

**About the Measure**

<b>Domain:</b>	Reproductive Health
<b>Measure:</b>	Male Fertility Status
<b>Definition:</b>	This measure describes how to properly collect, analyze and interpret the characteristics of a semen sample for the assessment of male fertility status.
<b>Purpose:</b>	Sperm and semen characteristics, such as sperm count, motility and morphology, as well as semen volume and semen fructose can influence a man's fertility status. By measuring these parameters, researchers and clinicians may be able to identify a potential cause of the couple's infertility related to the male partner. Additionally, abnormalities in sperm and semen may be related to environmental exposures, illicit drugs or medications.
<b>Essential PhenX Measures:</b>	<a href="#">Gender</a> <a href="#">Current Age</a>
<b>Related PhenX Measures:</b>	<a href="#">Reproductive History</a>
<b>Keywords:</b>	Semen, sperm, motility, morphology, fertility, World Health Organization, WHO
<b>Measure Release Date:</b>	

**About the Protocol**

<b>Protocol Release Date:</b>	
<b>PhenX Protocol Name:</b>	Sperm and Semen Parameters
<b>Protocol Name from Source:</b>	2010 WHO Laboratory Manual for the Examination and Processing of Human Semen, Fifth Edition
<b>Description:</b>	The 2010 WHO manual provides a standardized protocol for collection, analyses, and interpretation of sperm parameters such as sperm numbers, sperm motility, sperm morphology and azoospermia.
<b>Specific Instructions:</b>	Motility values may not be as accurate if samples are shipped overnight but morphology should be unaffected. Please note the WHO manual undergoes periodic updates and the Expert Review Panel encourages researchers to check with WHO for updates.

<b>Protocol:</b>	<p>Note that the following information is a summary, the full protocol is in the WHO laboratory manual.</p> <p><u>Collection of Semen Sample</u></p> <ul style="list-style-type: none"><li>• Provide the man with clear written and verbal instructions how to properly collect the sample.</li><li>• Sperm should be collected after a minimum of 2 days of abstinence or a maximum of 7 days of abstinence from ejaculation.</li></ul> <p>Instruct him to do the following:</p> <ul style="list-style-type: none"><li>• Urinate</li><li>• Wash hands and penis with soap. Rinse. Dry off with fresh disposable towel.</li><li>• Masturbate and ejaculate into the sterile specimen container. Cap the container. If some of the sperm is not ejaculated directly into the specimen container it should be recorded how much (% of sample) was not captured. This fraction of the sample should never be collected and processed.</li><li>• Ensure that a specimen label with subject's name and identification number is affixed to the side of the container.</li></ul> <p>He should record the following information at the time of sample collection.</p> <ol style="list-style-type: none"><li>1. Name</li><li>2. Birth date</li><li>3. ID code</li><li>4. Period of abstinence from ejaculation</li><li>5. Date and time of collection</li><li>6. Completeness of sample</li><li>7. Difficulties collecting the sample</li></ol> <p>Lab staff should record the following:</p> <ol style="list-style-type: none"><li>8. Time between collection and analyses</li></ol> <p>Keep the sample at 20° to 37° C. The time between the time of collection and delivery to the laboratory should be approximately 1 hour. The laboratory should begin analysis within 3 hours of collection. Ideally the sample is collected at or near the laboratory.</p> <p><u>Processing and Analyses of Semen Sample</u></p> <p>Normally, semen samples will liquefy within 30 minutes, and once this occurs laboratory staff can proceed with semen analysis.</p> <p>Follow the detailed instructions in the lab manual to measure and record the following characteristics of the sample.</p> <p>Semen volume (ml) _____</p> <p>Total sperm number (10<sup>6</sup> per ejaculate) _____</p>
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Sperm concentration ( $10^6$  per ml) \_\_\_\_\_

Total motility (PR + NP, %) \_\_\_\_\_

Progressive motility (PR, %) \_\_\_\_\_

Vitality (live spermatozoa, %) \_\_\_\_\_

Sperm morphology (normal forms, strict criteria %) \_\_\_\_\_

Other consensus threshold values that may be reported:

pH \_\_\_\_\_

Peroxidase-positive leukocytes ( $10^6$  per ml) \_\_\_\_\_

MAR test (motile spermatozoa with bound particles, %) \_\_\_\_\_

Immunobead test (motile spermatozoa with bound beads, %) \_\_\_\_\_

Seminal zinc ( $\mu$ mol/ejaculate) \_\_\_\_\_

Seminal fructose ( $\mu$ mol/ejaculate) \_\_\_\_\_

Seminal neutral glucosidase (mU/ejaculate) \_\_\_\_\_

**Interpreting the Results**

The following values represent lower reference limits for the semen parameters (5 centiles and their 95% confidence intervals)

Parameter	Lower reference limit
Semen volume (ml)	1.5 (1.4–1.7)
Total sperm number ( $10^6$ per ejaculate)	39 (33–46)
Sperm concentration ( $10^6$ per ml)	15 (12–16)
Total motility (PR + NP, %)	40 (38–42)
Progressive motility (PR, %)	32 (31–34)
Vitality (live spermatozoa, %)	58 (55–63)
Sperm morphology (normal forms, %)	4 (3.0–4.0)

	<i>Other consensus threshold values</i>	
	pH	> 7.2
	Peroxidase-positive leukocytes (10 <sup>6</sup> per ml)	< 1.0
	MAR test (motile spermatozoa with bound particles, %)	< 50
	Immunobead test (motile spermatozoa with bound beads, %)	< 50
	Seminal zinc (µmol/ejaculate)	≥ 2.4
	Seminal fructose (µmol/ejaculate)	≥ 13
	Seminal neutral glucosidase (mU/ejaculate)	≥ 20
<b>Selection Rationale:</b>	The WHO laboratory manual is the most comprehensive manual available for standardized protocols of semen collection and analyses.	
<b>Source:</b>	World Health Organization. (2010). WHO laboratory manual for the examination and processing of human semen, Fifth Edition. Geneva, Switzerland	
<b>Life Stage:</b>	Adolescent Adult	
<b>Language:</b>	English	
<b>Participant:</b>	Adult men and boys 14 and older	
<b>Personnel and Training Required:</b>	The processing and analyses procedures should be performed by a certified laboratory technician.	
<b>Equipment Needs:</b>	Highly specialized laboratory equipment is necessary to perform accurate semen analyses. Many groups rely on a Computer-Assisted Sperm Analysis (CASA) machine, particularly for motility assessments.	
<b>General References:</b>	For environmental exposures  Serrano M, Gonzalvo MC, Sánchez-Pozo MC, Clavero A, Fernández MF, López-Regalado ML, Mozas J, Martínez L, Castilla JA.(2014). Adherence to reporting guidelines in observational studies concerning exposure to persistent organic pollutants and effects on semen parameters. <i>Hum Reprod</i> , 2014 Jun;29(6):1122-33	

	<p>.</p> <p>For Infertility:</p> <p>Guzick , D. S., et al. (2001). Sperm Morphology, Motility, and Concentration in Fertile and Infertile Men. <i>New England Journal of Medicine</i>, 345(19): 1388-1393.</p> <p>Murray KS, James A, McGeedy JB, Reed ML, Kuang WW, Nangia AK. Fertil Steril. (2012). The Effect of the new 2010 World Health Organization criteria for semen analyses on male infertility. <i>Fertility and Sterility</i>, 98(6):1428-31.</p> <p>Rohayem, J., et al. (2015). Age and markers of Leydig cell function, but not of Sertoli cell function predict the success of sperm retrieval in adolescents and adults with Klinefelter's syndrome. <i>Andrology</i>, 3(5): 868-875.</p>										
<b>Mode of Administration:</b>	Bioassay, Clinical Assessment										
<b>Derived Variables:</b>	None										
<b>Requirements:</b>	<table border="1"> <thead> <tr> <th>Requirements Category</th> <th>Required (Yes/No):</th> </tr> </thead> <tbody> <tr> <td>Major equipment</td> <td>Yes</td> </tr> <tr> <td>Specialized training</td> <td>No</td> </tr> <tr> <td>Specialized requirements for biospecimen collection</td> <td>No</td> </tr> <tr> <td>Average time of greater than 15 minutes in an unaffected individual</td> <td>No</td> </tr> </tbody> </table>	Requirements Category	Required (Yes/No):	Major equipment	Yes	Specialized training	No	Specialized requirements for biospecimen collection	No	Average time of greater than 15 minutes in an unaffected individual	No
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<b>Annotations for Specific Conditions:</b>	No annotations at this time.										
<b>Process and Review:</b>	<p>The <a href="#">Expert Review Panel #5</a> (ERP 5) reviewed the measures in the Reproductive Health domain.</p> <p>Guidance from ERP 5 includes:</p> <ul style="list-style-type: none"> <li>• Added a New Measure</li> <li>• New Data Dictionary</li> </ul>										