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**CURRICULUM**  
**FOR**  
**2 YEARS DIPLOMA PROGRAMME**  
**IN**  
**ASSISTED REPRODUCTIVE**  
**TECHNIQUES**  
**(DART)**



**UNIVERSITY OF HEALTH SCIENCES**  
**LAHORE, PAKISTAN**

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## FOREWORD

The president of Pakistan inaugurated University of Health Sciences (UHS) Lahore on the 3<sup>rd</sup> of October 2002 with the vision to explicitly address academic and research needs in the field of health sciences and allied disciplines and to uplift their existing level to bring them at par with the international standards.

The mission of the University is to develop an intellectual nexus to provide excellence and innovation in medical education and research in order to:

- Impart knowledge and skills to health care providers to enhance their competence in providing community oriented and multidisciplinary patient-centered care
- Train and produce researchers and specialists in basic and clinical medical sciences
- Establish and maintain continuing professional development programmes for the faculty
- Provide trained professionals and scientists/researchers for the field of Electro Medical/Bio-medical disciplines
- Assure quality in health education and research at all levels

A university is the zenith of knowledge that imparts quality education and awards degrees for extensive educational attainments in various disciplines with attendant advancement for the development of intellectual community. Protection of traditional knowledge, making exploration about it and obtaining deep understanding of modern technology and research techniques are some of the responsibilities of any university.

UHS is running a number of courses in the field of health sciences in Punjab. The list extends from undergraduate level course up to the doctorate level both in basic, clinical and allied health sciences.

Since its inception, certain vital tasks were taken into serious consideration by UHS; for instance, curricula development and their up-gradation were among the most important ones besides introduction of contemporary educational programmes.

UHS has revised curricula for undergraduate Medical/Dental Education, BSc Nursing, and Allied Health Sciences.

In keeping with its commitment for further improvement in the standard of medical education, UHS has taken an initiative to modify and improve one-year postgraduate diploma courses to 2 years structured training programmes.

I do not believe in selling and old product in new packing with a fresh label on it, just to do the job. Original products with actual outcomes for the society must be guaranteed. Being the Vice

Chancellor of a public sector health university, I believe, it is my duty to remain vigilant and committed to the cause of improvement of the conventional medical and allied health sciences curricula on regular basis. This will help produce technically sound professionals with advanced knowledge and skills.

Presently, UHS has designed and facilitated curriculum development committees for eleven clinical disciplines namely: DTCD, DPM, DMRT, DOMS, DLO, Dip. Card, DCH, DCP, DGO, DMRD and DA.

This document precisely briefs the details of updated curriculum for Diploma in Assisted Reproductive techniques (DART) as prepared by the Expert's committee.

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Vice Chancellor / Chief Executive

## Aims and Objectives

### AIMS

The aim of the two-year diploma programme in Assisted Reproductive Techniques is to equip medical graduates with relevant professional knowledge, skills and ethical values to enable them to apply their acquired expertise at ART organizations as clinical Embryologist.

### OBJECTIVES

On completion of the course, students will be able to:

1. Describe human gamete biology, embryology and developmental biology from a cellular, genetic and molecular perspective
2. Apply critically their knowledge of clinical embryology to research,
3. Understand and discuss new developments in human infertility treatments
4. Critically examine and evaluate new infertility treatments
5. Interpret and classify from a theoretical understanding and practical field experience, the operations and management of IVF clinics and the regulations under which they operate, (including the issues of genetic manipulation and stem cell therapies)
6. Effectively articulate the arguments for and against the social, moral and ethical implications of IVF technologies, as they apply nationally and internationally to humans and develop a clear individual position on these issues
7. Understand and appropriately use statistical methods to analyze human infertility research data
8. Demonstrate an understanding of and competence in techniques used in the preparation of male and female gametes for IVF and ICSI and subsequent embryo culture, and the cryopreservation of gametes and embryos from all stages of culture
9. Demonstrate a capacity to take a leadership role in laboratory skills activities and to collaborate effectively with peers and laboratory staff
10. Conduct competently the quality assurance procedures that are essential to the reliable operation of an IVF clinic
11. Trouble-shoot a wide range of potential problems in the embryology laboratory
12. Demonstrate skills required to biopsy embryos in order to apply genetic and molecular diagnostic test
13. Outline the techniques used in and discuss the uses of karyotyping and fluorescent in-situ hybridisation (FISH) and demonstrate ability to Assess the developmental competence of an embryo prior to its transfer in clinical IVF.
14. Describe in detail the processes of spermatogenesis, hormonal control of reproduction and fertilization.
15. Describe the cellular, genetic and molecular aspects of embryonic development and differentiation to a level required by a human IVF program or a research laboratory
16. Demonstrate an ability to critically and constructively analyse research data in cellular, genetic and molecular aspects of embryology:

17. Identify and describe the roles of ART clinic staff: clinicians, scientific directors, embryologists, nurse coordinators, day surgery nurses, and counselors.
18. Trouble-shoot and audit the clinical processes in human assisted reproduction, including techniques for manipulating follicular growth, retrieving oocytes, analyzing and preparing semen for insemination, assessing embryo development and embryo transfer.
19. Apply basic laboratory skills, -such as performing dilutions, calculating the concentration of a solution, determining the molarity of a solution, testing pH and osmolarity, preparing media for in vitro culture and correct use and maintenance of equipment such as incubators, centrifuges and microscopes
20. Show competence in analyzing human semen.
21. Explain how to control and optimize the environment of gametes/embryos in the laboratory.
22. Have a broad theoretical knowledge about the components of culture systems competently demonstrate skills in preparing media suites for in vitro culture of embryos.
23. Develop practical skills in the techniques of oocytes maturation, sperm preparation by gradient and swim up, and insemination and IVF using frozen thawed ejaculated sperm
24. Understand the various quality control tests that are used routinely in an IVF laboratory, such as mouse bioassays, sperm survival tests.
25. Identify and interpret scoring systems for the selection of good from bad quality embryos from the 2-cell stage through to hatching blastocysts.
26. Classify maturation and fertilization status of oocytes and early stage embryos and identify cell numbers in fixed and stained embryos.
27. Critically assess the techniques of gamete and embryo cryopreservation as used in clinical human in vitro fertilization programs
28. Explain the physicochemical changes in cells during cryopreservation.
29. Demonstrate practical competence in the techniques of vitrification and slow cooling of embryos and gametes and to plan experiments to compare different freezing mentors.
30. Identify the equipment required to run an effective IVF laboratory and justify equipment needs.
31. Simulate the design of an IVF laboratory and its location within an IVF clinic
32. Review national and international guidelines for establishing a quality ART facility.
33. Predict, measure and solve problems that may arise in an IVF laboratory.
34. Identify applications of, and be skilled in the preparation of, micromanipulation instruments
35. Perform ICSI.
36. Identify methods used for the preparation of sperm from ejaculates and testicular biopsies.
37. Discuss other embryonic manipulations and explain the potential effects of epigenetics on the development of an embryo and subsequent offspring.
38. Possess a sound theoretical knowledge and understanding of the techniques essential to chromosomal and molecular genetic analysis in a clinical human IVF program
39. Demonstrate awareness of the relevant regulatory bodies and their requirements for licensing, accrediting and approving clinical and ART related research.
40. Discuss the role of ethics in health care and legal decision-making and be familiar with the main ethical frameworks and principles used in analyzing conflicts and solving problems.
41. Evaluate critically the ethical concerns raised by current ART practices and the future prospects for this technology in Pakistan and around the world.

## NOMENCLATURE AND DURATION

### **NOMENCLATURE OF THE PROPOSED COURSE:**

The name of diploma course should be retained as Diploma in Assisted Reproductive Techniques (DART). This name has been recognized and established for the last many decades worldwide. The duration of courses should be two years structured training in *Embryology Laboratory of Lahore Institute of Fertility & Endocrinology (LIFE)* at Hameed Latif Hospital, Lahore under an approved supervisor of the University.

**Course Title:** DART (Diploma in Assisted Reproductive Techniques)

**Training Center:** LIFE/Hameed Latif Hospital, Lahore (Accredited by UHS)

### **Course Duration and Scheme of the Course:**

**Total Duration:** 2 years structured training (6 months in Part I and one & a half year in Part II)

### **Course Contents**

1. Anatomy including Embryology
2. Physiology
3. Pharmacology
4. Pathology
5. Principles of IUI, IVF, ICSI, PGD, GIFT, ZIFT, Embryo Culture, Embryo transfer, Gamete micromanipulation and Cryopreservation
6. Clinical Aspects of Reproduction & Laboratory Work
7. Medicolegal Aspects of Assisted Reproduction
8. Biostatistics & Research
9. Behavioural Sciences

## ELIGIBILITY CRITERIA FOR ADMISSION

### **DOCUMENTS REQUIRED FOR THE ADMISSION**

1. Completed DART application form
2. Copy of MBBS degree with mark sheets of professional examinations and certificate of number of attempts in professional examinations
3. Copy of PMDC registration certificate
4. Three latest passport size photographs
5. Reference letters from two consultants, with whom the applicant has worked
6. Certificates of completion of required experience

### **GENERAL REQUIREMENTS**

Candidates eligible for admission should have MBBS or equivalent qualification, registered with PMDC.

The candidates with the following experience shall be preferred in the given order:

- a. One year experience of work in Assisted Reproduction Lab of a recognized Hospital /Infertility Centre
- b. One year Experience of work in Obst. & Gynae. Department of a Recognized Teaching Hospital
- c. One year Teaching Experience in Basic Medical Sciences Department of a Recognized Medical College
- d. One year Experience as Medical Officer in a Medical / Surgical & their Allied Disciplines of a Recognized Teaching Hospital

### **SPECIAL REQUIREMENTS**

1. Obtaining pass percentage in the entry test as determined by the UHS
2. Qualifying the interview successfully
3. Having up to the mark credentials, determined by the UHS (no. of attempts in each professional, any gold medals or distinctions, relevant work experience, research experience from a recognized institution, any research article published in a National or an International Journal)

### **REGISTRATION AND ENROLLMENT**

- Number of students enrolled for the course in an academic year must not exceed the allocation specified by UHS.
- UHS Lahore will approve supervisors for diploma courses.
- Candidates selected for the courses will be registered with UHS on fulfillment of prescribed procedure.



## ACCREDITATION RELATED ISSUES OF THE INSTITUTION:

### **1. Faculty**

Qualified teaching staff in accordance with the requirements of the university

ART Team includes the following

- a) Embryologist and supervisor of course (Dr. Haroon Latif Khan)
- b) Counsellor
- c) Endocrinologist
- d) Andrologist
- e) ART Laboratory technician
- f) Statistician
- g) Consultant Gynecologists practicing Infertility as their main subspecialty

### **2. Adequate Space**

- a). Including classrooms (with audiovisual aids) computer facility
- b). IVF Laboratory equipped to provide training as per the objectives
- c) ICSI equipment with manipulator
- d) Cryopreservation unit.
- e) PGD equipment
- f) Pathology laboratory for workup of and infertile couple
- g) Operation Theatre and Anaesthesia Facilities

### **3. Library**

Departmental library should have latest editions of recommended books of ART, embryology, latest edition of reference books of Obstetrics and Gynaecology

### **4. Work Load**

Adequate out patient department facilities and patient's workload for appropriate training for the enrolled students.

### **5 Training programme**

## Course Outline

### **1. Anatomy including Embryology**

- Gross anatomy & histology of male pelvic / reproductive organs, external genitalia
- Gross anatomy & histology of female pelvic/reproductive organs, external genitalia
- Normal & abnormal development of male reproductive system
- Normal & abnormal development of female reproductive system
- Development of early placenta
- Anatomy of the Endocrine Glands
- Gametogenesis, Ovulation, Spermatogenesis, Fertilization, Development of early embryo and implantation

### **2. Physiology**

- Physiology of spermatogenesis
- Male and female reproductive Endocrinology
- Physiology of urinary and lower gastrointestinal tract (rectum, anal canal)
- Physiological changes in male and female reproductive tract with age
- Physiological & neuro-endocrine changes during puberty, adolescence, menstruation, ovulation, fertilization, climacteric and menopause

### **3. Pharmacology**

- Pharmacology of drugs used during ovarian stimulation
- Role of hormones in assisted reproductive techniques
- Effect of drugs on gametes and gametogenesis

### **4. Pathology**

- Normal and abnormal microbiology of genital tract; bacterial, viral and parasitic infections and infestations
- History and introduction to microbiology
- Classification and life cycle of parasites
- Source of infection
- Morphologic identification of bacteria under microscope
- Distribution, size, motility, reproduction of bacteria and viruses
- Effects of environment upon bacteria and viruses
- Sterilization and disinfection, Physical and chemical disinfectants
- Spores, yeast and moulds
- Nosocomial infections
- Special microbiologic aspects, sterilization, disinfection and nosocomial infections in Assisted Reproductive Lab

- Effects of gross pathology on fertility
- Immunization

### **5. Principles of Assisted Reproductive Techniques:**

- Artificial Insemination AI: (Intracervical insemination (ICI), Intrauterine insemination (IUI), Intrauterine tuboperitoneal insemination (IUTPI), Intratubal Insemination (ITI)
- Intracytoplasmic sperm injection (ICSI)
- Pre-implantation genetic diagnosis (PGD)
- In-vitro Fertilization (IVF)
- Gamete intrafallopian transfer (GIFT)
- Zygote intrafallopian transfer (ZIFT)
- Embryo Culture
- Embryo transfer
- Gamete micromanipulation
- Cryopreservation
- Surrogacy

### **6. Clinical Aspects of Reproduction & Laboratory Work**

- Infertility Work-up for female factor
- Infertility workup for male factor
- Semen analysis
- Preparation of semen for Insemination
- Preparation of Embryo Transfer
- Intracytoplasmic sperm injection
- Pre-implantation genetic diagnosis
- Cryopreservation
- Endometriosis
- Polycystic Ovaries (PCO)
- Menstrual disturbances
- Problems of ovulation
- Controlled Ovarian Hyper stimulation
- Ovarian Hyper Stimulation Syndrome (OHSS)

### **7. Medicolegal Aspects of Assisted Reproduction**

- Legislation
- Ethics
- Legal and Religious aspects of AID and Surrogacy
- Current laws in Pakistan and Muslim world

### **8. Introduction to Biostatistics and Research**

- a. Introduction to Bio-Statistics
- b. Introduction to Bio- Medical Research
- c. Why research is important?

- d. What research to do?
  - Selecting a Field for Research
  - Drivers for Health Research
  - Participation in National and International Research
  - Participation in Pharmaceutical Company Research
  - Where do Research Ideas come from?
  - Criteria for a good research topic
- e. Ethics in Health Research
- f. Writing a Scientific Paper
- g. Making a Scientific Presentation
- h. Searching the Literature

## 9. Behavioural Sciences

- a. Bio-Psycho-Social (BPS) Model of Health Care
- b. Use of Non-medicinal Interventions in Clinical Practice
  - Communication Skills
  - Counseling
  - Informational Skills
- c. Crisis Intervention/Disaster Management
- d. Conflict Resolution
- e. Breaking Bad News
- f. Medical ethics, Professionalism and Doctor-Patient Relationship
  - Hippocratic Oath
  - Four Pillars of Medical Ethics (Autonomy, Beneficence, Non-maleficence and Justice)
  - Informed Consent and Confidentiality
  - Ethical Dilemmas in a Doctor's Life
- g. Delivery of Culturally Relevant care and Cultural Sensitivity
- h. Psychological aspects of health and Disease
  - Psychological Aspect of Health
  - Psychological Aspect of Disease
  - Stress and its management
  - Psychological aspect of Pain
  - Psychological Aspect of Aging

## METHODS OF INSTRUCTION/COURSE CONDUCTION

As a policy, active participation of students at all levels will be encouraged.

Basic sciences teaching shall be the responsibility of the supervisor /clinical teachers. The students shall not have to attend classes in basic science departments as a routine.

Following instructional strategies will be employed

1. Interactive lectures
2. Seminar Presentation and Journal Club Presentations
3. Group Discussions
4. SEQ as assignments on the content areas
5. Self study, assignments and use of internet
6. OPD and clinics
7. Case presentations
8. ART Lab procedures and development of skills
  - Maintenance of the laboratory and Standardization of equipment
  - Preparation of dishes and equipment to receive ova
  - Identification of ova at OPU
  - Handling and incubation of freshly picked up ova.
  - Handling of various culture media
  - Preparation of Culture Media
  - Preparation of Semen
  - Insemination
  - Inspection of early fertilization
  - Inspection of early developing embryo
  - Colour coding and its importance

In addition to the conventional teaching methodologies following interactive strategies will also be introduced to improve both communication and clinical skills in the upcoming consultants:

### Monthly Student Review Meetings

- a) Journal Club Meeting
- b) Core Curriculum Meetings
- c) Skills Development meeting

#### a. Journal Club Meeting

Two hours per month should be allocated to the presentation and discussion of a recent Journal article related to clinical embryology. The article should be critically evaluated and its relevant applicable results should be highlighted, which later can be incorporated in Laboratory practice. Record of all such articles should be maintained.

## **b. Core Curriculum Meetings**

All the core topics of DART should be thoroughly discussed during these sessions. The duration of each session should be at least two hours once a month. The supervisor should chair it. Each student should be given an opportunity to brainstorm all topics included in the course and to generate new ideas regarding the improvement of the course structure.

## **c. Skill Development**

Two hours everyday should be assigned for learning and practicing laboratory procedures to enhance skills of the trainee.

## **Annual Grand Meeting**

Once a year all students enrolled for DART should be invited to the annual meeting at UHS Lahore. One full day will be allocated to this event. One of the students, elected by the group will present the annual report. Issues and concerns related to their diploma course may be discussed during the meeting.

Feedback should be collected and also suggestions can be sought in order to involve students in decision-making. The research work and their literary work may also be displayed.

In the evening an informal gathering and dinner should be arranged. This will help in creating a sense of belonging and ownership among students and the faculty.

## LOG BOOK

The trainees must maintain a logbook and get it signed regularly by the supervisor. A complete and duly certified logbook should be part of the requirement to sit for examination. Logbook should include adequate number of laboratory procedures to show acquired skills.

Proposed Format of Log Book is as follows:

Candidate's Name: \_\_\_\_\_

Roll No. \_\_\_\_\_

SN	Date	Name of Patient, Age, Sex & Reg No.	Purpose of Procedure	Procedure Performed	Supervisor's Signature
1					
2					

Case Presented

SN	Date	Name of Patient, Age, Sex & Reg No.	Photographs of the Specimen	Supervisor's Signature
1				
2				

Seminar / Journal Club Presentation

SN	Date	Topic	Supervisor's Signature
1			
2			

Evaluation Record

(Excellent, Good, Adequate, Inadequate, Poor)

SN	Date	Subject	Method of Evaluation (Oral, Practical Theory)	Rating	Supervisor's Signature
1					
2					

## LITERATURE REVIEW

Students will be assigned a clinical embryology problem, most commonly encountered in the laboratory and will be specifically trained to review literature in the relevant field and write a "Review of an Article"

- Topic
- Introduction
- Discussion of the reviewed literature
- Conclusion
- References



## EXAMINATIONS

### **Assessment**

It will consist of action and professional growth-oriented student centered integrated assessment with an additional component of informal internal assessment; formative assessment and measurement based summative assessment.

### **Student Centered Integrated Assessment**

It views students as decision makers in need of information about their own performance. Integrated Assessment is meant to give students responsibility for deciding what to evaluate, as well as how to evaluate it, encourages students to “own” the evaluation and to use it as a basis for self-improvement. Therefore, it tends to be growth oriented student controlled, collaborative, dynamic, contextualized, informal, flexible and action oriented.

In the proposed curriculum, it will be based on:

- Self Assessment by the student
- Peer Assessment
- Informal Internal Assessment by the Faculty

### **Self-Assessment by the Student**

Each student will be provided with a pre-designed self-assessment form to evaluate his/her level of comfort and competency in dealing with different relevant laboratory procedures. It will be the responsibility of the student to correctly identify his/her areas of weakness and to take appropriate measures to address those weaknesses.

### **Peer Assessment**

The students will also be expected to evaluate their peers after the monthly small group meeting. These should be followed by a constructive feedback according to the prescribed guidelines and should be non-judgmental in nature. This will enable students to become good mentors in future.

### **Informal Internal Assessment by the Faculty**

There will be no formal allocation of marks for the component of Internal Assessment so that students are willing to confront their weaknesses rather than hiding them from their instructors.

It will include:

- a) Punctuality
- b) Laboratory work
- c) Monthly assessment (written tests to indicate particular areas of weaknesses)
- d) Participation in interactive sessions

### **Formative Assessment**

Will help to improve the existing instructional methods and the curriculum in use

### **Feedback to the faculty by the student**

After every three months the students will submit a written feedback regarding their course components and teaching methods. This will help to identify strengths and weaknesses of the relevant course, faculty members and to ascertain areas for further improvement.

### **Summative Assessment**

It will be carried out at the end of the programme to empirically evaluate cognitive, psychomotor and affective domains in order to award diplomas for successful completion of the course.

### **Eligibility to Appear in Final Examination**

- Only those candidates who have completed two years of structured / supervised training programme will be eligible to take the final exam
- Candidates who have completed their logbooks and hold certificates of 75% attendance should be allowed to sit for the exam.
- The application for the final examination will be forwarded with recommendations of the supervisor

## DART Examinations

### Part-I DART

The examination will be held after completion of 6 months of education.

#### Topics included in paper 1

- Anatomy including Embryology (20 MCQ)
- Physiology (20 MCQ)
- Pathology (20 MCQ)
- Pharmacology (15 MCQ)
- Medicolegal Aspects of Assisted Reproduction (10 MCQ)
- Introduction to Biostatistics and Research (05 MCQ)
- Behavioural Sciences (10 MCQ)

#### Components of the Part 1 examination

MCQ Paper	100	One Best Type
Total Marks	100	Marks

### Part-II DART

#### Components of the Part II examination

Theory paper 1	100 marks
Theory paper 2	100 marks
Clinical/Oral	180 marks
Log Book	20 marks
Total Marks	400

#### Topics Included in Part-II Examination:

**Theory Paper-I:** Principles of Assisted Reproductive Techniques

**Theory Paper-II:** Clinical Aspects of Reproduction & Laboratory Work

#### Theory: 200 Marks

<u>Paper I</u>	<u>100 Marks</u>	<u>3 Hours</u>
10 SEQs (No-Choice)	50 Marks	
50 MCQs	50 Marks	

<b>Paper II</b>	<b><u>100 Marks</u></b>	<b>3 Hours</b>
10 SEQs (No Choice)	50 Marks	
50 MCQs	50 Marks	

Only those candidates, who pass in theory papers, will be eligible to appear in the Clinical & Viva Voce Examination. Clinical & Viva Voce Examination shall cover 'Clinical Aspects of Reproduction & Laboratory Work'.

### **OSCE**

**90 Marks**

10 stations each carrying 9 marks of 10 minutes duration; each evaluating performance based assessment with five of them interactive

### **Clinical**

**90 Marks**

Four short cases each carrying 15 marks each and one long case of 30 marks.

A panel of examiners (internal and external) will be appointed for practical examination.

Each component of practical examination will be assessed by two examiners awarding marks simultaneously and independently. The final score awarded will be an average score, as agreed by both examiners.

### **Pass Percentage and other Regulations Regarding Examination**

- Criterion referenced assessment principles will be used
- 20 marks for the log book will be included in the OSCE component
- 60 % marks will be a pass score in each component
- Candidates failing in any one component will have to re-sit the entire examination
- A maximum of 5 attempts to sit for the examination will be allowed, to be availed within 3 calendar years of the first attempt
- Re-admission in DART course is not permissible under any circumstances
- Results will be announced according to rules and regulations set by the Examination Branch of the University of Health Sciences Lahore.

## Recommended Books

### Books

1. IVF lab  
Laboratory Aspects of In-Vitro Fertilization  
Editor: M. Brass J. W Lens
2. In Vitro Fertilization
  - A. Practical Approach  
Edited by David K. Gardner
3. Handbook of In Vitro Fertilization  
Edited by Alan O. Trounson and David K. Gardner
4. In-Vitro Fertilization and Assisted Reproductive  
Edited by Pekar R. Brinsden
5. Textbook of Assisted Reproductive Technologies (3<sup>rd</sup> edition)  
Edited by David K. Gardner, Ariel Weissman, Colin M. Howles,  
Zeev Shoham
6. Infertility: Malady to Remedy  
By Dr. Yousaf Latif Khan

### Atlases

Human Sperm Morphology Evaluation.  
Edited by Thinus F. Kruger and Daniel R. Franken.

An Atlas of Human Blastocysts  
Lucinda L. Veeck  
Nikca Zaninouice

### Journals

1. Human Reproduction.
2. Sterility and Fertility.
3. Human Reproduction Update.

