Who We Are

The Andrology Center and Reproductive Tissue Bank - a section of the Glickman Urological & Kidney Institute at Cleveland Clinic - provides specialized tests and services to evaluate male infertility. Our laboratory offers referring physicians and patient’s quantifiable results using the latest state-of-the-art technology. We are located in the Building X, which is part of the Downtown Main campus.

As part of the Center for Reproductive Medicine, the Andrology Center and Reproductive Tissue Bank is staffed with highly qualified and experienced laboratory technologists who are well trained in fertility testing and certified by the American Society of Clinical Pathologists (ASCP). Our laboratory is certified by the Clinical Laboratory Improvement Amendments (CLIA) and the Department of Health and Human Services. Since 1994, the lab has been accredited by the College of American Pathologists (CAP) and with the American Society for Reproductive Medicine (ASRM).

“Patients First” is the guiding principle of the Cleveland Clinic. To emulate this standard, our staff at the Andrology Center and Reproductive Tissue Bank continually strives to provide compassionate care and outstanding service every step of the way.

What We Offer

The Andrology Center and Reproductive Tissue Bank's specialized laboratory offers a wide variety of comprehensive tests and the latest technology to meet patient needs. The Andrology Center offers both research and clinical services. Our laboratory uses the latest World Health Organization (WHO 2010) guidelines and reference ranges in the evaluation of semen samples. Additionally, our laboratory’s Therapeutic Sperm Banking program provides a complete range of sperm banking services including a reliable system for the long-term preservation of human semen, epididymal aspirate and testicular tissue.

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Semen Profile
A semen profile assesses semen quality using the most comprehensive and advanced testing available. It is considered the cornerstone of the infertility investigation because it provides the physician with a clear understanding of the functional capacity of the sperm. A typical profile assesses routine semen parameters and levels of reactive oxygen species (ROS), total antioxidant capacity (TAC) and sperm DNA damage (TUNEL).

Semen Analysis
Semen analysis assesses a man’s fertility potential, sperm production, accessory gland function and ejaculatory capability. It specifically looks at sperm volume, pH, color, viscosity, sperm concentration, total sperm count and percent motility.

A computer assisted semen analyzer enhances this analysis by measuring sperm motion characteristics not detected by the human eye such as velocity, linearity, progressive motility and amplitude of lateral sperm head movement. It is also capable of determining sperm morphology. Our CASA system is among the most technologically advanced systems and yields far more accurate and quantifiable results than manual methods of semen analysis.

Computer Assisted Semen Analysis (CASA)
Our laboratory is equipped with a Computer Assisted Semen Analyzer and Integrated Visual Optical System (IVOS) software version 14 (Hamilton Thorne Research), which operates as a cell motion analyzer, cell morphology analyzer and computer. Computer assisted semen analysis has two advantages: it is precise and can quantitatively assess sperm kinematics. It is a semi-automated technique that provides data on sperm concentration, motility and special sperm motion parameters. These include: average path velocity, linearity, curvilinear velocity, amplitude of lateral head displacement, flagellar beat frequency and hyperactivation. The percent progressive motility has been shown to be related to pregnancy rates. The results for motility and concentration are also verified manually.

Clinical Utility of the Semen Analysis
The results of both manual semen analysis and CASA guide the clinician in assessing semen quality and creating an individualized treatment plan. Some of the motion parameters are used to grade of sperm motility while others are used to assess the functional quality of the sperm such as the fertilization potential.

Turn-Around-Time: 1-3 days

Leukocytospermia Quantification/Endtz Test
The presence of high numbers of white blood cells (WBCs) in semen, especially in the presence of granulocytes, is often associated with an underlying infection and male infertility. Leukocytes are powerful generators of ROS. The myeloperoxidase or Endtz test differentiates WBCs from other immature germ cells in the semen.

Load Microcentrifuge tube
Load Makler Chamber
Incubate 5 min.
Observe:
10X Brightfield Objective Lens
ENDTZ Calculation:
Count Cells in All 100 Squares
All granulocytes stain dark brown

Endtz Reagent
Mix 4.0 mL stock solution with 50 µL of 3% H2O2
10 µL Tyrodes Buffer
10 µL Liquified Semen

#WBC X 4 (dilution factor) = 10^5/mL semen
10^5/mL semen     10 =  10^6/mL semen

Reference Range:
If the presence of WBCs is ≥ 1X10^6 WBC/mL, this is known as leukocytospermia.

Turn-Around-Time: 1-3 days

Clinical Utility of the Test
Clinicians need to be aware that an Endtz value of ≥ 0.4 X 10^6 WBC/mL is indicative of a possible infection. The patient should undergo further investigation to identify the possible cause of infection. Antibiotics may be prescribed. Treating men with antibiotics may help reduce any infection by decreasing seminal leukocytes and ROS production. This often results in a subsequent improvement in sperm motility and natural conception. The patient may be asked to repeat the Endtz test to confirm that the infection has cleared.

Figure 1: Microscopic view of the counting chamber.

Figure 2: CASA screen shot showing measurement of various sperm motion parameters

Figure 3: Quantification of white blood cells by the Endtz test.

Figure 4: Endtz positive cells - these are leukocytes that stain brown.

Reference Range: If the presence of WBCs is ≥ 1X10^6 WBC/mL, this is known as leukocytospermia.
Positive Myeloperoxidase Staining (Endtz Test) as an Indicator of Excessive Reactive Oxygen Species Formation in Semen

M. SHEKARRIZ, R. K. SHARMA, A. J. THOMAS, Jr., and A. AGARWAL

Infertility

Empirical Treatment of Low-level Leukocytospermia With Doxycycline in Male Infertility Patients

Alaa Hamada, Ashok Agarwal, Reecha Sharma, Dan B. French, Ahmed Ragheb, and Edmund S. Sabanegh, Jr.

Increased DNA damage in sperm from leukocytospermic semen samples as determined by the sperm chromatin structure assay

Juan G. Alvarez, M.D., Rakesh K. Sharma, Ph.D., Mario Oliero, Ph.D., Ramadan A. Saleh, M.D., Merv G. Lopez, Ph.D., Anthony J. Thomas, Jr., M.D., Donald P. Evenson, Ph.D., and Ashok Agarwal, Ph.D.

Center for Advanced Research in Human Reproduction, Infertility, and Sexual Function, Urological Institute, The Cleveland Clinic Foundation, Cleveland, Ohio

SEMINAL OXIDATIVE STRESS IN PATIENTS WITH CHRONIC PROSTATITIS

FABIO F. PASQUALOTTO, RAKESH K. SHARMA, JEANNETTE M. POTTS, DAVID R. NELSON, ANTHONY J. THOMAS, JR., AND ASHOK AGARWAL
Sperm Morphology
Sperm count and motility alone are not adequate predictors of fertility. These tests must be run in conjunction with sperm morphology in the evaluation of the infertile male. The Cleveland Clinic Andrology Center uses the WHO 2010 (5th edition) criteria for assessing sperm morphology. Smears are stained using the Diff-Quik method. Abnormal sperm forms are associated with lower fertilizing potential and increased DNA damage.

Reference Value: ≥4% normal sperm forms

Turn-Around-Time: 1-3 days

Clinical Utility of the Test
Normal sperm morphology is a significant predictor of pregnancy in in-vivo and in-vitro fertilization.

Eosin-Nigrosin Test
It is important to determine whether immotile sperm are alive or dead. This is accomplished using the Eosin-Nigrosin or viability test. Spermatozoa that are alive have an intact sperm plasma membrane that does not allow the Eosin stain to penetrate. These sperm appear white when stained and viewed under a microscope. Dead spermatozoa have a compromised sperm membrane that absorbs some of the stain, which turns them pink.

Viability Staining: It is performed when the sperm motility is <25%. Viability test should be conducted within 30 but no more than 60 minutes after semen collection.

Turn-Around-Time: 1-3 days

Clinical Utility of the Test
The presence of a high percentage of immotile and non-viable sperm is characteristic of epididymal pathology.
Special Staining for Azoospermic Patients

Azoospermia is the absence of spermatozoa in the ejaculate. After analysis of the semen specimen, a special stain called the nuclear fast red picroindigocarmine, or NFPIC stain, is used.

Sperm heads stain bright pink and tails green. This test confirms the complete absence of spermatozoa or the presence of rare spermatozoa in the ejaculate.

Special staining is performed when no sperm are seen during a semen analysis.

**Turn-Around-Time: 1-3 days**

**Clinical Utility of the Test**

This test may help the clinician determine whether to perform a testicular biopsy or microscopic testicular sperm extraction (MicroTESE).

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**Key Publication On Identification Of Sperm In An ‘Azoospermic’ Semen Sample By Androogy Staff**

Urology 1998; 51: 816-819

**IDENTIFICATION OF SPERMATOZOA AND ROUND SPERMATIDS IN THE EJACULATES OF MEN WITH SPERMATOGENIC FAILURE**

BENJAMIN N. HENDIN, BRIJESH PATEL, HOWARD S. LEVIN, ANTHONY J. THOMAS, Jr, AND ASHOK AGARWAL
Intrauterine Insemination Computer Assisted Semen Analysis (*)

Intrauterine insemination (IUI) is an effective method of assisted reproduction that helps couples with male idiopathic infertility. The procedure works by increasing the number of healthy sperm available for fertilization during a given menstrual cycle. More than 1 million total motile sperm after sperm preparation are needed for one IUI procedure.

Sperm Processing

Tests marked with an asterisk (*) require an appointment. All others do not.

Intrauterine insemination (IUI) is regarded as an effective method for a specific subset of infertile patients such as those with idiopathic infertility, or cervical factor with unexplained or mild to moderate male-factor infertility. The rationale of this procedure is to increase the number of gametes available for fertilization during a given cycle. Total motile sperm needed for insemination is >1.0 million. Data from our laboratory reports pregnancy rates per cycle of 15.5% and a per patient success rate of 33.3%. The average number of cycles which the patients undergo is between 3 to 6 cycles.

Clinical Utility of the Procedure

The highest cumulative pregnancy rates with IUI are seen within 3 to 4 cycles. The average live birth rate per cycle is approximately 10%. Pregnancy rates depend on the underlying causes of male infertility. In most reports, cumulative pregnancy rates plateau after 3 to 6 cycles.

Sperm preparation, or sperm wash, may be done using the swim-up or a double-density gradient method.

Key Publication On Intrauterine Insemination By Andrology Staff


The Effect of Patient and Semen Characteristics on Live Birth Rates Following Intrauterine Insemination: A Retrospective Study

Benjamin N. Hendin, Tommaso Falcone, Jorge Hallak, David R. Nelson, Sreenivas Vemullapalli, Jeffrey Goldberg, Anthony J. Thomas, Jr., and Ashok Agarwal.

View of the lab with an Acuri C6 flowcytometer
Sperm Processing Techniques*

Swim-up Sperm Wash
The swim-up technique is based on active self-migration of motile spermatozoa into the wash medium. This technique can be used only for ejaculate with a high degree of progressively motile spermatozoa. Recovery rates are low if the initial semen specimen has poor progressive motility.

The swim-up method results in sperm fractions with improved motility and numbers that are adequate for conception. It also yields spermatozoa with good normal morphology that are free from seminal debris. This method is used in cases where the semen sample has normal sperm concentration and good motility.

Figure 9: Steps in the swim-up sperm preparation method.

Turn-Around-Time: 1-3 days
Advantage of Swim-up:
High percentage of motile sperm can be recovered.

Disadvantage of Swim-up:
The recovery rate of total number of motile sperm is low, especially if the initial progressive motility is low.

Density-Gradient Sperm Wash*
The density-gradient separation method concentrates highly motile, viable and morphologically normal sperm with low levels of DNA damage in a small volume of sperm wash medium. A double-density gradient is prepared by layering a high density layer (90%; lower gradient) on the bottom of the tube and an equal volume of a low density gradient (45%; upper layer) on the top. Liquefied semen is layered above the two gradients. Highly motile, morphologically normal spermatozoa are separated as a result of sperm density as well as by centrifugation. Seminal plasma, leukocytes and other debris are retained on the top of the gradient and the highly motile sperm are collected in a pellet at the bottom of the tube.

Figure 10: Separation of highly motile, morphologically normal sperm prepared by a double-density gradient method.

Turn-Around-Time: 1-3 days
Advantages of Density Gradient Preparation:
The density-gradient method is an efficient technique for samples with very low sperm concentration and motility. It results in a higher recovery rate of motile sperm than the swim-up technique. It is the method of choice for sperm preparation in the majority of ART and andrology laboratories.

Disadvantages of Density Gradient Preparation:
Samples that are highly viscous, show sperm agglutination or have very poor sperm concentration and motility may result in poor total motile sperm recovery.

Recovery Rates: >50% are seen in our laboratory

Figure 11: Pre- and post-wash sperm count and motility in patients with live births versus those without.

Other Tests

Sperm Antibody Test*
The presence of sperm antibodies reacting with antigens on the surface of the spermatozoa is considered typical of male immunological infertility. Autoimmune male infertility is defined as an inappropriate immune response against sperm antigens. Antibodies bind to sperm and cause sperm dysfunction that renders the male infertile. If a significant amount of agglutination of motile spermatozoa (clumping) is seen on wet preparation, this may be indicative of an underlying immunological problem. Men with high levels of sperm antibodies have significantly reduced fertility.

When to Order the Antibody Test:
1. Sperm agglutination
2. Poor sperm motility
3. Unexplained infertility
4. Failed in vitro fertilization (IVF)

Direct Mixed Antiglobulin Reaction (MAR) Test*
A patient’s semen sample can be tested for the presence of antisperm antibodies (IgG and IgA) by using a mixed antiglobulin reaction (MAR) test. Latex beads coated with the antibodies are added to a semen sample. This causes any sperm containing the antibodies to agglutinate or bind together. The percentage of agglutination is related to the severity of the immunological reaction.

Reference Value: <40% sperm binding to beads

Turn-Around-Time: 1 week

Clinical Utility of the Test:
The clinician needs to be aware that anti-sperm antibodies (ASA) may interfere with sperm-oocyte membrane interactions. Pregnancy rates may be reduced by ASA. Simple sperm wash may help reduce sperm clumping or agglutination prior to swim-up or density gradient. Steroids may be given to lower ASA levels in semen titers before intrauterine insemination (IUI), but are unnecessary if intracytoplasmic sperm injection (ICSI) is performed. Using IVF in patients with high ASA titer has been shown to result in lower pregnancy and higher miscarriage rates.

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Figure 14: Antibody binding at different sperm regions. A: negligible antibody binding; B: moderate and C-D: severe antibody binding.

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Semen Biochemistry
Fructose Test
Fructose is normally present in all semen specimens. The absence of fructose could indicate congenital bilateral absence of the vas deferens (the thin muscular tube that carries the sperm from the testes to the urethra) or bilateral ejaculatory duct obstruction. Qualitative measurement of fructose can be performed on patients suspected of having obstructive azoospermia. Obstructive azoospermia is the absence of sperm in the ejaculate due to a blockage of the ejaculatory duct.

Result: Positive test is indicated by a color change from dark pink to orange.

Turn-Around-Time: 1-3 days

Clinical Utility of the Test:
A negative result is indicative of a congenital bilateral absence of the vas deferens.

Did You Know?
The Center for Reproductive Medicine at the Cleveland Clinic has an international reputation for excellence in innovative research in human fertility and is dedicated to the dissemination of its results. Research papers from the Center’s staff are regularly selected for publication in distinguished specialty medical journals.
**Sperm Function Tests**

**Hypo-Osmotic Swelling (HOS) Test**

The ability of the human sperm tail to swell in the presence of a hypo-osmotic solution is a sign of a normal sperm membrane. HOS is correlated with the *in vitro* fertilizing ability of the spermatozoa. This test measures the functional integrity of the sperm plasma membrane.

**Reference Range:** >58% tail swelling (normal)

**Clinical Utility of the Test:**

HOS helps identify which spermatozoa are alive in specimen with poor motility or those retrieved from the testicular tissue for use with Intracytoplasmic Sperm Injection (ICSI).

**Semen Oxidative Stress Profile**

This analysis consists of three advanced tests conducted after an initial semen analysis. Reactive oxygen species, total antioxidant capacity and DNA damage are measured in a semen sample.

**Reactive Oxygen Species (ROS)**

Studies conducted in our center indicate that seminal oxidative stress tests have diagnostic and prognostic capabilities beyond those of conventional tests of sperm quality or function. An oxidative stress test accurately discriminates between fertile and infertile men. It may also identify patients with a clinical diagnosis of male-factor infertility who are likely to initiate a pregnancy if they are followed over a period of time.

Reactive oxygen species are highly reactive oxidizing agents belonging to the class of free radicals. The presence of ROS in the male reproductive tract has become a real concern because of potential toxic effects on sperm quality and function when levels are too high. Normally, antioxidants in seminal fluid neutralize any increased production of ROS. However, in cases of infection or other clinical conditions such as varicocele, significant amounts of ROS may be generated. About 40% to 80% of infertile men have sperm damaged by oxidative stress.

ROS levels can be measured using a chemical probe called luminol that reacts with free radicals and produces a luminescence. This is converted into an electronic signal that can be detected by an instrument called a luminometer.

**When to Order the Test:**

1. Leukocytospermia (high levels of WBCs in semen)
2. Idiopathic infertility
3. Infertile men with normozoospermic semen sample
4. Clinical varicocele
5. Advanced paternal age

**Turn-Around-Time:** 1-2 days

**Reference Range:** Normal Values: <93 RLU/sec

**Clinical Utility of the Test:**

High ROS levels are seen in men with idiopathic infertility and men with other underlying etiologies such as leukocytospermia, prostatitis, genital tract infections and varicocele.
Physiologic and pathologic levels of reactive oxygen species in neat semen of infertile men

Nisarg Desai, M.D., Rakesh Sharma, Ph.D., Kartikeya Makker, M.D., Edmund Sabanegh, M.D., and Ashok Agarwal, Ph.D.

Center for Reproductive Medicine, Glickman Urological and Kidney Institute and Department of Obstetrics and Gynecology and Women’s Health Institute, Cleveland Clinic, Cleveland, Ohio

Reactive oxygen species as an independent marker of male factor infertility

Ashok Agarwal, Ph.D., a Rakesh K. Sharma, Ph.D., a Kiran P. Nallella, M.D., a
Anihony J. Thomas, Jr., M.D., a Juan G. Alvarez, M.D., b,c and Suresh C. Sikka, Ph.D. d

a Center for Advanced Research in Human Reproduction, Infertility and Sexual Function, Glickman Urological Institute and Department of Obstetrics-Gynecology, Cleveland Clinic Foundation, Cleveland, Ohio; b Centro de Infertilidad Masculina ANDROGEN, La Coruña, Spain; c Harvard Medical School, Boston, Massachusetts; and d Department of Urology, Tulane University Health Sciences Center, New Orleans, Louisiana

View of the lab with a demonstration of the luminometer.
Total Antioxidant Capacity (TAC) Test
A balance between ROS and available antioxidants is important. A shift in the balance results in a decrease in the available antioxidants or an increase in free radicals. This shift is unfavorable, with the imbalance resulting in oxidative stress. Data suggests that antioxidant concentrations are significantly lower in patients who have increased levels of ROS.

This test utilizes clear seminal fluid that has been stored at -50 to -80°C. A colorimetric test called the total antioxidant assay is used to measure levels of total antioxidants (enzymatic, non-enzymatic and macromolecules) in the seminal plasma. The intensity of the color is inversely proportional to the amount of antioxidants in the sample. Results are expressed as micromoles of Trolox (standard).

Figure 19: Antioxidant levels measured as micromoles of Trolox in infertile patients and healthy donors. Infertile patients had significantly lower levels of total antioxidant capacity compared to donors.

Turn-Around-Time: 2-3 weeks
Reference Range:
Normal Values: >1790 microMolar Trolox

Clinical Utility of the Test:
Low TAC values indicate poor antioxidant reserve and inability of antioxidants to combat oxidative stress.

Key Publication On Total Antioxidant Capacity By Andrology Staff

Diagnostic value of the total antioxidant capacity (TAC) in human seminal plasma

Reda Mahfouz, M.D., a Rakesh Sharma, Ph.D., a,b Dipika Sharma, M.D., a Edmund Sabanegh, M.D., a and Ashok Agarwal, Ph.D., HCLD.a,b

a Reproductive Research Center, Glickman Urological & Kidney Institute; and b Department of Obstetrics–Gynecology, Cleveland Clinic, Cleveland, Ohio
Sperm DNA Damage Test*

Intact sperm DNA is important for successful fertilization and pregnancy.

DNA damage can be assessed using the terminal deoxynucleotidyltransferase dUTP nick end labeling (TUNEL) assay. The assay labels sperm DNA strand breaks with a fluorescent stain that can be visualized with a flow cytometer. This test is sensitive, requires 2-5 X10^6 sperm. Semen samples are often frozen and batched for DNA testing.

**Indications for ordering DNA test:**
1. Men with clinical varicocele
2. Semen with high percentage of morphological abnormalities
3. Men with idiopathic infertility
4. Fertilization failure
5. Repeated miscarriage and abortions

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**Figure 20:** Single or double-stranded DNA breaks are stained by the TdT enzyme and measured by flow cytometry.

**Figure 21:** A typical DNA plot showing the extent of DNA damage as measured by flow cytometry. A) Semen specimen showing spermatozoa with low DNA damage (normal) and B) sample with significantly high DNA damage (abnormal).
The Andrology Center offers DNA testing services to physicians who are not part of the Cleveland Clinic Health System. After initial semen analysis is conducted, the remainder of sample can be aliquoted, frozen at -70°C and batched. The samples can then be shipped overnight on dry ice.

**Figure 22:** A receiver operator characteristic curve for sperm DNA damage showing the cut-off, sensitivity, specificity and the area under the curve (AUC).

**Figure 23:** A plot showing A) distribution of samples from donors and patients with different ranges of DNA damage from 0->40% and B) percentage DNA damage in donors and infertile men.


**Reference Lab Services**

The Andrology Center offers DNA testing services to physicians who are not part of the Cleveland Clinic Health System. After initial semen analysis is conducted, the remainder of sample can be aliquoted, frozen at -70°C and batched. The samples can then be shipped overnight on dry ice.

**Turn-Around-Time:** 2-3 weeks

**Reference Range:** <12% DNA damage (normal value)

**Clinical Utility of the Test:**

High DNA damage in infertile men can lead to poor ART (assisted reproductive techniques) outcomes and increased miscarriage rates. Based on the extent of DNA damage, specific ART may be recommended.

**To Schedule sperm DNA test please call:**

Reference Lab at Tel. 216.444.5755
Infertility

**TUNEL as a Test for Sperm DNA Damage in the Evaluation of Male Infertility**

Rakesh K. Sharma, Edmund Sabanegh, Reda Mahfouz, Sajal Gupta, Aparna Thiyagarajan, and Ashok Agarwal

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Chapter 12

**Sperm DNA Fragmentation Analysis Using the TUNEL Assay**

Rakesh Sharma, Jayson Masaki, and Ashok Agarwal

*Technologist processing a semen specimen for sperm DNA damage.*
Acrosome Reaction Test
The acrosome reaction is the process in which the sperm plasma membrane fuses with the outer acrosomal membrane, which leads to a release of enzymes. These enzymes facilitate the binding of the spermatozoa to the oocyte and help the sperm penetrate and fertilize the oocyte. In many patients premature acrosome reaction may occur. These spermatozoa lose the ability to fertilize as the acrosomal enzymes are released even in the absence of the egg. The competency of capacitated spermatozoa can be tested by examining the acrosome reaction after a calcium ionophore challenge. The increase in the percentage of acrosome-reacted spermatozoa after ionophore challenge is a good indicator of the fertilizing ability of the spermatozoa.

Reference Range: >15% of acrosome-reacted sperm after ionophore challenge

Turn-Around-Time: 2-3 weeks

Clinical Utility of the Test:
Poor acrosome reaction indicates lack of sperm fertilization capacity.

Did You Know?

Our Center remains a global leader for excellence in the personalized diagnosis and treatment of male infertility through the development of several non-surgical, innovative techniques:

- Quantification of seminal oxidative stress by sperm in semen, allowing personalized antioxidant regimens
- Non-surgical optimization of semen quality by antioxidant therapy and management of oxidative damage
- Selection of best quality spermatozoa for assisted reproductive techniques
- Diagnosis of sperm functional abnormalities by advanced cytological and biochemical tests
Cryopreservation of human spermatozoa is an important area in assisted reproductive technology and oncology. Men undergoing cancer treatment, including certain types of chemotherapy, radiation therapy or surgery, face the possibility of temporary or permanent damage to their fertility. Physicians know which treatments are likely to cause a problem but often cannot predict how severely a man’s fertility may be affected by his cancer treatment.

One option to preserve a man’s ability to father his own children is to freeze, or cryopreserve, semen samples before cancer treatment begins. This process is called therapeutic sperm banking. Therapeutic sperm banking is also available to men before a vasectomy. Occasionally, therapeutic sperm banking is recommended in other situations where a man’s fertility could be damaged by surgery, gonadotoxic medical treatments or exposure to a toxic environment.

About Our Program
Our Therapeutic Sperm Banking program was established in 1980, making it one of the first reproductive tissue banks in the Cleveland area. We offer comprehensive services and a reliable system for long-term preservation of human semen, epididymal aspirate and testicular tissue. The Reproductive Tissue Bank has been accredited for the last 19 years by independent agency: the College of American Pathologists (CAP), and is also registered with the United States Food and Drug Administration (FDA).

How is the Specimen Collected?
Each patient is given a sterile collection cup for the collection of his specimen. Semen specimens are collected on-site at Cleveland Clinic's Andrology Center in a private room. We recommend collecting the sample at the laboratory because the sample’s freshness affects fertility. Within minutes after ejaculation, the number of motile sperm begins to drop rapidly. We advise patients to bank multiple samples (3 to 5 visits) to optimize the chances of a pregnancy with the least expensive and least invasive assisted reproductive method.

How is the Specimen Cryopreserved?
The samples are preserved in a cryoprotective media and stored in liquid nitrogen for long-term storage. Samples stored >20 years in our bank have resulted in successful pregnancies.

If you are not sure whether a medical treatment could damage your fertility, please consult your physician or call to make an appointment with our Male Infertility Specialist in the Department of Urology, Dr. Edmund Sabanegh. Call 216.444.5600 or toll-free at 800.223.2273, ext. 45600.

Dr. Sabanegh specializes in the treatment of male infertility, Klinefelter syndrome, varicoceles, hormone replacement therapy (HRT), vasectomy and vasectomy reversal. His surgical interests include microsurgical reconstruction of the male reproductive tract and advanced sperm harvest techniques.

Figure 25: Preparation of the semen for freezing and subsequent transfer into liquid nitrogen for long-term storage.
Does Sample Quality Matter?
Semen quality varies with each ejaculated specimen. In cases of poor semen quality, the Director of the Andrology Center will consult with the patient before his specimens are stored. In general, patients are encouraged to bank multiple specimens to increase the success rates.

How Does Cryopreservation Affect Sperm Quality?
It is reported that 40% of the patients utilizing cryopreserved samples have healthy, live births. Furthermore, chances for success are not affected by the type of ART or malignancy present.

![A patient reporting to the front desk](image)

**Figure 26:** Total motile sperm count and sperm motility before and after freezing in patients with testicular cancer.
Shipping Out-of-Town Semen Specimens
Many patients utilize our Therapeutic Sperm Banking program from outside of Ohio. Cryopreserved semen specimens can be prepared for shipping to out-of-town facilities at any time. Request for transfer of sperm specimens must be accompanied by written permission from the sperm banker and the physician who will be utilizing the specimen for assisted reproduction.

Our Innovation

NextGen® Home Sperm Banking Kit for Men from Geographically-Remote Sites Seeking Fertility Preservation Services
The Home Sperm Banking kit was designed and co-developed by the Andrology Center. This novel system permits patients collect semen specimens in the privacy of their own homes and transport them in a way that allows sperm to retain functional and fertilizing capacity. Samples are shipped overnight utilizing our NextGen® kit to ensure their quick arrival to the Andrology Center.

Figure 27: The NextGen® Home Shipping kit includes a collection cup, preservative/transport media and ice pack.

Who Can Use the NextGen® Kit?
Men who live across the continental United States, North America and anywhere else that offers 24-hour shipping to the United States can take advantage of this kit.

NextGen® Can Be Utilized by:
• Men with cancer for future procreative use
• Men with underlying subfertility
• Men serving in the military
• Pre-vasectomy patients
• Patients subjected to occupational exposure of environmental pollutants

Will the NextGen® Kit Affect Sperm Quality?
The NextGen® kit does not adversely affect sperm cryosurvival making it a possible alternative for patients who do not have ready access to a fertility clinic. Our collection kit provides an adequate number of sperm for use with advanced reproductive techniques.

For More Information on the NextGen® Kit
Interested patients can go online and view the details of the home kit, answers to frequently asked questions, information on physician referrals and payment options. www.ClevelandClinic.org/NextGen

For NextGen® Appointments:
Individuals interested in obtaining information about the NextGen® Home Sperm Banking Program should call 866.9BANKIN (866.922.6546).

Therapeutic Sperm Banking Appointments
Appointments are required for all visits to the Andrology Center. Repeat banking should be scheduled within 24 to 48 hours after the first appointment. Weekends are also available for subsequent sperm banking. The following information will be required before your first appointment:
• Letter of referral from physician
• Name, address and date of birth
• Medical record number for CCF patients

For more information or to make an appointment please call: 866.922.6546 or 216.444.8182 or visit us online at: www.clevelandclinic.org/reproductiveresearchcenter
### IUI and Sperm Banking – Patient Feedback

**Figure 27. Feedback on patient wait time for Andrology appointments.**

A. Ninety five percent of patients had a wait time of less than one week to get an Andrology appointment.

B. Hundred percent of patients surveyed reported that the time it took to get Andrology appointment met their expectation.

*Patients rated their experience on a scale of 1 to 10. 10 being highly satisfied.*

### Sperm Banking – Patient Feedback

*Figure 28. How well the sperm banking process was explained to the patients.*

More than 80% of sperm banking patients surveyed were satisfied with the explanation regarding key steps of sperm banking.

*Patients rated their experience on a scale of 1 to 10. 10 being highly satisfied.*

### Semen Analysis – Patient Feedback

*Figure 29. Evaluation of patient satisfaction with various aspects of their Andrology lab visit.*

High satisfaction scores both at Main campus and at the Avon facility.

Over 90% of patients surveyed at both locations were highly satisfied with their Andrology visit.

Patient satisfaction scores were significantly higher in 2014 when compared to our last survey in 2009.

*Patients rated their experience on a scale of 1 to 10. 10 being highly satisfied.*
Fertility Lab Services in Avon, Ohio

The Richard E. Jacobs Health Center (Avon), a Cleveland Clinic facility offers state-of-the-art services for diagnostic evaluation of male infertility. These include (but are not limited to):

1. Computer-Assisted Semen Analysis (CASA)
2. Leukocytospermia Quantitation/Endtz (Peroxidase) Test
3. Sperm Morphology
4. Eosin-Nigrosin Test for Viability
5. Special Staining for Azoospermic Patients
6. Sperm Preparation for Intrauterine Insemination
7. Antisperm Antibody Testing
8. Hypo-Osmotic Swelling (HOS) Test
9. Advanced Sperm Function Testing:
   • Reactive Oxygen Species
   • Total Antioxidant Capacity
   • DNA Damage
10. Therapeutic Sperm Banking

To schedule an appointment at this new location, please call 216.444.8182/440.695.4270 (7:30 am – 5:00 pm).
Andrology Center, Cleveland Clinic
Main Campus
10681 Carnegie Avenue, Building X11, OH 44106
216.444.8182
To schedule an appointment at the Main Campus Location, please call the toll free number at 800.223.2273 ext 48182 or call the direct lab line at 216.444.8182. Appointments are available from 7:30 am to 3:00 pm from Monday through Friday. Limited appointments are available from 7:30 am to 10:30 am on Saturday.
Parking: Dedicated parking spaces for patients are available in the Building X parking lot. Parking is free for 1 hour.

Richard E. Jacobs Health Center
33100 Cleveland Clinic Blvd.
Avon, OH 44011
440.695.4270
To schedule an appointment at the Avon Family Health Center call toll free at 800.599.7771 or direct lab line at 440.695.4270. Appointments are available from 7:30 am to 3:00 pm on Wednesday and Friday.

Therapeutic Sperm Banking
Cleveland, OH or Avon, OH
1.866.9BANKIN
To schedule an appointment for sperm banking at either the main campus or the Avon fertility lab, please call toll free: 1.866.9BANKIN (866.922.6546)
Or 1.800.CCF.CARE (extension 4.8182)
Or call direct: 216.444.8182
An appointment is required for all visits. We can generally schedule one within 24 hours. After your first visit, weekend times are available for subsequent banking. At the time you make an appointment, we will request the following information:
• Name, address, phone number and date of birth
• Your Social Security Number (for registration purposes)
• Reason you are requesting sperm banking
• An order for sperm banking from your referring physician
• The name, address and phone number of your referring physician
• The starting date for chemotherapy, radiation therapy or surgery

View of the patient waiting area.
Instructions for Collecting a Semen Sample

Before Collecting the Sample:
- You should abstain from sex for 2-3 days but no more than 7 days.
- If you are collecting a sample from home, you will need a sterile collection container. The container can be picked up at the lab or your local pharmacy.
- The sample must be delivered to the lab within 60 minutes from the time of collection. The sample also needs to be kept at body temperature during transport.
- You should make an appointment for your test, even if you are collecting the sample at home. Please call 216.444.8182 to make an appointment.

Collecting the Sample:
- The sample must be collected by masturbation only.
- Lubricants or condoms should not be used because they can kill the sperm.
- Make sure the container lid is sealed tightly after collecting the sample.

After Collecting the Sample:
- Write your full name, date of birth and time of collection on the sample container.
- Immediately place the container close to the body. This ensures that the semen sample is kept at body temperature during transit to the laboratory.

Handling the Sample to The Lab Staff:
- Please bring a photo ID with you to the Center.
- Make sure the sample is received by the Andrology Center staff only.
- It is important to let the technologist know if you have lost any sample during collection.
Andrology Center Staff

Dr. Ashok Agarwal, Ph.D., HCLD | Director

Dr. Ashok Agarwal, PhD, HCLD, is the Director of the Andrology Center and Reproductive Tissue Bank and the Director of Research at the Center for Reproductive Medicine. He is a Staff member in the Glickman Urological and Kidney Institute, Obstetrics-Gynecology and Women's Health Institute, Anatomic Pathology, and Immunology. Dr. Agarwal is also on the faculty of the Cleveland State University.

Dr. Agarwal is a board-certified Clinical Laboratory Director in Andrology by the American Board of Bioanalysis and an Inspector for the College of American Pathologists “Reproductive Laboratory Program” for accreditation of Andrology & IVF Laboratories. He served as the Chairman of the Board of the American College of Embryology from 2009 to 2012. He was the recipient of a 2011 Innovator Award for the development of “Remote Sperm Banking Kits” from Cleveland Clinic Innovations and a recipient of a 2011 Star Award from the American Society for Reproductive Medicine. Dr. Agarwal received the 2011 and 2013 “Scholarship in Teaching Award” for his innovative Summer Internship Course and the 2013 Teaching Award for the Training Program in Advanced Reproductive Techniques from the Case Western Reserve University School of Medicine. Dr. Agarwal has published over 500 scientific papers and review articles in peer-reviewed scientific journals, authored over 50 book chapters, and presented over 700 papers at both national and international scientific meetings. Dr. Agarwal is the recipient of 85 research grants. His current research interests are identifying biological markers of oxidative stress, DNA damage and apoptosis using proteomic research tools and bioinformatics analysis as well as preserving fertility in patients with cancer. Dr. Agarwal is actively involved in laboratory and clinical studies assessing the efficacy of certain antioxidants in improving the fertility of male patients.

Dr. Sajal Gupta, MD | Supervisor

Dr. Gupta holds the position of Assistant Professor at the Lerner College of Medicine of Case Western Reserve University and Project Staff in the Glickman Urological Institute and has served as the Assistant Coordinator of Research at the Center for Reproductive Medicine since 2006. Dr. Gupta has also served as the Supervisor of the Andrology Center since 2008. Dr. Gupta completed her Bachelor of Medicine and Bachelor of Surgery from the Lady Harding Medical College, University of Delhi. She then went on to complete her residency in Obstetrics and Gynecology in 1994 from University of Delhi. She completed a Research Fellowship in Reproductive Medicine at the Center for Reproductive Medicine from 2004 through 2007. She was the recipient of the Research Fellow of the year award for 2006 and an award for highest productivity in female reproductive research. She recently received “Dr. Tommaso Falcone Award for Excellence in Female Infertility and Women’s Health Research” and the 2011 and 2013 Scholarship in Teaching Award from the Case Western Reserve Medical School.

Dr. Gupta has published over 50 review articles and scientific papers in peer-reviewed scientific journals, authored a dozen book chapters, and has presented 50 abstracts at both national and international scientific meetings. She is a member of several professional societies, including: American Society of Reproductive Medicine, American Society of Andrology, and the Society for the Study of Male Reproduction. Dr. Gupta is an investigator on 18 research grants. Her current research interests include the role of free radicals in male and female infertility, endometriosis, assisted reproductive techniques and gamete cryobiology.

Dr. Rakesh Sharma, Ph.D. | Coordinator

Dr. Sharma is an Associate Professor at the Lerner College of Medicine of Case Western Reserve University and is the Coordinator of the Andrology Center and the Center for Reproductive Medicine.

Dr. Sharma received his Masters of Science in 1983 and his Ph.D. degree in 1992 from Panjab University, Chandigarh, India. He completed his postdoctoral training at the Cleveland Clinic. He is the recipient of the American Foundation for Urologic Disease (AFUD) Fellow Award. Dr. Sharma has published over 175 scientific papers and 25 reviews in peer-reviewed scientific journals, authored two dozen book chapters and presented 350 abstracts at both national and international scientific meetings. He is a member of several professional societies, including: American Society of Reproductive Medicine, American Society of Andrology, and the Society for the Study of Male Reproduction. Dr. Sharma is an investigator on 55 research grants. He is the recipient of the Cleveland Clinic Innovator Award, the 2011 and 2013 Scholarship in Teaching (SIT) Award from the CASE Medical School for his innovative Summer Internship Course and the 2012 Star Award from the American Society for Reproductive Medicine.

His current research interests include the role of free radicals in the pathophysiology of male and female infertility, oxidative stress and DNA integrity, alterations in oxidative stress-related proteins, sperm proteomics apoptosis, fertility preservation and endometriosis-associated infertility.