower compared to CD and HF / ER groups.

In conclusion, this work illustrated a weight management prior conception and use of VLCD during IVF treatment in clinical study needs further investigation with regard to the dietary duration, level of energy restriction and how this combination will influence IVF treatment outcomes. Furthermore, as we were unable to determine the question of how the dietary intervention affects the quality of oocytes and the animal study illustrated a promising result, thus further studies are required.

Statement

I hereby state that this thesis contains no material which has been accepted for the award of any other degree or diploma in any University or other tertiary institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person, except where stated.

I give consent for this thesis to be available for photocopying and loan purposes after depositing in The University of Adelaide library.

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The experiments reported in this work were performed by myself and any assistance received from others is acknowledged. To my knowledge, there are no intellectual property issues or conflicts of interest with other persons or organizations with respect to the data presented in this thesis.

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Publications

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Minge CE, Bennett BD, **Tsagareli V**, Lane M, Owens JA, Norman RJ, Robker RL. Ovulation and Oocyte quality are adversely affected by a High fat diet. *In press*.

Abbreviations

ACTH	Adrenocorticotrophic hormone
ART	Assisted Reproductive Technology
BMI	Body mass index
CC	Clomiphene Citrate
CD	Control diet
CSIRO	Commonwealth Scientific Industrial Research Organization
CVD	Cardiovascular disease
DHEA-s	Dehydroepiandrosterone sulphate
DHT	Dihydrotestosterone
DIVA	Diet and IVF assessment
DNA	Deoxyribonucleic acid
DOB	Date of birth
ESHRE	European Society for Human Reproduction & Embryology
ET	Embryo transfer
FET	Frozen embryo transfer
FSH	Follicle stimulating hormone
GH	Growth hormone
GIFT	Gamete intra fallopian transfer
HC	High carbohydrate
hCG	Human chorionic gonadotrophin
HDL - C	High density lipoprotein cholesterol
HFD	High fat diet
HF / ER	High fat / Energy restricted
HP	High protein
ICSI	Intracytoplasmic sperm injection
IUD	Intrauterine device
IUGR	Intrauterine growth retardation
IUI	Intrauterine insemination
IVF	In vitro fertilisation
LC	Low carbohydrate
LCD	Low calorie diet
LDL - C	Low density lipoprotein cholesterol
LH	Luteinizing hormone
NHANES	National Health and Nutrition Examination Survey
NH&MRC	National Health and Medical Research Council
OC	Oral contraceptives
OPU	Oocyte pick up
PCO	Polycystic ovaries
PCOS	Polycystic ovarian syndrome
RDI	Recommended dietary intake
RM	Recurrent miscarriage
RMU	Reproductive Medicine Unit
SHBG	Serum testosterone-binding globulin
SEM	Standard Error Mean
STIs	Sexually transmitted infections
TWD	The Total Wellbeing Diet
VLCD	Very low calorie diet
WHO	World Health Organization