Provider's guide to optimal biomarker ranges

100+ Biomarkers for whole person care

Fullscript®

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Delivering more proactive patient care requires a clear understanding of biomarkers and optimal ranges. While conventional biomarker ranges are an effective tool in identifying and diagnosing disease – they fail to fully support providers looking to deliver more preventative, personalized care. Optimal biomarker ranges* are narrower to focus on supporting metabolism, energy, and overall well-being.

By continuously monitoring biomarker trends over time, providers may better detect subtle shifts in metabolism, inflammation, and nutrient status before they lead to chronic conditions. This enables personalized interventions through lifestyle, diet, and supplementation to support long-term wellness.

Fullscript's interpretations tool enhances this process by delivering a clear visualization of biomarker trends, helping providers tailor protocols based on a patient's unique needs.

This guide, developed by the Fullscript Medical Advisory Team, utilizes medical research and advanced technology to refine optimal ranges through large datasets from trusted sources like ScienceDirect and PubMeb. Please be aware that different healthcare providers have varying approaches to lab testing and interpretation; selection of specific tests, methodologies, and recommendations can differ based on training, experience, and needs of individual patients.

Whole person care is focused on helping patients more clearly understand and take control of their health – this data-driven approach can help provide targeted and evidence-based support for optimal well-being.

*Optimal ranges are established by various experts based on their own experience and research, including Fullscript's Medical Advisory team; they are intended solely as informational reference content. Optimal ranges are not medical diagnoses or treatments, are not a substitute for a practitioner's professional judgment in specific individual situations, and are not meant to provide medical or professional advice. While content has been obtained from sources believed to be reliable, we cannot and do not guarantee the accuracy, validity, timeliness or completeness of the content.

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Basophils, CBC

Basophils are involved in allergic reactions and inflammatory responses. Abnormal levels can indicate various health conditions, including allergies, infections, and certain types of leukemia. Understanding their role can help in managing allergic conditions, chronic inflammatory diseases, and hematological disorders more effectively.

Standard Range:

- Male/Female: 0-200 cells/uL

Recommended Range:

- Male/Female Optimal: 0-100 cells/uL
- Male/Female Suboptimal High: 100-200 cells/uL
- Male/Female High: > 200 cells/uL

Source(s):

https://www.tuasaude.com/en/basophils/
https://pubmed.ncbi.nlm.nih.gov/29247714/
https://www.semanticscholar.org/paper/d9403f26d00f9ceef9cab1ce60972acd46ea7b93
https://www.semanticscholar.org/paper/eadda7e3c87a98aa22704ee99eed6606d80e2bd4

Basophils (%)

% basophils is a key measurement in a complete blood count (CBC) test, representing the percentage of neutrophils among total white blood cells in a blood sample. Basophils are involved in allergic reactions and inflammatory responses. Abnormal levels can indicate various health conditions, including allergies, infections, and certain types of leukemia. Understanding their role can help in managing allergic conditions, chronic inflammatory diseases, and hematological disorders more effectively.

Standard Range:

- **Low:** > 0.5%
- **High:** <1.0%

Recommended Range:

- **Low:** 0-0.5%
- **High:** <1.0%

Source(s):

https://ncbi.nlm.nih.gov/books/NBK563148/
https://pubmed.ncbi.nlm.nih.gov/10228396/
https://www.semanticscholar.org/paper/ddb8a7d5ad7986a650d8a3102414e222a37c686e
https://www.semanticscholar.org/paper/d441a777fb4298e1aa478ff7514e6421d6995788
https://www.semanticscholar.org/paper/9beaa944dd76d94920d844996fcb394a06019a50

Eosinophils, CBC

The eosinophils blood test measures the number and percentage of eosinophils in the blood. Eosinophils are a type of white blood cell involved in the body's immune response, particularly in fighting parasitic infections, allergic reactions, and certain autoimmune conditions. They contain granules filled with enzymes and proteins that can be released to combat pathogens and modulate inflammation., CBC

Standard Range:

- 15-500 cells/uL

Recommended Range:

- **Optimal:** 0- 500 cells/uL
- **High:** > 500 cells/uL

Source(s):

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8641810/
https://my.clevelandclinic.org/health/body/23402-eosinophils
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2526447/#:~:text=It%20was%20found%20that%20as,and%20metabolic%20syndrome%20also%20increased.
https://pubmed.ncbi.nlm.nih.gov/23526980/
https://pubmed.ncbi.nlm.nih.gov/30208386/
https://www.semanticscholar.org/paper/5ad7575634c4c8602fd182aaae649f5b13d421b6
https://www.semanticscholar.org/paper/96bd016bd70131390507f05778612187ee9cc7e6

Eosinophils (%)

The eosinophils blood test measures the number and percentage of eosinophils in the blood. Eosinophils are a type of white blood cell involved in the body's immune response, particularly in fighting parasitic infections, allergic reactions, and certain autoimmune conditions. They contain granules filled with enzymes and proteins that can be released to combat pathogens and modulate inflammation.

Standard Range:

- Low: <1%
- High: >4%

Recommended Range:

- Low: 0-1%
- High: >4%

Source(s):

https://www.mountsinai.org/health-library/tests/blood-differential-test#:~:text=Lymphocytes%3A%2020%25%20to%2040%25,Basophils%3A%200.5%25%20to%201%25
https://ncbi.nlm.nih.gov/books/NBK563148/
https://onlinelibrary.wiley.com/doi/abs/10.1111/cea.12345

Hematocit, CBC

Hematocrit (HCT) is a key parameter in the complete blood count (CBC) test. It measures the proportion of red blood cells in the blood, providing insight into oxygen-carrying capacity and blood viscosity. Hematocrit is essential for diagnosing and monitoring conditions such as anemia, dehydration, polycythemia, and other hematological or cardiovascular disorders. It helps clinicians assess overall blood volume status and guides treatment strategies for various medical conditions affecting red blood cell production and turnover.

Standard Range:

- Male: >18 Years: 38.5-50.0%
- Female: >18 Years: 35.0-45.0%

Recommended Range:

- Male:
    - Low: 0-38.3%
    - Optimal: 38.3-48.6%
    - High: > 48.6%
- Female
    - Low: < 36.0%
    - Optimal: 36-48%
    - High: > 48%

Source(s):

https://pubmed.ncbi.nlm.nih.gov/22802225/
https://www.ncbi.nlm.nih.gov/books/NBK259/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3619954/
https://www.semanticscholar.org/paper/7251c741e5f8b60c9c819b67ddfc1accef91a46d
https://www.semanticscholar.org/paper/1206a14f74cec58e54c94b97ee175d973857dfbb
https://www.semanticscholar.org/paper/5fee77310544d7fd6c04381854cc6844121c2a47

Hemoglobin, CBC

Hemoglobin is crucial for transporting oxygen from the lungs to the rest of the body and returning carbon dioxide from the tissues back to the lungs. Its levels are essential for diagnosing and managing conditions like anemia, polycythemia, and hemoglobinopathies, which have significant health implications and vital for overall health and detecting underlying medical conditions. Accurate hemoglobin levels help guide treatment decisions and monitor the effectiveness of therapeutic interventions.

Standard Range:

- Adult females (AFAB): 11.7 - 15.5 g/dL
- Adult males (AMAB): 13.2 - 17.1 g/dL

Recommended Range:

- Male:
    - Low: 0- 13.8 g/dL
    - Optimal: 14-15 g/dL
    - Suboptimal high: 15-17.1 g/dL
    - High: > 17.1 g/dL
- Female:
    - Low: 0- 12.0 g/dL
    - Optimal: 12.0-15.1 g/dL
    - High: > 15.1 g/dL

Source(s):

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6483202/
https://pubmed.ncbi.nlm.nih.gov/29378732/
https://testdirectory.questdiagnostics.com/test/test-detail/510/hemoglobin?cc=MASTER#
https://testdirectory.questdiagnostics.com/test/test-guides/TS_Anemia_Cascading_Reflex/anemia-diagnostic-cascading-reflex
https://snucm.elsevierpure.com/en/publications/the-low-number-of-red-blood-cells-is-an-important-risk-factor-for
https://www.semanticscholar.org/paper/019808fd7844a49a3be9a0d6ab44dde4b9d834dd
https://www.semanticscholar.org/paper/3386a47d7a181dca3802809eff5387f5067f4f13
https://www.semanticscholar.org/paper/c0faf77dd7243735a34a77e85a8fb9a6a92f0f88

Lymphocytes, CBC

The lymphocytes blood test measures the number and percentage of lymphocytes in the blood. Lymphocytes are a type of white blood cell that plays a crucial role in the immune system, helping the body fight infections and other diseases. There are three main types of lymphocytes: B cells, T cells, and natural killer (NK) cells., CBC

Standard Range:

- 850-3900 cells/uL

Recommended Range:

- **Low:** 0-1000 cells/uL
- **Optimal:** 1000-4800 cells/uL
- **High:** > 4800 cells/uL

Source(s):

https://www.nhlbi.nih.gov/health/lymphopenia/diagnosis
https://www.semanticscholar.org/paper/1d8d931facf9b8694fa1668c92c4e8c613700f87
https://www.semanticscholar.org/paper/ef6347599dd4d5dd7ad5094e2ea3a3911c2cbfc9
https://www.semanticscholar.org/paper/1d8d931facf9b8694fa1668c92c4e8c613700f87
https://www.semanticscholar.org/paper/40fe30f9d105a67c084d4bc4ff2f96e21682db70

Lymphocytes (%)

The lymphocytes blood test measures the number and percentage of lymphocytes in the blood. Lymphocytes are a type of white blood cell that plays a crucial role in the immune system, helping the body fight infections and other diseases. There are three main types of lymphocytes: B cells, T cells, and natural killer (NK) cells.

Standard Range:

- **Low:** <20%
- **High:** >40%

Recommended Range:

- **Low:** 0-20%
- **High:** >40%

Source(s):

https://www.mountsinai.org/health-library/tests/blood-differential-test#:~:text=Lymphocytes%3A%2020%25%20to%2040%25,Basophils%3A%200.5%25%20to%201%25
https://ncbi.nlm.nih.gov/books/NBK563148/

Mean Corpuscular Hemoglobin (MCH) Platelet Count, CBC

Mean Corpuscular Hemoglobin (MCH) measures the average amount of hemoglobin within a single red blood cell, providing key insights into the oxygen-carrying capacity of blood. It is crucial for diagnosing and managing various types of anemia, guiding treatment plans, monitoring chronic conditions, assessing nutritional status, and serving as an early indicator of other hematologic disorders or potential health issues. Platelet Count, CBC

Standard Range:

- 27 and 33 picograms (pg)

Recommended Range:

- Low: 0- 27 pg/cell
- Optimal: 27.0-31.0 pg/cell
- Suboptimal high: 31.0-33.0 pg/cell
- High: > 33.0 pg/cell

Source(s):

https://www.liebertpub.com/doi/10.1089/10906570050114786?url_ver=Z39.88-2003&rfr_id=ori%3Arid%3Acrossref.org&rfr_dat=cr_pub++0pubmed
https://www.semanticscholar.org/paper/3386a47d7a181dca3802809eff5387f5067f4f13

Mean Corpuscular Hemoglobin Concentration (MCHC), CBC

Understanding MCHC is essential for diagnosing and managing various medical conditions, particularly those related to anemia and other blood disorders. It aids in the accurate diagnosis of anemia types, monitoring treatment effectiveness, differentiating blood disorders, and assessing overall health indicators such as nutritional status and bone marrow function., CBC

Standard Range:

- 32 - 36 g/dL

Recommended Range:

- **Low:** 0- 32 g/dL
- **Optimal:** 32-36 g/dL
- **High:** > 36 g/dL

Source(s):

https://www.ncbi.nlm.nih.gov/books/NBK260/#:~:text=The%20normal%20values%20for%20MCH,blood%20cell%20count%20as%20follows
https://pubmed.ncbi.nlm.nih.gov/10149417/
https://www.semanticscholar.org/paper/488614d1ef3431ed7ad149580a272d61ece51cd1

Mean Corpuscular Volume (MCV), CBC

Mean Corpuscular Volume (MCV) is a key parameter in the complete blood count (CBC) test. Since it measures the average size of red blood cells, it's useful in diagnosing and differentiating types of anemia. It helps clinicians identify whether anemia is microcytic, normocytic, or macrocytic, guiding further diagnostic and treatment strategies for conditions such as iron deficiency anemia, vitamin B12 deficiency, and bone marrow disorders and other hematological and metabolic conditions. (MCV), CBC

Standard Range:

- 80.0 - 100.0 fL

Recommended Range:

- **Low:** 0- 80.0 fL
- **Optimal:** 80.0-95.0 fL
- **Suboptimal high:** 95-100 fL
- **High:** > 100 fL

Source(s):

https://academic.oup.com/ajcp/article-abstract/55/4/438/1764378?redirectedFrom=fulltext&login=false
https://www.semanticscholar.org/paper/Mean-Corpuscular-Volume-(MCV)-Maner-Moosavi/1b44cc0e4f610fece83a60d323f9f4bd750eb94b
https://www.semanticscholar.org/paper/3386a47d7a181dca3802809eff5387f5067f4f13
https://www.semanticscholar.org/paper/82926ceb812f1113191bb5b392a24f829129989b

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Mean Platelet Volume (MPV), CBC (includes Differential and Platelets)

Mean Platelet Volume (MPV) is crucial for diagnosing and managing various health conditions related to platelet function and hematologic health. It reflects platelet size and is an indicator of platelet production, helping to assess conditions like thrombocytopenia, thrombocytosis, and bone marrow disorders. Additionally, MPV can indicate the presence of inflammation, cardiovascular risk, or platelet activation, providing insight into the body's clotting and inflammatory status. It is monitored in chronic diseases to assess platelet function, guide treatment, and evaluate the risk of thrombotic or bleeding disorders.

Standard Range:

- 7.5 - 11.5 femtoliters (fL)

Recommended Range:

- **Low:** 0- 7.0 fL
- **Suboptimal low:** 7.0 - 7.5 fL
- **Optimal:** 7.5 - 9.0 fL
- **Suboptimal high:** 9.0-11.5 fL
- **High:** > 11.5 fL

Source(s):

https://testdirectory.questdiagnostics.com/test/test-detail/6399/cbc-includes-differential-and-platelets?q=cbc&cc=MASTER
https://my.clevelandclinic.org/health/diagnostics/23572-mpv-blood-test
https://www.semanticscholar.org/paper/7cb40416f1acef7083b3ee25b9786affda465fd7
https://www.semanticscholar.org/paper/d19203a7a2defe23c48786d078241db45f356510
https://www.semanticscholar.org/paper/3415d171f219535f17b35d13fa3a0a2d52e4c87b

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Metamyelocytes

The Metamyelocytes blood test measures the presence and percentage of metamyelocytes in the blood. Metamyelocytes are immature white blood cells that develop in the bone marrow and typically do not appear in the bloodstream under normal conditions. Their presence may indicate bone marrow stress, infection, inflammation, or hematologic disorders. Metamyelocytes are part of the granulocytic lineage, maturing into neutrophils that play a critical role in immune defense. Monitoring metamyelocyte levels helps assess bone marrow activity, detect underlying infections or disorders, and guide further diagnostic evaluation in hematologic and inflammatory conditions.

Standard Range:

- **Optimal:** 0%
- **High:** > 0%

Recommended Range:

- **Male:**
- **Optimal:** 0%
- **High:** > 0%

- Female:
- Optimal: 0-1%
- High: > 1%

Source(s):

https://www.semanticscholar.org/paper/354c0afcbeeff763a9ec74d28ce8183bb56383e3
https://www.semanticscholar.org/paper/c72ab07abd453ba2e4311d95d5a9138a26d0cf08
https://www.semanticscholar.org/paper/An-Investigation-into-the-Development-and-Fate-of-Wickramasinghe-Bush/dee01b827989ad419ddfbd9aadb60a005d04406a
https://www.semanticscholar.org/paper/253c6df4e0f5ecd0e256dda540895d360072a1e2
https://www.semanticscholar.org/paper/Cerebral-fat-embolism-syndrome-mimicking-thrombotic-Kammeyer-Devnani/253c6df4e0f5ecd0e256dda540895d360072a1e2

Absolute Metamyelocytes

The Absolute Metamyelocytes blood test measures the total number of metamyelocytes in the bloodstream, providing insight into bone marrow activity and immune response. Metamyelocytes are immature white blood cells that typically reside in the bone marrow and are rarely found in circulation under normal conditions. Their presence in the blood may indicate bone marrow stress, infection, inflammation, or hematologic disorders. Monitoring absolute metamyelocyte levels helps assess immune system activation, detect underlying conditions affecting blood cell production, and guide further diagnostic evaluation in hematologic and inflammatory diseases.

Standard Range:

- Optimal: 0 cells/uL
- High: > 0 cells/uL

Recommended Range:

- Male:
    - Optimal: 0 cells/uL
    - High: > 0 cells/uL
- Female:
    - Optimal: 0 cells/uL
    - High: > 0 cells/uL

Source(s):

https://www.semanticscholar.org/paper/354c0afcbeeff763a9ec74d28ce8183bb56383e3
https://www.semanticscholar.org/paper/c72ab07abd453ba2e4311d95d5a9138a26d0cf08
https://www.semanticscholar.org/paper/An-Investigation-into-the-Development-and-Fate-of-Wickramasinghe-Bush/dee01b827989ad419ddfbd9aadb60a005d04406a
https://www.semanticscholar.org/paper/253c6df4e0f5ecd0e256dda540895d360072a1e2
https://www.semanticscholar.org/paper/Cerebral-fat-embolism-syndrome-mimicking-thrombotic-Kammeyer-Devnani/253c6df4e0f5ecd0e256dda540895d360072a1e2

Monocytes, CBC

The monocytes blood test measures the number and percentage of monocytes in the blood. Monocytes are a type of white blood cell that plays a critical role in the body's immune system, particularly in fighting infections, removing dead or damaged tissues, and regulating the immune response. Monocytes are produced in the bone marrow and then circulate in the bloodstream before moving into tissues, where they differentiate into macrophages and dendritic cells., CBC

Standard Range:

- 200-950 cells/uL

Recommended Range:

- **Low:** 0- 200 cells/uL
- **Optimal:** 200-800 cells/uL
- **High:** > 800 cells/uL

Source(s):

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2526447/#:~:text=It%20was%20found%20that%20as,and%20metabolic%20syndrome%20also%20increased.
https://pubmed.ncbi.nlm.nih.gov/23526980/
https://www.semanticscholar.org/paper/ef6347599dd4d5dd7ad5094e2ea3a3911c2cbfc9
https://www.semanticscholar.org/paper/9beaa944dd76d94920d844996fcb394a06019a50
https://www.semanticscholar.org/paper/9436e3ef7219696a4ca196d82a74ee88377d4754

Monocytes (%)

The monocytes blood test measures the number and percentage of monocytes in the blood. Monocytes are a type of white blood cell that plays a critical role in the body's immune system, particularly in fighting infections, removing dead or damaged tissues, and regulating the immune response. Monocytes are produced in the bone marrow and then circulate in the bloodstream before moving into tissues, where they differentiate into macrophages and dendritic cells.

Standard Range:

- Low: >2%
- High: <8%

Recommended Range:

- Low: 0-2%
- High: <8%

Source(s):

https://ncbi.nlm.nih.gov/books/NBK563148/
https://pubmed.ncbi.nlm.nih.gov/10228396/
https://www.semanticscholar.org/paper/c6bddcb85a8e645892665837cef7d1895590b6fd
https://www.semanticscholar.org/paper/Histology%2C-White-Blood-Cell-Toney-Butler/1284c1378220a97ed1d86255f72c2c0b4f30ad38

Absolute Myelocytes

The Absolute Myelocytes blood test measures the total number of myelocytes in the bloodstream, providing important information about bone marrow function and blood cell production. Myelocytes are immature white blood cells that are typically found in the bone marrow and mature into granulocytes (like neutrophils) as they develop. Their presence in the blood can indicate bone marrow stress, infection, or certain hematologic conditions. Monitoring absolute myelocyte levels helps assess bone marrow health, detect underlying infections or inflammatory conditions, and guide further diagnostic evaluation in disorders affecting white blood cell production.

Standard Range:

- **Optimal:** 0 cells/uL
- **High:** > 0 cells/uL

Recommended Range:

- **Optimal:** 0 cells/uL
- **High:** > 0 cells/uL

Source(s):

https://academic.oup.com/jleukbio/article/108/5/1665/6884423?login=false
https://www.semanticscholar.org/paper/Cerebral-fat-embolism-syndrome-mimicking-thrombotic-Kammeyer-Devnani/253c6df4e0f5ecd0e256dda540895d360072a1e2

Neutrophils, CBC

Monocytes, measured as part of a complete blood count (CBC), are crucial for diagnosing and managing various health conditions related to immune function and inflammation. They play a key role in the body's defense by responding to infections, clearing dead or damaged tissues, and regulating immune responses. Elevated or decreased monocyte levels can indicate conditions such as infections, chronic inflammatory diseases, autoimmune disorders, or hematologic conditions.

Standard Range:

- 1500-7800 cells/uL

Recommended Range:

- **Low:** 0- 1500 cells/uL
- **Optimal:** 1500-8000 cells/uL
- **High:** > 8000 cells/uL

Source(s):

https://requestatest.com/includes/uploads/tests/CBC.pdf
https://pubmed.ncbi.nlm.nih.gov/23526980/
https://pubmed.ncbi.nlm.nih.gov/28254179/
https://www.semanticscholar.org/paper/58cb7f204fd129c0f2ebda02c94d9e2683582b12

Neutrophils (%)

% neutrophils is a key measurement in a complete blood count (CBC) test, representing the percentage of neutrophils among total white blood cells in a blood sample. Neutrophils are crucial for the immune system as they are the first line of defense against infections. They play a significant role in engulfing and destroying pathogens, forming NETs to trap and kill pathogens, regulating inflammation, and interacting with other immune cells. Their function and efficiency can greatly influence the outcome of various diseases, including bacterial infections, inflammatory conditions, and cancer.

Standard Range:

- Low: >40%
- High: <60%

Recommended Range:

- Low: 0-40%
- High: >60%

Source(s):

https://www.semanticscholar.org/paper/Does-the-band-cell-survive-the-21st-century-Meer-Gelder/0de09f2531e0b9e017b0e4bc7f1f96b02bf1ce61
https://pubmed.ncbi.nlm.nih.gov/16183235/
https://www.semanticscholar.org/paper/bd78ccbf28cf532ef88e5cd7d067fe25ece6a656
https://www.semanticscholar.org/paper/c3e62dac16b96f1b89587e78baa8f2cc966f9120

Band Neutrophils

The Band Neutrophils blood test measures the number of banded neutrophils in the bloodstream. Band neutrophils are immature white blood cells that are part of the neutrophil lineage. They are typically produced in the bone marrow and released into the blood when the body is under stress, such as during infection or inflammation. An increased number of band neutrophils, known as a "left shift," can indicate an ongoing infection, inflammatory response, or bone marrow activation. Monitoring band neutrophil levels helps assess the body's immune response and guide diagnosis and treatment in various acute conditions.

Standard Range:

- 0% to 3%

Recommended Range:

- **Optimal:** 0-3%
- **Suboptimal high:** 3-10%
- **High:** >10%

Source(s):

https://onlinelibrary.wiley.com/doi/pdfdirect/10.1111/ijlh.12372
https://www.semanticscholar.org/paper/Bandemia-as-an-Early-Predictive-Marker-of-A-Cohort-Harada-Harada/280ea5276cde3a37bb6b95fbf91562978874dcf3
https://imagebank.hematology.org/image/60396/band-neutrophil#:~:text=Band%20neutrophils%20are%20slightly%20less%20mature%20than,neutrophils%20can%20be%20seen%20in%20infectious%20and
https://www.semanticscholar.org/paper/Review-of-A-Large-Clinical-Series%3A-Is-the-Band-in-Cavallazzi-Bennin/d7afa591418b71d66595c307f16fe257c214eec1

Platelets, CBC

The platelets blood test measures the number of platelets in the blood as part of a complete blood count (CBC). Platelets are small cell fragments that play a critical role in blood clotting, wound healing, and maintaining vascular integrity. They are produced in the bone marrow and circulate in the bloodstream, where they help prevent excessive bleeding and contribute to immune responses. Abnormal platelet counts can indicate conditions such as thrombocytopenia, thrombocytosis, clotting disorders, or bone marrow diseases. Platelet levels are monitored to assess bleeding risk, clotting function, and overall hematologic health.

Standard Range:

- 140-400 thousand/uL

Recommended Range:

- **Low:** 0- 150 thousand/uL
- **Optimal:** 150-450 thousand/uL
- **High:** > 450 thousand/uL

Source(s):

https://redcliffelabs.com/myhealth/lab-test/blood-test/platelet-count-low-vs-normal-vs-high-range-in-human/
https://www.oneblood.org/blog/what-is-a-normal-platelet-count.html
https://www.semanticscholar.org/paper/2fa125cc3de7e6b2cf60826d8854dc376c65f22e
https://www.semanticscholar.org/paper/ea21bfa9abdd8ecbcc8ab3749bd496285bb4e044

RBC (Blood)

An RBC (Red Blood Cell) count test measures the number of red blood cells in a blood sample, which is essential for diagnosing and monitoring conditions such as anemia, dehydration, and bone marrow disorders. It provides critical information about the body's ability to carry oxygen and can help identify underlying health issues like nutritional deficiencies, chronic illnesses, and hematologic diseases. Accurate RBC counts guide treatment decisions and help monitor the effectiveness of therapies.

Standard Range:

- **Low:** 3.77 million cells/µL
- **High:** 5.28 million cells/µL

Recommended Range:

- Male:
    - **Low:** 0-4.7 million cells/µL
    - **Optimal:** 4.7-6.1 million cells/µL
    - **High:** > 6.1 million cells/µL
- Female:
    - **Low:** 0-4.2 million cells/µL
    - **Optimal:** 4.2-5.4 million cells/µL
    - **High:** > 5.4 million cells/µL

Source(s):

https://www.mountsinai.org/health-library/tests/rbc-count#:~:text=Normal%20Results,to%205.4%20million%20cells/mcL
https://www.semanticscholar.org/paper/ef6347599dd4d5dd7ad5094e2ea3a3911c2cbfc9
https://www.semanticscholar.org/paper/40fe30f9d105a67c084d4bc4ff2f96e21682db70
https://www.semanticscholar.org/paper/ef6347599dd4d5dd7ad5094e2ea3a3911c2cbfc9
https://www.semanticscholar.org/paper/40fe30f9d105a67c084d4bc4ff2f96e21682db70

Red Blood Cells, CBC

Red blood cells (RBCs) are specialized cells in the blood that transport oxygen from the lungs to tissues and organs while carrying carbon dioxide back to the lungs for removal. They contain hemoglobin, a protein that binds oxygen, enabling efficient oxygen delivery throughout the body. RBCs play a vital role in maintaining energy levels, supporting organ function, and sustaining overall health. Proper RBC production and function are essential for preventing conditions such as anemia, which can lead to fatigue, weakness, and impaired oxygen transport.

Standard Range:

- **Adult females:** 3.80 - 5.10 cells/µL
- **Adult males AMAB):** 4.20 - 5.80 cells/µL

Recommended Range:

- Male:
    - **Low:** 0-4.20 cells/uL
    - **Optimal:** 4.20-5.80 cells/µL
    - **High:** > 5.80 cells/µL
- Female:
    - **Low:** < 3.8 cells/µL
    - **Optimal:** 3.80-5.10 cells/µL
    - **High:** > 5.10 cells/µL

Source(s):

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7686855/
(RBCs normal ranges for males were 4.7 to 6.1 million cells per microliter (cells/mcL) and for females 4.2 to 5.4 million cells/mcL)
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6306047/
https://www.ncbi.nlm.nih.gov/books/NBK260/
https://pubmed.ncbi.nlm.nih.gov/30285066/
https://snucm.elsevierpure.com/en/publications/the-low-number-of-red-blood-cells-is-an-important-risk-factor-for
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11101252/
https://www.semanticscholar.org/paper/ef6347599dd4d5dd7ad5094e2ea3a3911c2cbfc9

Red Cell Distribution Width (RDW), CBC (includes Differential and Platelets)

RDW is crucial for diagnosing different types of anemia, monitoring chronic diseases, assessing inflammation and infection, predicting outcomes in critical care, identifying nutritional deficiencies, and evaluating bone marrow function. It provides valuable insights that can lead to more accurate diagnoses and better management of various health conditions, ultimately improving patient care and outcomes., CBC (includes Differential and Platelets)

Standard Range:

- Normal RDW range: 11.5% to 14.5%

Recommended Range:

- Low: < 11.5%
- Optimal: 11.5-13%
- Suboptimal high: 13-14.5%
- High: > 14.5%

Source(s):

https://pubmed.ncbi.nlm.nih.gov/30212481/
https://pubmed.ncbi.nlm.nih.gov/19880817/
https://pmc.ncbi.nlm.nih.gov/articles/PMC5606102/
https://bmcresnotes.biomedcentral.com/articles/10.1186/s13104-020-05125-y
https://www.semanticscholar.org/paper/0b7cb683b5b554b181fca091ff076c9cbc996302

WBC (Blood)

A White Blood Cell (WBC) test measures the number of white blood cells in the blood, which is crucial for diagnosing and monitoring various conditions such as infections, inflammation, immune system disorders, and blood cancers. Abnormal WBC counts can indicate the presence of these conditions, helping guide further diagnostic testing and treatment decisions.

Standard Range:

- 3400 – 10800 cells/µL

Recommended Range:

- Low: 0- 4500 cells/µL
- Optimal: 4500-11000 cells/µL
- High: >11000 cells/µL

Source(s):

https://www.mountsinai.org/health-library/tests/wbc-count#:~:text=The%20normal%20number%20of%20WBCs,or%20may%20test%20different%20specimens.
https://www.semanticscholar.org/paper/ef6347599dd4d5dd7ad5094e2ea3a3911c2cbfc9
https://www.semanticscholar.org/paper/30b3d7fc33b3dafe7a77ad7b13fa41885d064bf4
https://www.semanticscholar.org/paper/Association-between-White-Blood-Cell-Counts-within-Hong-Noh/4e186e6a9184f52a41f2f332c463689d21d4c09c

https://www.semanticscholar.org/paper/ef6347599dd4d5dd7ad5094e2ea3a3911c2cbfc9
https://www.semanticscholar.org/paper/30b3d7fc33b3dafe7a77ad7b13fa41885d064bf4
https://www.semanticscholar.org/paper/Association-between-White-Blood-Cell-Counts-within-Hong-Noh/4e186e6a9184f52a41f2f332c463689d21d4c09c

White Blood Cells, CBC

White blood cells (WBCs) are a vital component of the immune system that help defend the body against infections, foreign invaders, and abnormal cells. They play a crucial role in immune response, inflammation regulation, and tissue repair. WBCs are produced in the bone marrow and circulate throughout the bloodstream and lymphatic system, targeting harmful pathogens and supporting overall immunity. Maintaining a balanced WBC count is essential for protecting against infections, autoimmune disorders, and other health conditions.

Standard Range:

- 3.8-10.8 thousand/µL

Recommended Range:

- **Low:** 0-3.8 thousand/uL
- **Optimal:** 3.8-10.0 thousand/µL
- **High:** > 10.0 thousand/µL

Source(s):

https://pubmed.ncbi.nlm.nih.gov/36941499/
https://pubmed.ncbi.nlm.nih.gov/32157617/
https://www.semanticscholar.org/paper/ef6347599dd4d5dd7ad5094e2ea3a3911c2cbfc9
https://www.semanticscholar.org/paper/5c4e660c5169322c443fc182f4f7bd1558168e97

Cardiovascular

Apolipoprotein B

Apolipoprotein B (ApoB) is a critical biomarker for cardiovascular health. It is a strong predictor of cardiovascular disease (CVD), aids in clinical decision-making for therapeutic interventions, and informs public health strategies to reduce the burden of CVD. ApoB levels reflect the number of atherogenic lipoprotein particles, making it a more accurate marker for assessing cardiovascular risk compared to LDL cholesterol levels.

Standard Range:

- **Optimal:** <90 mg/dL
- **Moderate:** 90-119 mg/dL
- **High: ≥120 mg/dL**

Recommended Range:

- **Optimal:** 0- 90 mg/dL
- **Suboptimal high:** 90-119 mg/dL
- **High: ≥ 120** mg/dL

Source(s):

https://www.aafp.org/pubs/afp/issues/2003/0315/p1386.html#:~:text=A%20target%20value%20of%20apo%20B%20of,mg%20per%20dL%20(0.8%20g%20per%20L).
https://my.clevelandclinic.org/health/diagnostics/24992-apolipoprotein-b-test
https://pubmed.ncbi.nlm.nih.gov/19168552/
https://pubmed.ncbi.nlm.nih.gov/29917037/ https://www.ncbi.nlm.nih.gov/books/NBK570370/
https://www.mayoclinicproceedings.org/article/S0025-6196(11)60330-3/fulltext
https://www.semanticscholar.org/paper/5501fd105a2a5b91a1aeb6756af65563e8bc9e1f
https://www.semanticscholar.org/paper/0b4602237302f85d7621c8be63b38fc5551e6396
https://www.semanticscholar.org/paper/5a9e254bb243462e5842564331fe7c640ef5a738

Fibrinogen

Fibrinogen is a key biomarker in coagulation and cardiovascular health. As a clotting protein produced by the liver, it plays a crucial role in blood clot formation and wound healing. Since it is also an acute-phase reactant, fibrinogen levels can rise in response to inflammation, infection, or tissue injury. It is useful in assessing bleeding disorders, thrombosis risk, and inflammatory conditions, helping clinicians evaluate cardiovascular health, monitor systemic inflammation, and guide treatment strategies for clotting disorders and chronic diseases.

Standard Range:

- 175-425 mg/dL

Recommended Range:

- **Low:** 0- 200 mg/dL
- **Optimal:** 200-400 mg/dL
- **High:** > 400 mg/dL

Source(s):

https://www.ncbi.nlm.nih.gov/books/NBK537184/
https://testdirectory.questdiagnostics.com/test/test-detail/461/fibrinogen-activity-clauss?cc=MASTER
https://pubmed.ncbi.nlm.nih.gov/29176380/
https://pubmed.ncbi.nlm.nih.gov/11815639/
https://pubmed.ncbi.nlm.nih.gov/7845427/
https://www.semanticscholar.org/paper/ab21e3a20b599e3f078766b56f68c6d6407d5eb7
https://www.semanticscholar.org/paper/5cb798b25334dc0545689e8dea8b8eda6ffd248b

HDL Cholesterol

HDL cholesterol is crucial for cardiovascular health as it helps transport cholesterol from the arteries to the liver for excretion, has anti-inflammatory and antioxidant properties, maintains endothelial function, and reduces the risk of blood clots. Higher levels are associated with a lower risk of heart disease and stroke, better management of metabolic syndrome, and increased longevity.

Standard Range:

- Male: ≥40 mg/dL
- Female: ≥50 mg/dL

Recommended Range:

- Male:
    - Low: 0- 40 mg/dL
    - Suboptimal low: 40-59 mg/dL
    - Optimal: ≥ 60 mg/dL
- Female:
    - Low: < 50 mg/dL
    - Suboptimal low: 50-59 mg/dL
    - Optimal: ≥ 60 mg/dL

Source(s):

https://pubmed.ncbi.nlm.nih.gov/34971388/
https://pubmed.ncbi.nlm.nih.gov/30869791/
https://www.semanticscholar.org/paper/1652f64a1c58c62987d3ac4745bef81bd823049e
https://jamanetwork.com/journals/jamacardiology/fullarticle/2792282
https://pubmed.ncbi.nlm.nih.gov/22617230/

HDL Large

HDL Large particles are crucial for cardiovascular health due to their efficiency in promoting cholesterol efflux, anti-inflammatory properties, antioxidant effects, and ability to maintain endothelial function. Measuring the size and concentration of HDL particles, including HDL Large, provides a more detailed assessment of cardiovascular risk and helps tailor effective treatment strategies.

Standard Range:

- 6729 nmol/L

Recommended Range:

- **Optimal:** 0-6729 nmol/L
- **High:** >6729 nmol/L

Source(s):

https://pubmed.ncbi.nlm.nih.gov/30704250/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9016450/

Homocysteine

Elevated homocysteine levels are associated with various health issues, including cardiovascular diseases, cognitive decline, osteoporosis, and pregnancy complications. Managing homocysteine levels can help in the prevention and management of these conditions, improving public health outcomes.

Standard Range:

- **Male:** <11.4 umol/L
- **Female:** <10.4 umol/L

Recommended Range:

- **Optimal:** 0-11.4 umol/L
- **Suboptimal High:** 11.4-15 umol/L

- **High:** >15 umol/L

Source(s):

https://www.semanticscholar.org/paper/Using-data-mining-technology-to-explore-at-low-Tseng-Huang/908b6d25c5e60c8714dc238dc2f134e55cd8907a
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4566450/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11138896/
https://pubmed.ncbi.nlm.nih.gov/22239874/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3816557/
https://www.semanticscholar.org/paper/812055fe5055499a30b97ac7922ff10b3ef2ed27
https://www.semanticscholar.org/paper/00a1bd218adbfda64bef8a7f160b64fe1887b62f

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hsCRP

hsCRP is a valuable biomarker for assessing inflammation and predicting the risk of various chronic diseases, particularly cardiovascular diseases. Understanding and monitoring hsCRP levels can lead to early detection, better disease management, and improved overall health outcomes.

Standard Range:

- **Optimal:** < 1.0 mg/L
- **Suboptimal High:** 1.0-3.0 mg/L
- **High:** > 3.0 mg/L

Recommended Range:

- **Optimal:** 0- 1.0 mg/L
- **Suboptimal High:** 1.0-3.0 mg/L
- **High:** > 3.0 mg/L

Source(s):

https://testdirectory.questdiagnostics.com/test/test-detail/10124/hs-crp?q=crp&cc=MASTER
https://www.semanticscholar.org/paper/12fff2e2b48be79b46943a8a1df1b88d1c715e75
https://www.semanticscholar.org/paper/0c3dec8d937ebbbfc5de70fa6ac0234d155d3cc1

https://www.semanticscholar.org/paper/2199730041923b430396d948bde4105ede113d2a

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LDL Cholesterol (Calculated)

Understanding why LDL cholesterol matters is crucial for maintaining cardiovascular health and preventing serious health conditions. Elevated levels of LDL cholesterol are a significant risk factor for heart disease, which is one of the leading causes of death globally. By comprehending the role of LDL cholesterol, individuals can take proactive steps to manage their cholesterol levels, thereby reducing their risk of heart attacks, strokes, and other cardiovascular diseases. (Calculated)

Standard Range:

- <100 mg/dL

Recommended Range:

- **Optimal:** 0-100 mg/dL
- **Suboptimal high:** 100-159 mg/dL
- **High:** > 160 mg/dL

Source(s):

https://pubmed.ncbi.nlm.nih.gov/30971484/
https://pubmed.ncbi.nlm.nih.gov/20666103/
https://www.semanticscholar.org/paper/b9eafb057829f4d5c87825cc8e9f6fa77260b8cb
https://www.semanticscholar.org/paper/591e2b680105c28f4919200e74a9aafb42d8001a

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LDL Medium

Medium LDL particles fall between small dense LDL and large buoyant LDL in terms of size and density. Its atherogenic potential, susceptibility to oxidation, and impact on diagnostic and treatment strategies make it a critical factor in managing heart health. Understanding and monitoring LDL Medium can lead to better risk assessment, personalized treatment, and improved outcomes in cardiovascular disease prevention and management.

Standard Range:

- < 215 angstrom

Recommended Range:

- **Optimal:** 0- 215 angstrom
- **High:** >215 angstrom

Source(s):

https://my.functionhealth.com/biomarkers/heart/ldl-medium
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4446774/

LDL Particle Number

LDL Particle Number is a more accurate predictor of cardiovascular risk than the total amount of LDL cholesterol (LDL-C). High LDL-P is associated with greater risk of plaque buildup in arteries, leading to atherosclerosis and cardiovascular diseases. Understanding LDL-P can influence treatment decisions, risk assessment, and overall management of cardiovascular health, leading to more effective prevention strategies and better health outcomes.

Standard Range:

- <1138 nmol/L

Recommended Range:

- **Optimal:** 0-1000 nmol/L
- Suboptimal high: 1000-1600 nmol/L
- **High:** > 1600 nmol/L

Source(s):

https://pubmed.ncbi.nlm.nih.gov/19657464/
https://pubmed.ncbi.nlm.nih.gov/26371381/
https://www.semanticscholar.org/paper/be2862a2d922c057f992a1a6ee83cba7cc5aa7b8

LDL Pattern

LDL Pattern is a key marker in lipid profiling, providing insight into the size and density of low-density lipoprotein (LDL) particles. Since smaller, denser LDL particles are more prone to oxidation and arterial plaque formation, this biomarker is useful in assessing cardiovascular risk beyond standard LDL cholesterol levels. It helps differentiate between LDL subtypes associated with higher or lower atherosclerosis risk, offering a deeper understanding of lipid metabolism and cardiovascular health.

Standard Range:

- A = optimal
- B = high

Recommended Range:

- A = optimal
- B = high

Source(s):
https://www.ahajournals.org/doi/full/10.1161/01.ATV.17.4.707
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8260186/
https://www.semanticscholar.org/paper/7fe2e563e4039f3380698807e2edce6fb1019647
https://www.semanticscholar.org/paper/6d97f9787d507b08ed2c1663fe0a6a103da3c15d
https://www.semanticscholar.org/paper/9d979a046ea41b3d650ff5e6651a0cfce22c1743

LDL Peak Size

LDL peak size refers to the predominant size of LDL (Low-Density Lipoprotein) particles in the blood. This measurement helps to identify the distribution of LDL particle sizes, which can provide insight into cardiovascular risk. Larger LDL particles are generally considered less atherogenic compared to smaller, denser LDL particles, which are more likely to penetrate the arterial wall and contribute to plaque formation.

Standard Range:

- 222.9 Angstrom

Recommended Range:

- **Low:** 0-222 Angstrom
- **Optimal:** >222 Angstrom

Source(s):

https://www.researchgate.net/publication/11824907_A_prospective_population-based_study_of_low_density_lipoprotein_particle_size_as_a_risk_factor_for_ischemic_heart_disease_in_men
https://www.semanticscholar.org/paper/7f9f5b06d5e9f54626c1d3bd6acb1190ca7ac106
https://www.semanticscholar.org/paper/341e34fb99f7cc36ef26ffba14b6cc9b9900a0d2
https://www.semanticscholar.org/paper/4b06cc74dfc5b0e8d05cb494b0d87656c674e966

LDL small (sdLDL)

LDL small (sdLDL) is crucial for diagnosing and managing various health conditions related to cardiovascular health. It serves as a key indicator of atherogenic risk, helps assess the likelihood of developing cardiovascular disease, and is associated with conditions like metabolic syndrome and diabetes. Additionally, elevated sdLDL levels indicate increased susceptibility to oxidative damage and plaque formation, making it a valuable marker for evaluating lipid-related risks. It is also monitored in chronic diseases to guide treatment strategies and improve cardiovascular risk management.

Standard Range:

- <50.0 mg/dL

Recommended Range:

- **Optimal:** 0- 20 mg/dL
- **Suboptimal High:** 20-50 mg/dL
- **High:** >50 mg/dL

Source(s):

https://www.ahajournals.org/doi/10.1161/ATVBAHA.114.303284
https://nutritionandmetabolism.biomedcentral.com/articles/10.1186/s12986-019-0334-y
https://testdirectory.questdiagnostics.com/test/test-detail/36406/sdldl?cc=MASTER
https://www.semanticscholar.org/paper/4b02dfa8f9a3b907cd6e897064794ce300e2aaa8
https://www.semanticscholar.org/paper/a9f4a94f1f81baf37a718d69773a304f1b898093
https://www.semanticscholar.org/paper/562f724a2c249ae00104325db8ee2664e67a8030

Lipoprotein(a)

The Lipoprotein(a) blood test measures the concentration of Lipoprotein(a) [Lp(a)] in the blood, a key marker for cardiovascular health. Lp(a) is a type of low-density lipoprotein (LDL) that contains an additional protein, apolipoprotein(a), which can contribute to plaque buildup in arteries and increase the risk of heart disease and stroke. Elevated Lp(a) levels are largely determined by genetics and are associated with a higher risk of atherosclerosis and thrombosis. Monitoring Lp(a) levels helps assess cardiovascular risk, guide preventive strategies, and inform treatment decisions for heart health management.

Standard Range:

- **Optimal** <75 nmol/L
- **Moderate** 75-125 nmol/L
- **High** >125 nmol/L

Recommended Range:

- **Optimal:** 0- 65 nmol/L

- **Suboptimal high:** 65-125 nmol/L
- **High:** > 125 nmol/L

Source(s):

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10605347/#:~:text=32%E2%80%9390%20nmol%2FL%E2%80%94,%2FL%E2%80%94very%20high%20chance.
https://pubmed.ncbi.nlm.nih.gov/19622820/
https://pubmed.ncbi.nlm.nih.gov/20965889/
https://pubmed.ncbi.nlm.nih.gov/26361154/
https://pubmed.ncbi.nlm.nih.gov/31578080/

Lp-PLA2

Lp-PLA2 is a biomarker for cardiovascular diseases, indicating increased risk for coronary heart disease, stroke, and other cardiovascular events. It plays a role in the inflammatory processes within atherosclerotic plaques, contributing to plaque instability and potential rupture. Monitoring Lp-PLA2 levels helps in assessing cardiovascular risk and guiding therapeutic interventions.

Recommended Range:

- **Optimal:** 0-200 ng/mL
- **Borderline High:** 200-235 ng/mL
- **High:** > 235 ng/mL

Source(s):

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8744129/
https://www.semanticscholar.org/paper/2043ec741ad60c443a3be02adef7d0e7f0239ac4
https://www.semanticscholar.org/paper/d9af5ecce63c9335f73cb9c0a28e7a08127678ae
https://www.semanticscholar.org/paper/9348b20f77c12f9c635bcf02e06b3ad46508eb8c

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Non-HDL Cholesterol

Non-HDL cholesterol is a significant marker for assessing the risk of heart disease. It provides a comprehensive risk assessment, has predictive value for cardiovascular events, serves as a treatment target, is easy to calculate, and is particularly relevant in metabolic conditions like diabetes and metabolic syndrome.

Standard Range:

- ≤ 130 mg/dl

Recommended Range:

- **Optimal:** 0-130 mg/dl
- **High:** > 130 mg/dl

Source(s):

https://www.sciencedirect.com/science/article/pii/S0735109721001911?via%3Dihub
https://www.ahajournals.org/doi/10.1161/HYPERTENSIONAHA.122.19912
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10543254/
https://www.semanticscholar.org/paper/f73c664ba80f4ccf1f736c20e2d649e82ee0b42d
https://www.semanticscholar.org/paper/ef50ceb53f5b00ef251f22831030e674764f1d9d
https://www.semanticscholar.org/paper/89423d6656e645340a74c27e38429e7e1f7dca71

Total Cholesterol

Understanding why total cholesterol matters is crucial for maintaining cardiovascular health and preventing serious conditions such as heart disease and stroke. High cholesterol levels are often asymptomatic, meaning individuals may not be aware of their risk until significant damage has occurred. Therefore, knowing the importance of total cholesterol can lead to early intervention and better health outcomes.

Standard Range:

- < 200 mg/dL

Recommended Range:

- Optimal: 0- 200 mg/dL
- Suboptimal high: 200-240 mg/dL
- High: > 240 mg/dL

Source(s):

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6367420/
https://pubmed.ncbi.nlm.nih.gov/30733566/
https://pubmed.ncbi.nlm.nih.gov/12967690/
https://www.semanticscholar.org/paper/56a3289a457e28bfa6444e6d38a049850202a7a4
https://www.semanticscholar.org/paper/7b5fe70a49946296580d98c7d9531b44f326a351
https://www.semanticscholar.org/paper/7fbe54f1fe2f0e4e32ab430a30d14287e1afcd94
https://www.semanticscholar.org/paper/81aa40140a5d25ac89198f089739a43ad9eb8431

Total Cholesterol/HDL Ratio

The Total Cholesterol/HDL Ratio is a key indicator of cardiovascular health, providing insight into the balance between total cholesterol and high-density lipoprotein (HDL). Since it reflects the proportion of cholesterol that may contribute to plaque buildup in arteries, it is useful in assessing the risk of heart disease and atherosclerosis. A higher ratio may indicate an increased cardiovascular risk, while a lower ratio suggests better heart health. This biomarker helps clinicians evaluate lipid metabolism and guide lifestyle or therapeutic interventions to reduce cardiovascular risk.

Standard Range:

- Male/Female < 5.0

Recommended Range:

- Male/Female Optimal: 0- 3.5:1
- Suboptimal high: 3.5-5:1
- High: > 5:1

Source(s):

https://www.semanticscholar.org/paper/Total-Cholesterol-HDL-Ratio-%E2%80%93-An-Individual-of-in-Panimathi-Rekha/649d51639dc0d0c36819aa7d5d43ed26cfa6ce1b
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10001260/
https://www.semanticscholar.org/paper/72404f1680f6eb3953582bb61c3dae7faaaf9d63
https://www.semanticscholar.org/paper/917e11d1f19f341dafdca9353b7db4f7ff5d6a42
https://www.semanticscholar.org/paper/5c84cd6e792b49bc4e854666f6c5fb63bccc311c

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Triglycerides

Testing triglycerides measures the level of triglycerides in the blood, which are a type of fat. High triglyceride levels can indicate an increased risk of heart disease, stroke, and pancreatitis. This test helps evaluate cardiovascular health and is often included in lipid panels along with cholesterol measurements. It aids in diagnosing conditions such as hyperlipidemia and metabolic syndrome. Monitoring triglycerides can guide treatment plans, including lifestyle changes and medications, to reduce cardiovascular risk and improve overall health.

Standard Range:

- < 150 mg/dL

Recommended Range:

- Optimal: 0- 100 mg/dL
- Suboptimal high: 100-150 mg/dL
- High: > 150 mg/dL

Source(s):

https://www.lipidjournal.com/article/S1933-2874(20)30079-9/pdf#:~:text=CONCLUSIONS%3A%20The%20average%20of%20several,%2C150%20mg%2FdL).
https://pmc.ncbi.nlm.nih.gov/articles/PMC3853839/
https://www.semanticscholar.org/paper/bac84151fb73ff6809c744317da9c1809940ca41
https://www.semanticscholar.org/paper/40d7f57b60fb23db27f36f467194e942fbf2a2f4
https://www.semanticscholar.org/paper/a089524b5bf9bb1995b330bf2a650da86c45c9fc
https://www.semanticscholar.org/paper/b89a47bb1875ad1257842f60cb589a6b69fd01d

Hormone

Cortisol (AM)

The cortisol (AM) blood test measures the level of cortisol in the blood, typically collected in the morning. Cortisol is a steroid hormone produced by the adrenal glands in response to stress and low blood-glucose concentration. It follows a diurnal rhythm, with peak levels in the morning and lowest levels at night. This test helps assess adrenal gland function and diagnose disorders related to abnormal cortisol levels.

Standard Range:

- Male/Female >17 Years (7-9 a.m.): 4.0-22.0 mcg/dL

Recommended Range:

- Male/Female Low: 0- 4.0 mcg/dL
- Male/Female Suboptimal Low: 4.0-5.0 mcg/dL
- Male/Female Optimal: 5.0-22.0 mcg/dL
- Male/Female Suboptimal High: 22.0-25.0 mcg/dL
- Male/Female High: > 25.0 mcg/dL

Source(s):

https://pubmed.ncbi.nlm.nih.gov/27861636/
https://pubmed.ncbi.nlm.nih.gov/33783308/
https://www.neurology.org/doi/abs/10.1212/wnl.0000000000006549
https://pubmed.ncbi.nlm.nih.gov/31405343/
https://www.semanticscholar.org/paper/cb4428e38f0bb5c833b35efcf8725729d3bf24a0
https://www.semanticscholar.org/paper/1526b18dfa9f2e30e509ac1c2e4328979149de24

DHEA-S

The DHEA-S (Dehydroepiandrosterone Sulfate) blood test measures the level of DHEA-S in the blood. DHEA-S is a sulfated form of DHEA, a hormone produced primarily by the adrenal glands and, to a lesser extent, by the ovaries in women and the testes in men. It serves as a precursor to sex hormones such as estrogen and testosterone. DHEA-S levels provide insights into adrenal gland function and help diagnose various endocrine disorders.

Standard Range:

- Male:
    - **18-21 Years:** 20-480 µg/dL
    - **22-30 Years:** 74-617 µg/dL
    - **31-40 Years:** 93-415 µg/dL
    - **41-50 Years:** 61-442 µg/dL
    - **51-60 Years:** 32-279 µg/dL
    - **61-70 Years:** 20-217 µg/dL
    - **>70 Years:** 3-225 µg/dL

- Female:
    - **18-21 Years:** 44-286 µg/dL
    - **22-30 Years:** 14-349 µg/dL
    - **31-40 Years:** 19-237 µg/dL
    - **41-50 Years:** 15-205 µg/dL
    - **51-60 Years:** 5-167 µg/dL
    - **61-70 Years:** 9-118 µg/dL
    - **>70 Years:** 4-157 µg/dL

Recommended Range:

- Male:
    - **18-21 Years:** 20-480 µg/dL
    - **22-30 Years:** 74-617 µg/dL
    - **31-40 Years:** 93-415 µg/dL
    - **41-50 Years:** 61-442 µg/dL
    - **51-60 Years:** 32-279 µg/dL
    - **61-70 Years:** 20-217 µg/dL
    - **>70 Years**: 3-225 µg/dL

- Female:
    - **18-21 Years:** 44-286 µg/dL
    - **22-30 Years:** 14-349 µg/dL
    - **31-40 Years:** 19-237 µg/dL
    - **41-50 Years:** 15-205 µg/dL
    - **51-60 Years:** 5-167 µg/dL
    - **61-70 Years:** 9-118 µg/dL
    - **>70 Years:** 4-157 µg/dL

Source(s):

https://www.mountsinai.org/health-library/tests/dhea-sulfate-test
https://www.semanticscholar.org/paper/27f7b3a3846c713e9b92df37f3d5346076971894
https://www.semanticscholar.org/paper/51f0eafaa3834a8aba023d7709d80818013c2935
https://www.semanticscholar.org/paper/c8b9b00c3a1ba76d11a774563b93e8a5cab79447

Estradiol

The estradiol blood test measures the level of estradiol, the most potent form of estrogen, in the blood. Estradiol (E2) is a steroid hormone produced primarily by the ovaries in women, and in smaller amounts by the testes in men and the adrenal glands in both sexes. It plays a critical role in the regulation of the menstrual cycle, reproductive system, bone health, and secondary sexual characteristics.

Standard Range:

- Male:
    - <39 pg/mL
- Female:
    - **Follicular Phase:** 19-144 pg/mL
    - **Mid-Cycle:** 64-357 pg/mL
    - **Luteal Phase:** 56-214 pg/mL
    - **Postmenopausal:** <31 pg/mL

Recommended Range:

- Male:
    - <39 pg/mL

- Female:
    - **Low:** 0-19 pg/mL
    - **Suboptimal Low:** 19-30 pg/mL
    - **Optimal:** 30-400 pg/mL
    - **Suboptimal High:** 400-800 pg/mL
    - **High:** >800 pg/mL

Source(s):

https://academic.oup.com/jcem/article/99/1/56/2836184?login=false
https://pubmed.ncbi.nlm.nih.gov/12877253/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8441577/#:~:text=57.9%25%2C%20adjusted%20odds%20ratio%200.28,%2C%20estradiol%2C%20miscarriage%2C%20pregnancy%20outcomes
https://testdirectory.questdiagnostics.com/test/test-detail/4021/estradiol?p=r&q=estradiol&cc=MASTER
https://www.semanticscholar.org/paper/a0050406dad355fd22c59b19e089328b8b646c99
https://www.semanticscholar.org/paper/e6ed4390101815d85b512e6fb943fbef94c5171b

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T3, Free

T3, Free is crucial for diagnosing and managing various health conditions related to thyroid function. It serves as a key indicator of active thyroid hormone levels, helps assess conditions like hyperthyroidism and hypothyroidism, and aids in detecting thyroid dysfunction even when TSH and T4 levels appear normal. Additionally, it plays a vital role in metabolism, energy regulation, and cardiovascular health, making it a valuable marker for evaluating metabolic disorders. It is also monitored in chronic diseases to assess thyroid status, guide treatment, and optimize hormonal balance.

Standard Range:

- 2.3-4.2 pg/mL

Recommended Range:

- **Low:** 0- 2.0 pg/mL
- **Suboptimal low:** 2.0-2.3 pg/mL
- **Optimal:** 2.3-4.2 pg/mL
- **Suboptimal high:** 4.2-4.4 pg/mL
- **High:** > 4.4 pg/mL

Source(s):

https://testdirectory.questdiagnostics.com/test/test-detail/34429/t3-free?q=free%20T3&cc=MASTER
https://www.semanticscholar.org/paper/ecc241142d44a3c7bb4fd4d480118e3dddb4a953
https://www.semanticscholar.org/paper/9aab30478022f9280630c1ce6b28292391d7697e

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T4, Free

T4, Free is crucial for diagnosing and managing various health conditions related to thyroid function. It serves as a key indicator of thyroid hormone availability, helps assess conditions like hypothyroidism and hyperthyroidism, and aids in detecting thyroid dysfunction even when TSH levels are normal. Additionally, it plays a vital role in metabolism, growth, and energy regulation, making it a valuable marker for evaluating endocrine health. It is also monitored in chronic diseases to assess thyroid status, guide treatment, and optimize hormonal balance.

Standard Range:

- 0.8-1.8 ng/dL

Recommended Range:

- **Low:** 0-0.8 ng/dL
- **Optimal:** 0.8-1.8 ng/dL
- **Suboptimal high:** 1.8-2.0 ng/dL
- **High:** > 2.0 ng/dL

Source(s):

https://testdirectory.questdiagnostics.com/test/test-detail/866/t4-free-ft4?p=r&q=free%20T4&cc=MASTER
https://www.semanticscholar.org/paper/8138c441de56b6b953b0c3a6f386e3cca1688cbf
https://www.semanticscholar.org/paper/5ca0afb36e6dd782659d15e781f765916e4f45bb
https://www.semanticscholar.org/paper/5944a98b9717345069f8df427d4eaefb4e33e0e7
https://www.semanticscholar.org/paper/5944a98b9717345069f8df427d4eaefb4e33e0e7

Reverse T3

Reverse T3 is important for assessing thyroid function, diagnosing Non-Thyroidal Illness Syndrome (NTIS), differentiating types of hypothyroidism, and monitoring treatment efficacy in patients on thyroid hormone replacement therapy.

Standard Range:

- 8-25 ng/dL

Recommended Range:

- **Low:** 0-8 ng/dL
- **Optimal:** 8-25 ng/dL
- **High:** > 25 ng/dL

Source(s):

https://www.scirp.org/journal/paperinformation?paperid=110736#:~:text=Conclusion%3A%20Reverse%20T3%20is%20a,and%20low%2Fnormal%20TSH%20levels.
https://pubmed.ncbi.nlm.nih.gov/33040575/
https://pubmed.ncbi.nlm.nih.gov/735616/
https://www.semanticscholar.org/paper/ecc241142d44a3c7bb4fd4d480118e3dddb4a953

Testosterone, Free

The free testosterone blood test measures the level of testosterone that is not bound to proteins in the blood. Testosterone circulates in the blood in two main forms: bound and unbound (free). About 98% of testosterone is bound to proteins such as sex hormone-binding globulin (SHBG) and albumin, leaving approximately 2% as free testosterone. Free testosterone is the bioactive form that can enter cells and exert its effects on the body.

Standard Range:

- Male:
    - 18-69 Years: 46-224.0 pg/mL
    - **70-89 Years:** 6.0-73.0 pg/mL
    - **>89 Years:** N/A pg/mL

- Female:
    - **18-69 Years:** 0.2-5.0 pg/mL
    - **70-89 Years:** 0.3-5.0 pg/mL
    - **>89 Years:** N/A

Recommended Range:

- Male:
    - 18-69 Years:
        - **Low:** 0-46.0 pg/mL
        - **Optimal:** 46.0-224.0 pg/mL
        - **High:** >224.0 pg/mL
    - 70-89 Years:
        - **Low:** 0-6.0 pg/mL
        - **Optimal:** 6.0 - 73.0 pg/mL
        - **High:** >73.0 pg/mL
- Female:
    - 18-69 Years:
        - **Low:** 0-0.2 pg/mL
        - **Optimal:** 0.2-5.0 pg/mL
        - **High:** >5.0 pg/mL
    - 79-89 Years:
        - **Low:** 0-0.3 pg/mL
        - **Optimal:** 0.3-5.0 pg/mL
        - **High:** >5.0 pg/mL

Source(s):

https://journals.sagepub.com/doi/10.1258/acb.2012.012047?url_ver=Z39.88-2003&rfr_id=ori:rid:crossref.org&rfr_dat=cr_pub%20%200pubmed
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5562247/#:~:text=Conclusion,of%20high%2Dgrade%20prostate%20cancer.
https://testdirectory.questdiagnostics.com/test/test-detail/18944/testosterone-free?p=r&q=Testosterone,%20Free&cc=MASTER
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10729679/
https://pubmed.ncbi.nlm.nih.gov/23404928/
https://www.semanticscholar.org/paper/facb9c459c88c27e1e5b7c05f0cf651132c66ce8
https://www.semanticscholar.org/paper/37daa91ca7aa71793919af2e725d6b7d9f5f9995
https://www.semanticscholar.org/paper/77d643626540ecf1c81335f50854a2e71212098b

Testosterone, Total

The total testosterone blood test measures the level of testosterone, the primary male sex hormone, in the blood. Testosterone is crucial for the development of male reproductive tissues, muscle mass, bone density, and secondary sexual characteristics. It also plays a role in women's health, affecting libido, bone density, and muscle mass.

Standard Range:

- Male:
    - 250-1100 ng/dL
- Female:
    - 2-45 ng/dL

Recommended Range:

- Male:
    - **Low:** 0-250 ng/dL
    - **Optimal:** 250-1100 ng/dL
    - **High:** >1100 ng/dL
- Female:
    - **Low:** <2 ng/dL
    - **Optimal:** 2-45 ng/dL
    - **High:** >45 ng/dL

Source(s):

https://pubmed.ncbi.nlm.nih.gov/29746252/
https://pubmed.ncbi.nlm.nih.gov/23404928/
https://pubmed.ncbi.nlm.nih.gov/23404928/
https://testdirectory.questdiagnostics.com/test/test-detail/15983/testosterone-total-ms?p=r&q=Testosterone,%20total&cc=MASTER
https://www.semanticscholar.org/paper/3e914e34bbed79f1d616c3800c4f48681f8a668b
https://www.semanticscholar.org/paper/facb9c459c88c27e1e5b7c05f0cf651132c66ce8

Thyroid-Stimulating Hormone (TSH)

Thyroid-Stimulating Hormone (TSH) is crucial for diagnosing and managing various health conditions related to thyroid function. It acts as a regulatory hormone for thyroid activity, serves as an early indicator of hypothyroidism or hyperthyroidism, and helps detect thyroid dysfunction in cases of abnormal T3 and T4 levels. Additionally, TSH is a sensitive marker for assessing the overall health of the thyroid gland, useful in diagnosing conditions like Hashimoto's thyroiditis and Graves' disease. It is monitored in chronic diseases to evaluate thyroid status and guide treatment strategies.

Standard Range:

- 0.40-4.50 mIU/L
- Pregnancy First Trimester
    - 0.26-2.66 mIU/L
- Pregnancy Second Trimester
    - 0.55-2.73 mIU/L
- Pregnancy Third Trimester
    - 0.43-2.91 mIU/L

Recommended Range:

- **Low:** 0-0.4 mIU/L
- **Optimal:** 0.4-4.0 mIU/L
- **Suboptimal high:** 4.0-4.5 mIU/L
- **High:** > 4.5 mIU/L

Source(s):

https://www.thyroid.org/patient-thyroid-information/ct-for-patients/february-2024/vol-17-issue-2-p-5-6/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4480274/
https://www.semanticscholar.org/paper/af972752786d7340b3608677dac4457e01c214eb
https://www.semanticscholar.org/paper/e50e59f33d026b8009fdddbb63066ff3a43943be
https://www.semanticscholar.org/paper/4ab8dc98f5682e964e2e890279793481fc40dd68
https://www.semanticscholar.org/paper/5fd30c0104a7b457f36d22eead8525dad653921d
https://www.semanticscholar.org/paper/5863ae309220df3ff6c79891695c5cb4600ab4e5

Kidneys

Amorphous Sediment, Urinalysis

The presence of amorphous sediment in urine can indicate several underlying health issues such as urinary tract infections, kidney stones, dehydration, and metabolic disorders. It is crucial for diagnosing, monitoring, and preventing health conditions, as well as providing insights into a person's diet and hydration status., Urinalysis

Standard Range:

- **Optimal:** None or Few

Recommended Range:

- **Optimal:** None or Few
- **High:** Large amounts

Source(s):

https://www.semanticscholar.org/paper/Protocols-to-Dissolve-Amorphous-Urate-Crystals-in-Behan-Johnston/43a8cfa4ed624946f26c1290f110358d9a887b9a
https://www.semanticscholar.org/paper/b587da78ed049719bf7e57fefa8a338543fdf81d
https://www.semanticscholar.org/paper/b843a049f1995cd8cdec2070d8c5a498a1196e83

Appearance, Urinalysis

Urine appearance is a significant indicator of an individual's overall health. It can provide valuable insights into hydration levels, dietary habits, and potential medical conditions. Monitoring urine appearance can help in early detection of various health issues, making it an essential aspect of routine health checks., Urinalysis

Standard Range:

- Clear

Recommended Range:

- **Optimal:** Clear, light yellow, transparent
- **Non-optimal:** milky, cloudy, foamy

Source(s):

https://www.semanticscholar.org/paper/0d8c6a88fe0535e346797fd9679032b4200f0a39
https://www.semanticscholar.org/paper/b3c6d8ddda274eb1b333c1afa23acff78c168411
https://www.semanticscholar.org/paper/f4a5fe053dfbebb68adb5c9e1af73bd414e6cd81
https://www.semanticscholar.org/paper/dcd4c0667fdee911e11d89224911bf4f98a69f32
https://www.semanticscholar.org/paper/84ea16fac670a2cf2a102bb640b9de907a98153e
https://www.semanticscholar.org/paper/f864db65d39bda8d0f7147233398bd2cbda8ff95
https://www.semanticscholar.org/paper/b3c6d8ddda274eb1b333c1afa23acff78c168411

Bacteria, Urinalysis

Bacteria in urine, known as bacteriuria, is a significant clinical finding that can indicate various underlying health issues such as urinary tract infections (UTIs), kidney infections, or other systemic conditions. Early detection and treatment can prevent complications, and guide effective antibiotic therapy strategies to reduce the incidence of UTIs and related conditions., Urinalysis

Standard Range:

- None seen (0.0)

Recommended Range:

- **Optimal:** 0.0 (negative)
- **High:** > 0.0

Source(s):

https://testdirectory.questdiagnostics.com/test/test-detail/5463/urinalysis-complete?cc=MASTER
https://www.semanticscholar.org/paper/13c28c5cd88ae73662643f7d896b039b6d95fdd3
https://www.semanticscholar.org/paper/b7de07fdbaaedee2c8ab97fedeb9cc2053debd32
https://www.semanticscholar.org/paper/bbc814a5c4cb7081a0acb272f934398db562077e

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Bilirubin, Urinalysis

A bilirubin urine test measures the amount of bilirubin in the urine. Bilirubin is a yellow pigment formed by the breakdown of red blood cells in the liver. Normally, bilirubin is processed by the liver, converted into bile, and excreted in the stool. The presence of bilirubin in the urine typically indicates liver dysfunction or bile duct obstruction., Urinalysis

Standard Range:

- 0.0 (negative)

Recommended Range:

- **Optimal:** 0.0 (negative)
- **High:** > 0.0

Source(s):

https://testdirectory.questdiagnostics.com/test/test-detail/5463/urinalysis-complete?cc=MASTER
https://www.semanticscholar.org/paper/799af74c5b85e111af43e9405517aa0cfe63d940
https://www.semanticscholar.org/paper/8e2ac97beb2d2a5ac11ae2fa841fb2a580b01a40
https://www.semanticscholar.org/paper/dbe788f394aa1c718fa5d8dbbcba538ff12f9b74

Blood Urea Nitrogen

Blood Urea Nitrogen (BUN) is a vital marker for assessing kidney function, liver health, hydration status, nutritional status, and the impact of certain medications. Elevated BUN levels can indicate impaired kidney function, liver dysfunction, dehydration, or a high protein diet, while low levels can suggest overhydration or malnutrition. Monitoring BUN levels helps in early detection and management of various health conditions.

Standard Range:

- Male/Female: 7-25 mg/dL

Recommended Range:

- Male:
    - Low: 0- 7 mg/dL
    - Optimal: 7-20 mg/dL
    - Suboptimal High: 20-25 mg/dL
    - High: > 25 mg/dL
- Female:
    - Low: 0-6 mg/dL
    - Optimal: 6-20 mg/dL
    - Suboptimal High: 20-25 mg/dL
    - High: > 25 mg/dL

Source(s):

https://pubmed.ncbi.nlm.nih.gov/8207875/
https://pubmed.ncbi.nlm.nih.gov/30080216/
https://pubmed.ncbi.nlm.nih.gov/29370259/
https://ncbi.nlm.nih.gov/pmc/articles/PMC8983180/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7377803/
https://www.semanticscholar.org/paper/a3bf8516b099ae53b559b8f3a82a815a6be88e1a
https://www.semanticscholar.org/paper/0e28f066bf729f321542804db518fb18a0c3715e
https://www.semanticscholar.org/paper/c9b22210900ee3f7ffc4366b2711cd19595514e9

BUN/Creatinine Ratio

BUN (Blood Urea Nitrogen) and Creatinine are both waste products filtered by the kidneys and their levels in the blood provide important information about kidney function. The BUN/Creatinine ratio is a useful marker for evaluating kidney function and can help differentiate between various causes of kidney dysfunction.

Standard Range:

- 6-20

Recommended Range:

- **Low:** 0-10
- **Optimal:** 10-20
- **High:** > 20

Source(s):

https://testdirectory.questdiagnostics.com/test/test-detail/296/buncreatinine-ratio?cc=MASTER
https://pubmed.ncbi.nlm.nih.gov/29497527/
https://jkns.or.kr/journal/view.php?doi=10.3340/jkns.2016.1010.009#:~:text=Moreover%2C%20an%20elevated%20serum%20BUN,ratios%20and%20severe%20leg%20paresis.
https://www.semanticscholar.org/paper/ad43267d135bd8810c2e430b7d13fd1ab59302f7
https://www.semanticscholar.org/paper/5dff54d619687996072360d8c533819337251dd0

Calcium

A calcium blood test measures the level of calcium in the blood. Calcium is a vital mineral for various bodily functions, including bone health, muscle function, nerve signaling, and blood clotting. The test is typically ordered to check for abnormal calcium levels, which can indicate a variety of health issues.

Standard Range:

- Male:
    - **20-49 Years:** 8.6-10.3 mg/dL

    - **>49 Years:** 8.6 - 10.3 mg/dL
- Female:
    - **20-49 Years:** 8.6-10.2 mg/dL
    - **>49 Years:** 8.6-10.4 mg/dL

Recommended Range:

- **Low:** 0-8.5 mg/dL
- **Optimal:** 8.5-10.2 mg/dL
- **High:** > 10.2 mg/dL

Source(s):

https://pubmed.ncbi.nlm.nih.gov/8964843/
https://testdirectory.questdiagnostics.com/test/test-detail/303/calcium?p=r&q=calcium&cc=MASTER
https://www.parathyroid.com/Normal-Blood-Calcium-Levels.htm
https://www.ncbi.nlm.nih.gov/books/NBK557683/
https://www.semanticscholar.org/paper/4e51f132e472a3c4762c3fb40eeffee0197d0b38
https://www.semanticscholar.org/paper/2aa6676c61f078871884c050878e1a5eacf05ac4
https://www.semanticscholar.org/paper/c62480536e166a8d2b79fa2d9cabd870ddc3d791

Calcium Oxalate Crystals, Urinalysis

A calcium blood test measures the level of calcium in the blood. Calcium is a vital mineral for various bodily functions, including bone health, muscle function, nerve signaling, and blood clotting. The test is typically ordered to check for abnormal calcium levels, which can indicate a variety of health issues. Oxalate Crystals, Urinalysis

Standard Range:

- None or Few

Recommended Range:

- Optimal: None or Few

Source(s):

https://www.semanticscholar.org/paper/Kidney-Stones-(Renal-Calculi%2C-Nephrolithiasis)-Espinosa-Murray/c14ad900f9164fa3579d769da46cc0b54db5fe79
https://www.semanticscholar.org/paper/b587da78ed049719bf7e57fefa8a338543fdf81d
https://www.semanticscholar.org/paper/2a9040b31ff1067280f02dc7570e90a9a70cf3d5
https://www.semanticscholar.org/paper/558f339242d1f92c67a1666e9ca4a0c57b407e05

Carbon Dioxide

A carbon dioxide (CO_2) blood test measures the amount of carbon dioxide in the blood. CO_2 in the blood is primarily in the form of bicarbonate (HCO_3^-), a component of the body's buffering system that helps maintain acid-base balance. This test is often part of an electrolyte panel or metabolic panel.

Standard Range:

- **Male/Female:** 20-32 mmol/L

Recommended Range:

- **Male/Female Low:** 0-20 mmol/L
- **Male/Female Suboptimal Low:** 20-22 mmol/L
- **Male/Female Optimal:** 23-29 mmol/L
- **Male/Female Suboptimal High:** 29-32 mmol/L
- **Male/Female High:** > 32 mmol/L

Source(s):

https://pubmed.ncbi.nlm.nih.gov/20008503/
https://pubmed.ncbi.nlm.nih.gov/26769766/
https://pubmed.ncbi.nlm.nih.gov/21354683/
https://pubmed.ncbi.nlm.nih.gov/22825995/
https://www.semanticscholar.org/paper/49f098da8fd8219de5967658bffec4db8ccbeef6
https://www.semanticscholar.org/paper/23ef6f3ec318f706d5eec7a4347475aadbc082fd
https://www.semanticscholar.org/paper/f5d72e08a6f4a8bbff2e2bd66b5adb87a1fe11e5

Chloride

Chloride is an electrolyte that helps maintain the body's acid-base balance, fluid balance, and electrical neutrality in the cells. It works closely with other electrolytes, such as sodium, potassium, and bicarbonate, to ensure proper bodily functions. A chloride blood test measures the level of chloride in the blood.

Standard Range:

- 98-110 mmol/L

Recommended Range:

- **Low:** 0-96 mmol/L
- **Optimal:** 96-106 mmol/L
- **High:** > 106 mmol/L

Source(s):

https://www.ahajournals.org/doi/10.1161/HYPERTENSIONAHA.113.01793#:~:text=Data%20suggest%20that%20increased%20dietary,bicarbonate%20(HCO3%E2%88%92).
https://testdirectory.questdiagnostics.com/test/test-detail/330/chloride?p=r&q=Chloride&cc=MASTER
https://www.semanticscholar.org/paper/6b7f196dba8fb1b04e974aa8357c80d885f6adfc
https://www.semanticscholar.org/paper/bb00875fb25e10a2a40190528bf0ef0b8f4c2a71
https://www.semanticscholar.org/paper/1733a05a5cbead0ff1894f576024bb864700e97e
https://www.semanticscholar.org/paper/5bf5ec787417c34dfb4426cf5ceccc765bd3f981

Creatinine

Creatinine is a waste product formed by the normal breakdown of muscle tissue. It is produced from creatine, a molecule important for energy production in muscles. Once produced, creatinine enters the bloodstream and is transported to the kidneys, where it is filtered out and excreted in urine. Because creatinine is produced and excreted at a relatively constant rate, its levels in the blood are a useful indicator of kidney function.

Standard Range:

- Male:
    - **18-29 Years:** 0.60 - 1.24 mg/dL
    - **30-39 Years:** 0.60 - 1.26 mg/dL
    - **40-49 Years:** 0.60 - 1.29 mg/dL
    - **50-59 Years:** 0.70-1.30 mg/dL
    - **60-69 Years:** 0.70 - 1.35 mg/dL
    - **70-79 Years:** 0.70 - 1.28 mg/dL
    - **>80 Years:** 0.70-1.22 mg/dL
- Female:
    - **18-29 Years:** 0.50-0.96 mg/dL
    - **30-39 Years:** 0.50-0.97 mg/dL
    - **40-49 Years:** 0.50-1.03 mg/dL
    - **60-69 Years:** 0.50-1.05 mg/dL
    - **70-79 Years:** 0.60-1.00 mg/dL
    - **>80 Years:** 0.60-0.95 mg/dL

Recommended Range:

- Male:
    - **Low:** 0-0.74 mg/dL
    - **Optimal:** 0.74-1.35 mg/dL
    - **High:** > 1.35 mg/dL
- Female:
    - **Low:** 0-0.5 mg/dL
    - **Optimal:** 0.5-1.1 mg/dL
    - **High:** > 1.1 mg/dL

Source(s):

https://testdirectory.questdiagnostics.com/test/test-detail/375/creatinine?p=r&q=creatinine&cc=MASTER
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2646021/#:~:text=Lower%20serum%20creatinine%20was%20associated,0.71%20and%200.80%20mg%2Fdl.
https://www.sciencedirect.com/science/article/pii/S0085253815485886#:~:text=Modest%20preoperative%20serum%20creatinine%20elevation%20(%3E1.5%20mg%2FdL),adverse%20outcomes%20after%20general%20surgery.
https://www.semanticscholar.org/paper/d0349af372bd38d18ba2d975780ebc10b6bb63a9
https://www.semanticscholar.org/paper/df9819165b065ea06ef27be540c777437db9d69f

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Crystals, Urinalysis

The presence of crystals in urine can be a precursor to more serious conditions such as kidney stones, urinary tract infections (UTIs), or metabolic disorders. Early detection and analysis of these crystals can lead to timely intervention, preventing complications and promoting better health outcomes., Urinalysis

Standard Range:

- None seen

Recommended Range:

- None seen

Source(s):

https://www.semanticscholar.org/paper/2a9040b31ff1067280f02dc7570e90a9a70cf3d5
https://www.semanticscholar.org/paper/aaf10ce3e655b258b0503a2cc37f520977e26b5f
https://www.semanticscholar.org/paper/b587da78ed049719bf7e57fefa8a338543fdf81d

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Cystatin C

Cystatin C is a small protein produced by all nucleated cells, and it is filtered out of the blood by the kidneys. It is produced at a constant rate and almost completely reabsorbed by the kidneys, so its level in the blood is a good indicator of kidney function. Unlike creatinine, cystatin C is less influenced by muscle mass, age, and sex, making it a potentially more reliable marker for kidney function. Elevated levels can indicate early stages of kidney dysfunction, increased risk of cardiovascular events, and can be used to monitor chronic kidney disease and acute kidney injury.

Recommended Range:

- **Low:** 0-0.6 mg/L
- **Optimal:** 0.6-1.0 mg/L
- **High:** > 1.0 mg/L

Source(s):

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6817201/
https://pubmed.ncbi.nlm.nih.gov/10672373/
https://www.semanticscholar.org/paper/847366ec3cdbdf706972b9a30c691ace8560c5f4
https://www.semanticscholar.org/paper/d0349af372bd38d18ba2d975780ebc10b6bb63a9

Estimated Glomerular Filtration Rate (eGFR)

Estimated Glomerular Filtration Rate (eGFR) is a measure of how well your kidneys are filtering blood. It helps in staging chronic kidney disease, identifying acute kidney injury, adjusting medication dosages, avoiding nephrotoxic drugs, guiding decisions on dialysis and transplantation, assessing surgical risks, and informing public health policies. eGFR is expressed in milliliters per minute per 1.73 meters squared (mL/min/1.73 m²) and provides an overall assessment of kidney function. (eGFR)

Standard Range:

- >60 mL/min/1.73 m²

Recommended Range:

- **Low:** 0-70 mL/min/1.73 m²
- **Suboptimal low:** 70-90 mL/min/1.73 m²
- **Optimal:** > 90 mL/min/1.73 m²

Source(s):

https://pubmed.ncbi.nlm.nih.gov/20616658/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2744545/
https://www.semanticscholar.org/paper/ASSOCIATION-BETWEEN-SYSTOLIC-BLOOD-PRESSURE-AND-IN-Tonkin-hill-Bouwmeester/15746910f1910f3c7d9fb0b5834ed805f103b1f2
https://pubmed.ncbi.nlm.nih.gov/37434027/
https://link.springer.com/article/10.1007/s12291-012-0280-1
https://dergipark.org.tr/en/download/article-file/2843833
https://www.semanticscholar.org/paper/cdadfaddb83cea2fede15cbad67894bd78c70b65
https://www.semanticscholar.org/paper/6964706afbfec391e7870b8359988171532ad59c
https://www.kidney.org/kidney-topics/estimated-glomerular-filtration-rate-egfrv
https://www.semanticscholar.org/paper/51f810c6cb88dd3709d3e482a7ab1a6773099d58

Glucose (Fasting)

Glucose (fasting) is essential for diagnosing and managing various health conditions related to glucose metabolism. It serves as a primary indicator of diabetes and prediabetes, helps assess insulin resistance, and aids in detecting hypoglycemia. Additionally, it is a key marker for monitoring metabolic disorders, guiding treatment decisions, and evaluating the impact of lifestyle and medication interventions. Since glucose levels fluctuate with diet and physiological stress, fasting glucose provides a standardized measure to assess long-term metabolic health and detect underlying endocrine or metabolic dysfunctions.

Standard Range:

- **Male/Female:** 65-99 mg/dL

Recommended Range:

- **Low:** 0- 65 md/dL
- **Suboptimal Low:** 65-70 mg/dL
- **Optimal:** 70-99 mg/dL
- **Suboptimal High:** 100-125 mg/dL
- **High:** > 126 mg/dL

Source(s):

https://pubmed.ncbi.nlm.nih.gov/10333902/
https://pubmed.ncbi.nlm.nih.gov/23647841/
https://www.semanticscholar.org/paper/9bc445ade4d6137b60964183286d47d43809c81a
https://www.semanticscholar.org/paper/a15c2b63e7a3f550d994382c48c763f695f5280d
https://www.semanticscholar.org/paper/ce147b3bfd145df7ee170de7b3e21694ed7da423
https://www.semanticscholar.org/paper/22e670fcbeec2a404f6b9a8ac34e0b9313b56742

Glucose, Urinalysis

The glucose urinalysis test measures the presence of glucose in the urine, providing insight into glucose metabolism and kidney function. Glucose is a crucial energy source for the body,

and its presence in urine can indicate conditions such as diabetes, impaired glucose regulation, or kidney dysfunction. Normally, glucose is reabsorbed by the kidneys, but elevated levels may suggest hyperglycemia or issues with renal glucose handling. Monitoring urinary glucose levels can help assess metabolic health, detect early signs of diabetes, and guide treatment decisions for glucose regulation disorders.

Standard Range:

- Negative

Recommended Range:

- **Optimal:** 0.0 (negative)
- **Suboptimal high:** 0.0-0.8 mmol/L
- **High:** > 8.0 mmol/L

Source(s):

https://testdirectory.questdiagnostics.com/test/test-detail/4719/glucose-qualitative-urine?p=r&q=glucose%20urine&cc=MASTER
https://www.semanticscholar.org/paper/9bc445ade4d6137b60964183286d47d43809c81a

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Granular Casts, Urinalysis

Granular casts in urine are important because they can be indicative of various renal pathologies, including acute tubular necrosis, glomerulonephritis, and chronic kidney disease. Their presence suggests renal tubular damage, helps in diagnosing acute kidney injury, indicates ongoing tubular damage in chronic kidney disease, provides clues for glomerulonephritis, has prognostic value, and guides further investigations., Urinalysis

Standard Range:

- None seen

Recommended Range:

- **Optimal:** 0-5 / LPF (none seen)
- **High:** > 5 / LPF

Source(s):

https://www.semanticscholar.org/paper/Urinary-Casts-After-Stress-Haber-Lindner/6bf504e7f6783f6498f8742bdd11921338e0f854
https://www.semanticscholar.org/paper/ad07635228f31f362e9bf4031981c7e87b140cae
https://www.semanticscholar.org/paper/Urinary-cast-is-a-useful-predictor-of-acute-kidney-Higuchi-Kabeya/ea758b2a098c25f9628d0ec10e7b73981122b1b2

Hyaline Casts, Urinalysis

Hyaline casts in urine are an important diagnostic marker in urinalysis. While they can be found in healthy individuals, an increased number can indicate underlying renal or systemic conditions. Understanding their presence and significance can aid in the early detection and management of various health issues, making this a critical aspect of clinical practice., Urinalysis

Standard Range:

- None seen

Recommended Range:

- **Optimal:** 0-2 / LPF (none seen)
- **High:** > 2 / LPF

Source(s):

https://www.osmosis.org/answers/hyaline-casts#:~:text=Are%20hyaline%20casts%20normal%20in,kidney%2C%20or%20renal%2C%20disease.
https://media.neliti.com/media/publications/279129-hyaline-cast-in-urine-in-normal-healthy-b0d47717.pdf

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Ketones, Urinalysis

High levels of ketones in urine can indicate diabetic ketoacidosis (DKA), a potentially life-threatening condition. Regular monitoring helps in early detection and prompt treatment, especially for Type 1 diabetes patients.

Standard Range:

- Negative

Recommended Range:

- **Optimal:** 0.0 (negative)
- **Suboptimal high:** 0.0-0.6 mmol/L
- **High:** > 0.6 mmol/L

Source(s):

https://testdirectory.questdiagnostics.com/test/test-detail/5463/urinalysis-complete?cc=MASTER
https://www.semanticscholar.org/paper/39d86bde87b90fb20db4b275b6baf91c7d25add1
https://www.semanticscholar.org/paper/aa351f2112794274d473dae5cafc415b9a23ca0c

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Leukocyte Esterase, Urinalysis

The leukocyte esterase urine test detects the presence of leukocyte esterase, an enzyme found in white blood cells (leukocytes). This test is commonly used to screen for urinary tract infections (UTIs) because the presence of leukocyte esterase in the urine suggests an increased number of white blood cells, which can indicate infection or inflammation in the urinary tract., Urinalysis

Standard Range:

- Negative

Recommended Range:

- **Optimal:** Negative

- **High:** Positive

Source(s):

https://testdirectory.questdiagnostics.com/test/test-detail/5463/urinalysis-complete?cc=MASTER
https://www.semanticscholar.org/paper/20353af9b879b1758f35e2dc0c693e7ef7d84110
https://www.semanticscholar.org/paper/05c7524dc63d02bfd68c8563f99a5e1fad6718c2
https://www.semanticscholar.org/paper/ce6ef6c69c6c2617390f435a783511e2ab5bf0d9

Nitrite, Urinalysis

The presence of nitrite in urine is a significant indicator of bacterial infection in the urinary tract. Its detection is essential for the timely diagnosis and treatment of UTIs, which can prevent more severe health issues. Therefore, understanding and monitoring nitrite levels in urine is a critical aspect of maintaining urinary health., Urinalysis

Recommended Range:

- **Optimal:** Negative
- **High:** Positive

Source(s):

https://testdirectory.questdiagnostics.com/test/test-detail/5463/urinalysis-complete?cc=MASTER
https://www.semanticscholar.org/paper/ce6ef6c69c6c2617390f435a783511e2ab5bf0d9
https://www.semanticscholar.org/paper/19a86a2a42ce84ac49c41b0eec4f3b4476c1d436
https://www.semanticscholar.org/paper/674b01574af866486817c7d6539df0d9dc29a9d2
https://www.semanticscholar.org/paper/05c7524dc63d02bfd68c8563f99a5e1fad6718c2

Occult Blood, Urinalysis

Occult blood in urine, or hematuria, is a critical indicator of various underlying health issues. It can signal urinary tract infections, kidney diseases, bladder conditions, prostate issues, systemic diseases, trauma or injury, and medication side effects. Early detection through microscopic examination or chemical tests can lead to timely diagnosis and treatment, preventing the progression of potentially serious conditions and improving patient outcomes., Urinalysis

Standard Range:

- Negative

Recommended Range:

- **Optimal:** Negative
- **High:** Positive

Source(s):

https://testdirectory.questdiagnostics.com/test/test-detail/5463/urinalysis-complete?cc=MASTER
https://www.semanticscholar.org/paper/674b01574af866486817c7d6539df0d9dc29a9d2
https://www.semanticscholar.org/paper/545e42105c832753d963887e589353dcbc6969e0
https://www.semanticscholar.org/paper/c8a7ae12cf8c57d0e4c507363f8adb01437469ba

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pH, Urinalysis

Urine pH is a valuable diagnostic tool that provides insights into a person's health, diet, and metabolic processes. Monitoring urine pH can help in diagnosing and managing various health conditions, optimizing medication efficacy, and preventing disease. Understanding the importance of urine pH can lead to better health outcomes and improved quality of life., Urinalysis

Standard Range:

- 5.0-8.0

Recommended Range:

- **Low:** 0- 4.5
- **Optimal:** 4.5-8.0
- **High:** > 8.0

Source(s):

https://testdirectory.questdiagnostics.com/test/test-detail/5463/urinalysis-complete?cc=MASTER
https://www.semanticscholar.org/paper/1ba5801785e4b8ddcbcc8b42948ea794d8ad6b67
https://www.semanticscholar.org/paper/22ae6a6419083611b829a89de8baa4e5121cf322
https://www.semanticscholar.org/paper/4351dbfcf9039ad52f53b3eef2c546dea2fc74ff
https://www.semanticscholar.org/paper/1ba5801785e4b8ddcbcc8b42948ea794d8ad6b67

Potassium

Potassium is essential for maintaining electrolyte balance, nerve function, muscle contraction, heart health, blood pressure regulation, and bone health. Imbalances can lead to serious health issues such as hypokalemia and hyperkalemia. A potassium blood test measures the level of potassium in the blood.

Standard Range:

- 3.5-5.3 mmol/L

Recommended Range:

- Low: 0- 3.5 mmol/L
- Optimal: 3.5-5.0 mmol/L
- Suboptimal high: 5.0-5.3 mmol/L
- High: > 5.3 mmol/L

Source(s):

https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/485434
https://nutritionj.biomedcentral.com/articles/10.1186/s12937-023-00888-z
https://www.semanticscholar.org/paper/a60e384e03d7e811cc3c6427fb05dee1660d81a8

https://www.semanticscholar.org/paper/40e6671fb04d3b6d02423699ab1f06e4d21fabda
https://www.semanticscholar.org/paper/4ade67c822cee9462c93263dffa2949dd094a4e5

Protein, Urinalysis

A protein urine test, also known as a urine protein test or urinalysis for protein, measures the amount of protein in the urine. Under normal conditions, very little protein is present in urine because the kidneys filter out waste products while retaining valuable substances like proteins. Elevated levels of protein in the urine, a condition known as proteinuria, can indicate kidney disease or other medical conditions., Urinalysis

Standard Range:

- Negative

Recommended Range:

- **Optimal:** 0-10 mg/dL
- **High:** > 10 mg/dL

Source(s):

https://testdirectory.questdiagnostics.com/test/test-detail/5463/urinalysis-complete?cc=MASTER
https://www.semanticscholar.org/paper/d2730cd7cb5919106c31a0463af7045e2c553f89
https://www.semanticscholar.org/paper/b23371c2ba84d41f1d0f1d8ffe23b542437fb5c2
https://www.semanticscholar.org/paper/d6bf9d2a6941e5c50223fe4049ec5b0d22f98509
https://www.semanticscholar.org/paper/8f8f453175df7c0ab3e9c6be5c7e2a225fd8e78a

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Renal Epithelial Cells, Urinalysis

Renal epithelial cells are crucial for kidney function, including filtration, reabsorption, acid-base balance, hormone production, and detoxification. Changes in these cells can indicate kidney disease, making them important for diagnosis, treatment, and public health initiatives., Urinalysis

Standard Range:

- ≤3 /HPF

Recommended Range:

- Optimal: 0-2 /HPF
- Suboptimal High: 2-3 /HPF
- High: > 3 /HPF

Source(s):

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9536011/
https://www.semanticscholar.org/paper/Differential-count-and-quantitative-estimation-of-W%C3%A5hlin/286c276880232c939210331d2be57aa378352b2d
https://www.semanticscholar.org/paper/7c2ac1729195ac897f2fccf3006e187bfd924466
https://www.semanticscholar.org/paper/7e4baa5f6668b7ec3a79d6ab897abc2066d826f5

Sodium

Sodium is integral to maintaining fluid balance, nerve and muscle function, blood pressure regulation, and nutrient absorption. Both deficiency and excess of sodium can lead to significant health issues. The balance of sodium in the body is regulated by the kidneys, and it is influenced by fluid intake, diet, and various hormones.

Standard Range:

- 135-146 mmol/L

Recommended Range:

- **Low:** 0- 135 mmol/L
- **Optimal:** 135-145 mmol/L
- **High:** > 145 mmol/L

Source(s):

https://pubmed.ncbi.nlm.nih.gov/35348651/
https://www.thelancet.com/journals/ebiom/article/PIIS2352-3964(22)00586-2/fulltext
https://www.semanticscholar.org/paper/2850db1bc5ac457631dd2edc0888765b6fb88c5c
https://www.semanticscholar.org/paper/909e234260f3b476bd8d9aec7f2f66fe6b5be0f6
https://www.semanticscholar.org/paper/80a6f7fe20fd29eebaa875c2378a967dc960cb26

Specific Gravity, Urinalysis

The specific gravity urine test measures the concentration of solutes in the urine. This test helps determine the kidney's ability to concentrate urine and maintain fluid balance. It reflects the density of urine compared to the density of water and provides insight into the body's hydration status and kidney function., Urinalysis

Standard Range:

- 1.001-1.035

Recommended Range:

- Low: 0- 1.001
- Suboptimal low: 1.001-1.005
- Optimal: 1.005-1.030
- Suboptimal high: 1.030-1.035
- High: > 1.035

Source(s):
https://testdirectory.questdiagnostics.com/test/test-detail/3190/specific-gravity-urine?cc=MASTER
https://www.semanticscholar.org/paper/1f1682902da2ad374a46835dacef53d92381f814
https://www.semanticscholar.org/paper/dbe788f394aa1c718fa5d8dbbcba538ff12f9b74

Squamous Epithelial Cells, Urinalysis

The squamous epithelial cells urine test measures the number of squamous epithelial cells present in a urine sample. Squamous epithelial cells are flat cells found in the outer layer of the skin and the mucous membranes, including the lining of the urinary tract. The presence of these cells in urine can indicate contamination of the sample or potential issues within the urinary tract. They serve as important diagnostic markers for conditions like infections, inflammatory diseases, and cancers, and are vital in the wound healing process., Urinalysis

Standard Range:

- Negative

Recommended Range:

- Optimal: 0.0 (negative)
- Suboptimal high: 0- 5 cells/HPF
- High: > 5 cells/HPF

Source(s):

https://testdirectory.questdiagnostics.com/test/test-detail/5463/urinalysis-complete?cc=MASTER
https://www.semanticscholar.org/paper/bbe7d5f15d157634e4e1e12d8bfc156a9ccaafa7
https://www.semanticscholar.org/paper/7e462f53d8d284e75567b8df278a25a9f97c60dc

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Total Protein

The total protein test measures the total amount of protein in the plasma, which is the liquid part of the blood. Proteins are essential components of all cells and tissues in the body, playing a key role in building and repairing tissues, producing enzymes and hormones, and supporting immune function. The two main types of proteins in the blood are albumin and globulin.

Standard Range:

- 6.1-8.1 g/dL

Recommended Range:

- **Low:** 0- 6.0 g/dL
- **Optimal:** 6.0-8.3 g/dL
- **High:** > 8.3 g/dL

Source(s):

https://testdirectory.questdiagnostics.com/test/test-detail/747/protein-total-and-protein-electrophoresis?p=r&q=total%20protein&cc=MASTER
https://www.semanticscholar.org/paper/Analysis-on-the-test-result-of-serum-total-protein-Gang/88f1c7f545ef69175cee3ebc69218eccbaac57a6
https://www.semanticscholar.org/paper/3a526bf3514a4114975b40614a3f8a7007c8b97b
https://www.semanticscholar.org/paper/fec0accf342a7624101243a42637e7520da4b7e5

Transitional Epithelial, Urinalysis

The transitional epithelial urinalysis detects the presence of transitional epithelial cells in the urine. These cells line the bladder, ureters, and parts of the kidneys, playing a crucial role in protecting the urinary tract and allowing it to stretch. A small number of transitional epithelial cells in urine is normal, but an elevated count may indicate infections, inflammation, or underlying urinary tract conditions. This test helps assess bladder and kidney health, aiding in the diagnosis of conditions such as urinary tract infections, kidney disease, or, in rare cases, urinary tract cancers.

Standard Range:

- ≤5 /HPF

Recommended Range:

- **Optimal:** 0-2 /HPF
- **Suboptimal High:** 2-5 /HPF
- **High:** > 5 /HPF

Source(s):

https://flebo.in/health/epithelial-cells-in-urine-normal-range-overview/#:~:text=When%20testing%20and%20checking%20for,high%20power%20yield%20or%20HPF.
https://www.metropolisindia.com/blog/preventive-healthcare/understanding-epithelial-cells-in-urine-tests-ranges-and-causes#:~:text=Understanding%20your%20Epithelial%20Cells%20in,indicate%20an%20underlying%20medical%20condition.&text=The%20normal%20range%20of%20epithelial,0%2D2%20cells%20per%20HPF
https://medlineplus.gov/lab-tests/epithelial-cells-in-urine/#:~:text=Are%20there%20any%20risks%20to,mean%2C%20talk%20with%20your%20provider.
https://www.semanticscholar.org/paper/3e405c0c8ff2e8a187004fb0b55a9ea801c81d60

Triple Phosphate Crystals, Urinalysis

The presence of triple phosphate crystals in urine can indicate urinary tract infections (UTIs), kidney stones, or metabolic imbalances. Recognizing and addressing these crystals can lead to timely and effective treatment, preventing complications and improving patient health outcomes., Urinalysis

Standard Range:

- Optimal: None or Few

Recommended Range:

- Optimal: None or Few

Source(s):

https://www.semanticscholar.org/paper/1537cd2ed7e97d0c25dc846502fe9af33663578d
https://www.semanticscholar.org/paper/2a9040b31ff1067280f02dc7570e90a9a70cf3d5
https://www.semanticscholar.org/paper/b587da78ed049719bf7e57fefa8a338543fdf81d

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Uric Acid Crystals, Urinalysis

Uric acid is a waste product found in the blood, created when the body breaks down purines, which are substances found in certain foods and drinks. Most uric acid dissolves in the blood, is filtered through the kidneys, and is excreted in urine. However, if the body produces too much uric acid or the kidneys do not excrete enough, uric acid levels can build up in the blood, leading to hyperuricemia. Crystals, Urinalysis

Standard Range:

- Optimal: None or Few

Recommended Range:

- Male:
    - **Low:** 0- 3.4 mg/dl
        - **Optimal:** 3.4- 6.0 mg/dl
- **Suboptimal High:** 6.0-7.0 mg/dl
    - **High:** >7.0 mg/dl
- Female:
    - **Low:** 0-2.4 mg/dl
    - **Optimal:** 2.4-6.0 mg/dl
    - **High:** >6.0 mg/dl

Source(s):

https://testdirectory.questdiagnostics.com/test/test-detail/5463/urinalysis-complete?cc=MASTER
https://www.semanticscholar.org/paper/52b7184b6bd405e95f8eafe5633df04448598795

RBC, Urinalysis

Red Blood Cells (RBC) in urinalysis are a key indicator of kidney and urinary tract health. Since the presence of RBCs in urine, known as hematuria, may signal conditions such as infections, kidney stones, trauma, or glomerular diseases, it is useful in diagnosing and monitoring urinary and renal disorders. RBC levels provide insight into potential underlying conditions affecting the kidneys, bladder, or urinary tract.

Standard Range:

- Negative

Recommended Range:

- Optimal: 0.0 RBC/HPF
- Suboptimal high: 0-3 RBC/HPF
- High: > 3 RBC/HPF

Source(s):

https://testdirectory.questdiagnostics.com/test/test-detail/5463/urinalysis-complete?cc=MASTER
https://www.semanticscholar.org/paper/c8a7ae12cf8c57d0e4c507363f8adb01437469ba
https://www.semanticscholar.org/paper/bbea884532a1eb462a6682f24585c34111712824
https://www.semanticscholar.org/paper/8b7219080d9fdaef7e7c49c4181b073ecb7f2f33

WBC, Urinalysis

WBC (White Blood Cells) in urinalysis is crucial for diagnosing and managing various health conditions related to urinary tract and kidney function. It acts as an indicator of infection, inflammation, or immune response within the urinary system, helping to detect conditions like urinary tract infections (UTIs), pyelonephritis, or interstitial nephritis. Additionally, elevated WBC levels in urine can signal the presence of inflammatory or infectious processes, serving as an early marker for such conditions.

Standard Range:

- Negative

Recommended Range:

- **Optimal:** 0.0
- **Suboptimal high:** 0- 5 WBC/HPF
- **High:** > 5 WBC/HPF

Source(s):

https://testdirectory.questdiagnostics.com/test/test-detail/5463/urinalysis-complete?cc=MASTER
https://www.semanticscholar.org/paper/64f8b2f03f6afc0ab3431c6278c379681fa92d35
https://www.semanticscholar.org/paper/98f3643677bc63dcb463725b67a9b1e00cfd1361
https://www.semanticscholar.org/paper/d37effc56cd78b066558b0bc4a06a731a483bef3

Yeast, Urinalysis

A yeast urine test is conducted to detect the presence of yeast cells in the urine. This test is typically used to diagnose urinary tract infections (UTIs) caused by yeast, most commonly Candida species. Yeast infections in the urinary tract can occur, although they are less common than bacterial UTIs. They can be seen more frequently in individuals with certain risk factors, such as diabetes, a compromised immune system, or prolonged use of antibiotics or catheters.

Standard Range:

- 0 (negative)

Recommended Range:

- **Optimal:** 0
- **High:** > 0

Source(s):

https://testdirectory.questdiagnostics.com/test/test-detail/5463/urinalysis-complete?cc=MASTER

https://www.semanticscholar.org/paper/c1326bbb2d478e298da53482b15851642613c55b
https://www.semanticscholar.org/paper/36eceb153e145a714deb0ab48a9a6890d5745c3d
https://www.semanticscholar.org/paper/1866894537444e905765a4cc441c3efd8c2527d8

Liver

Albumin

The albumin blood test measures the amount of albumin in the blood. Albumin is a protein made by the liver and is the most abundant protein in the plasma. It plays a crucial role in maintaining oncotic pressure (the pressure that keeps fluid from leaking out of blood vessels), transporting hormones, vitamins, drugs, and substances like calcium throughout the body, and maintaining overall fluid balance.

Standard Range:

- 3.6-5.1 g/dL

Recommended Range:

- **Low:** 0-3.5 g/dL
- **Optimal:** 3.5-5.0 g/dL
- **High:** > 5.0 g/dL

Source(s):

https://pubmed.ncbi.nlm.nih.gov/21290995/
https://pubmed.ncbi.nlm.nih.gov/2333868/
https://pubmed.ncbi.nlm.nih.gov/8366899/
https://pubmed.ncbi.nlm.nih.gov/28138809/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5300948/
https://pubmed.ncbi.nlm.nih.gov/10437629/
https://www.semanticscholar.org/paper/8f4301940c5b31e9b62c6e41ed34a0cd01fe3ff6
https://www.semanticscholar.org/paper/4da6ba280af670ea8cfb5b58bda0f133216bfdb3
https://www.semanticscholar.org/paper/9f6fdd5b39feec10cb04067c045a84abb1d25111

Albumin/Globulin Ratio

The Albumin/Globulin (A/G) ratio is a calculated value derived from the measurements of two major types of proteins in the blood: albumin and globulin. This ratio helps in evaluating and diagnosing various health conditions, including liver and kidney diseases, and certain inflammatory or immune disorders.

Standard Range:

- Male/Female: 1.0-2.5 A/G

Recommended Range:

- Male/Female Low: <0-1.0 A/G
- Male/Female Optimal: 1.0-2.1 A/G
- Male/Female Suboptimal High: 2.1-2.5 A/G
- High: > 2.5 A/G

Source(s):

https://www.tandfonline.com/doi/epdf/10.2147/JIR.S347161?needAccess=true
https://pubmed.ncbi.nlm.nih.gov/35505797/
https://pubmed.ncbi.nlm.nih.gov/34737599/
https://www.semanticscholar.org/paper/9f6fdd5b39feec10cb04067c045a84abb1d25111
https://www.semanticscholar.org/paper/48e0bd742d50d24eaf61beba18d9b50eb3355fa6
https://www.semanticscholar.org/paper/d417ae625cfc2c39858d0b2a552e2be99f03a4f9

Alkaline Phosphatase (ALP)

Alkaline phosphatase (ALP) is crucial for diagnosing liver disease, bone disorders, gallbladder issues, and kidney function. It also provides insights into growth and development in children, maternal and fetal health during pregnancy, and nutritional status. Regular monitoring aids in early detection, comprehensive health assessment, targeted treatment, and preventive healthcare.

Standard Range:

- Male:
    - 17 - 19 Years: 46-169 U/L
    - 20-49 Years: 36-130 U/L
    - >49 Years: 35-144 U/L
- Female:
    - 17-19 Years: 36-128 U/L
    - 20-49 Years: 31-125 U/L
    - >49 Years: 37-153 U/L

Recommended Range:

- Male:
    - Low: 0-35 U/L
    - Suboptimal Low: 35-40 U/L
    - Optimal: 40-130 U/L
    - High: > 130 U/L
- Female:
    - Female: 0-30 U/L
    - Optimal: 30-120 U/L
    - High: > 120 U/L

Source(s):

https://michaellustgarten.com/2019/10/07/alkaline-phosphatase/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3952340/
https://pubmed.ncbi.nlm.nih.gov/19841303/
https://pubmed.ncbi.nlm.nih.gov/26426894/
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0102276

Alanine Aminotransferase (ALT)

ALT, also known as SGPT (serum glutamic-pyruvic transaminase), is an enzyme primarily found in the liver. It plays a role in converting amino acids into energy for the liver cells. Elevated levels of ALT in the blood often indicate liver damage or inflammation.

Standard Range:

- Male: 9-46 U/L
- Female ≥20 Years: 6-29 U/L

Recommended Range:

- Male Low: 0- 7 U/L
- Male Suboptimal Low: 7-9 U/L
- Male Optimal: 9-46 U/L
- Male Suboptimal High: 46-55 U/L
- Male High: > 55 U/L
- Female Low: 0-6 U/L U/L
- Female Optimal: 6-29 U/L
- Female Suboptimal High: 29-35 U/L
- Female High: >35 U/L

Source(s):

https://www.aafp.org/pubs/afp/issues/2005/0315/p1105.html
https://www.mayocliniclabs.com/test-catalog/overview/8362
https://pubmed.ncbi.nlm.nih.gov/23973920/
https://pubmed.ncbi.nlm.nih.gov/22817613/
https://medlineplus.gov/lab-tests/alt-blood-test/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4931219/
https://www.semanticscholar.org/paper/e09e84eadefcef8d7bc93a6cbf5570705d8731e7
https://www.semanticscholar.org/paper/6cf5555a6c98546819e24044ad31e6f38231e2f9
https://www.semanticscholar.org/paper/491ce66b084a64de77d0cbe57bc38c93193d8b06

Aspartate Aminotransferase (AST)

AST, also known as SGOT (serum glutamic-oxaloacetic transaminase), is an enzyme found primarily in the liver, heart, muscles, and other tissues. It plays a role in the metabolism of amino acids. Elevated levels of AST in the blood can indicate damage to these tissues, particularly the liver.

Standard Range:

- Male:
    - **20-49 Years:** 10 - 40 U/L
    - **>49 Years:** 10-35 U/L
- Female:
    - **20-44 Years:** 10-30 U/L
    - **>45 Years:** 10-35 U/L

Recommended Range:

- **Male/Female Low**: 0- 10 U/L
- **Male/Female Optimal**: 10-30 U/L
- **Male/Female Suboptimal High**: 30-40 U/L
- **Male/Female High**: > 40 U/L

Source(s):

https://www.nmcd-journal.com/article/S0939-4753(20)30308-2/abstract
https://jlpm.amegroups.org/article/view/5898/html
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4443194/
https://www.semanticscholar.org/paper/2edbe33c108f2f750ab3a1a639b3436a7077fded
https://www.semanticscholar.org/paper/491ce66b084a64de77d0cbe57bc38c93193d8b06

Direct Bilirubin

The direct bilirubin blood test measures the level of direct (conjugated) bilirubin in the blood. Bilirubin is a yellow pigment produced during the normal breakdown of red blood cells. Once produced, bilirubin is transported to the liver, where it is converted into a conjugated form (direct bilirubin) that can be excreted into bile and eliminated from the body through stool.

Elevated levels of direct bilirubin in the blood can indicate liver dysfunction or bile duct obstruction.

Standard Range:

- <0.2 mg/dL

Recommended Range:

- **Optimal:** 0- 0.2 mg/dL
- **High:** > 0.2 mg/dL

Source(s):

https://testdirectory.questdiagnostics.com/test/test-detail/285/bilirubin-direct?p=r&q=Bilirubin,%20Direct&cc=MASTER
https://labpedia.net/bilirubin-part-1-total-bilirubin-direct-and-indirect-bilirubin-classification-of-jaundice-neonatal-jaundice/
https://www.semanticscholar.org/paper/f3c06b59e1b993ce39daa39472cc8ae419d0faee
https://www.semanticscholar.org/paper/dc3e14cdedfc17e2919659f55997796bdf296f76
https://www.semanticscholar.org/paper/2b7dd978eb5254495c463d81b749616f74864b80

Indirect Bilirubin (Calculated)

Indirect Bilirubin (Calculated) is essential for diagnosing and managing various health conditions related to bilirubin metabolism and liver function. It serves as a key indicator of hemolysis, aids in detecting conditions like Gilbert's syndrome, and helps assess liver function abnormalities. Additionally, elevated levels can indicate increased red blood cell breakdown, liver dysfunction, or inherited metabolic disorders. It is also monitored in chronic diseases to evaluate bilirubin processing, guide treatment, and assess overall hepatic and hematologic health.

Standard Range:

- 0.2-1.2 mg/dL (calc)

Recommended Range:

- **Low:** 0- 0.2 mg/dL (calc)

- **Optimal:** 0.2-0.8 mg/dL (calc)
- **Suboptimal High:** 0.8-1.2 mg/dL (calc)
- **High:** >1.2 mg/dL (calc)

Source(s):

https://emedicine.medscape.com/article/2074068-overview
https://www.semanticscholar.org/paper/8fdcc598e778aaea2738e2fd5ef1120e04a046fe
https://www.semanticscholar.org/paper/f3c06b59e1b993ce39daa39472cc8ae419d0faee

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Gamma-glutamyl Transferase (GGT)

GGT is crucial for diagnosing and managing various health conditions related to liver function and biliary health. It serves as a sensitive marker for liver disease, alcohol consumption, and bile duct obstruction, aiding in the early detection of hepatobiliary disorders. Additionally, it helps differentiate liver from bone disease when evaluating elevated alkaline phosphatase levels. GGT is also useful in assessing oxidative stress and cardiovascular risk and is monitored in chronic liver diseases to guide treatment and evaluate disease progression.

Standard Range:

- Male:
    - **20-29 Years:** 3-70 U/L
    - **30-39 Years:** 3-90 U/L
    - **40-54 Years:** 3-95 U/L
    - **55-59 Years:** 3-85 U/L
    - **>60 Years:** 3-70 U/L
- Female:
    - **20-29 Years:** 3-40 U/L
    - **30-39 Years:** 3-50 U/L
    - **40-49 Years:** 3-55 U/L
    - **50-59 Years:** 3-70 U/L
    - **>60 Years:** 3-65 U/L

Recommended Range:

- Male:
    - **Low:** 0-3 U/L

    - **Suboptimal Low:** 3-10 U/L
    - **Optimal:** 10-60 U/L
    - **Suboptimal High:** 60-95 U/L
    - **High:** >95 U/L

- Female:
    - **Low:** 0-3 U/L
    - **Suboptimal Low:** 3-9 U/L
    - **Optimal:** 9-36 U/L
    - **Suboptimal High:** 36-70 U/L
    - **High:** >70 U/L

Source(s):

https://pubmed.ncbi.nlm.nih.gov/27512925/
https://pubmed.ncbi.nlm.nih.gov/32310756/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4620378/
https://pubmed.ncbi.nlm.nih.gov/19317327/
https://www.semanticscholar.org/paper/23fff20994e3758c7c1dbc4cf6146efde6e1cb0f
https://www.semanticscholar.org/paper/a90f254ad9d1415cd2aab86c838bc0a3dc0ace36

Globulin (Calculated)

The globulin blood test measures the levels of globulin proteins in the blood. Globulins are a group of proteins that play various roles in the body, including fighting infections, transporting nutrients, and supporting blood clotting. Globulins are categorized into different types: alpha, beta, and gamma globulins, each with specific functions.

Standard Range:

- 1.9-3.7 g/dL (calc)

Recommended Range:

- **Low:** 0- 2.0 g/dL
- **Optimal:** 2.0-3.5 g/dL
- **High:** > 5 g/dL

Source(s):

https://pubmed.ncbi.nlm.nih.gov/25816467/
https://pubmed.ncbi.nlm.nih.gov/26629820/
https://pubmed.ncbi.nlm.nih.gov/27656432/
https://pubmed.ncbi.nlm.nih.gov/29348636/
https://www.semanticscholar.org/paper/2adfc06a2abbf3ec5eb2385f30d3a476a8121a35
https://www.semanticscholar.org/paper/9f6fdd5b39feec10cb04067c045a84abb1d25111
https://www.semanticscholar.org/paper/70f15600227123f214aa6423d1a36d87d43b0ebd

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Total Bilirubin

Bilirubin is a yellow pigment that is produced during the normal breakdown of red blood cells. It is processed by the liver, where it is converted into a form that can be excreted in bile and urine. The total bilirubin test is often part of a liver function panel and helps diagnose and monitor liver and bile duct health.

Standard Range:

- 0.2-1.2 mg/dL

Recommended Range:

- **Low:** 0.0 mg/dL
- **Optimal:** 0.1-1.2 mg/dL
- **High:** > 1.2 mg/dL

Source(s):

https://pubmed.ncbi.nlm.nih.gov/15382174/
https://testdirectory.questdiagnostics.com/test/test-detail/287/bilirubin-total?p=r&q=Bilirubin,%20Total&cc=MASTER
https://www.semanticscholar.org/paper/697aa2724af911e7e13db9b96f984901f10afec9
https://www.semanticscholar.org/paper/a1a007a60d21fb184e74e0dc94e1e90a9defc58d
https://www.semanticscholar.org/paper/44065de315def2bbe3703163b31036f8779a4aaa

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Metabolic

Estimated Average Glucose

The Estimated Average Glucose (eAG) blood test measures the average blood glucose levels over an extended period, providing insight into long-term glucose control and metabolic health. eAG is calculated based on hemoglobin A1c levels and reflects an individual's typical blood sugar levels over the past two to three months. It plays a crucial role in assessing diabetes risk, monitoring glycemic control in individuals with diabetes, and guiding treatment decisions. Tracking eAG levels helps evaluate overall blood sugar management, prevent complications, and support metabolic health.

Standard Range:

- **Optimal:** < 114 mg/dL
- **Suboptimal High:** 114 mg/dL - 140 mg/dL
- **High:** > 140 mg/dL

Recommended Range:

- Male
    - **Low:** 0-70 mg/dL
    - **Optimal:** 70-100 mg/dL
    - **Suboptimal High:** 100-126 mg/dL
    - **High:** >126 mg/dL
- Female:
    - **Low:** 0- 70 mg/dL
    - **Optimal:** 70-100 mg/dL
    - **Suboptimal High:** 100-126 mg/dL
    - **High:** >126 mg/dL

Source(s):

https://www.semanticscholar.org/paper/ADAG-Study-Group-Data-Links-A1C-Levels-with-Blood-Klonoff/204b867cebd5e7c28c3f24a0027ced2c8bf6035d
https://www.who.int/data/gho/indicator-metadata-registry/imr-details/2380#:~:text=The%20expected%20values%20for%20normal,and%20monitoring%20glycemia%20are%20recommended.
https://professional.diabetes.org/glucose_calc

https://www.semanticscholar.org/paper/26a9b20a0136a5429ca4d88d756ff71fa661e384
https://www.semanticscholar.org/paper/908af2feeba5dcc80801ab73cd0874cd3ec172cf

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Hemoglobin A1c (HbA1c)

Hemoglobin A1c (HbA1c) is a key biomarker in diabetes management and long-term blood sugar control. It reflects the average blood glucose levels over the past two to three months by measuring the percentage of glycated hemoglobin in red blood cells. HbA1c is essential for diagnosing diabetes and prediabetes, as well as monitoring the effectiveness of treatment strategies. It helps clinicians assess glycemic control and the risk of complications such as cardiovascular disease, neuropathy, and kidney dysfunction, guiding personalized interventions for metabolic health.

Standard Range:

- < 5.7%

Recommended Range:

- **Optimal:** 0- 5.6%
- **Suboptimal high:** 5.6-6.0 %
- **High:** > 6.0 %

Source(s):

https://www.ahajournals.org/doi/10.1161/CIRCOUTCOMES.110.957936
https://testdirectory.questdiagnostics.com/test/test-detail/496/hemoglobin-a1c?q=Hemoglobin%20A1c&cc=MASTER
https://www.semanticscholar.org/paper/a0b7aea0a210cd76eeb27fd9afcf418a454df777
https://www.semanticscholar.org/paper/3fbe87e15193721cfadbeebde29179276b1cf53d
https://www.semanticscholar.org/paper/87552df5d7d1a0ae35307142c64f16431c56c8df
https://www.semanticscholar.org/paper/fb9d41026d8a8e0b1f6293e6f54e704f12b11f59

Insulin (fasting)

Insulin is crucial for regulating blood sugar levels, storing glucose, and influencing fat and protein metabolism. Proper insulin function is essential for maintaining overall health and managing conditions like diabetes. Dysregulation can lead to serious health issues such as hyperglycemia, hypoglycemia, and diabetes. (fasting)

Standard Range:

- ≤18.4 uIU/mL

Recommended Range:

- **Optimal:** 0-18.4 uIU/mL
- **High:** > 18.4 uIU/mL

Source(s):

https://pubmed.ncbi.nlm.nih.gov/25794879/
https://pubmed.ncbi.nlm.nih.gov/23131894/
https://www.semanticscholar.org/paper/O≤ptimal-Fasting-Insulin-Cutoff-Value-to-Predict-and-Lee-An/1474a1600800ad3432854bc1423f3b8a212877b4
https://bmccardiovascdisord.biomedcentral.com/articles/10.1186/1471-2261-14-107
https://bmccardiovascdisord.biomedcentral.com/articles/10.1186/1471-2261-14-107
https://www.semanticscholar.org/paper/2d336cc1a168ede4760c6d28b2e41302b7efdc58
https://www.semanticscholar.org/paper/05fae670eaf0efde9637891c6eabccbd80acb046

Mean Plasma Glucose (MPG)

The Mean Plasma Glucose (MPG) test measures the average concentration of glucose in the blood over time, providing insight into glucose metabolism and overall glycemic control. MPG is closely related to hemoglobin A1c levels and reflects blood sugar trends over weeks to months. It plays a crucial role in assessing diabetes risk, monitoring blood glucose management in individuals with diabetes, and guiding treatment strategies. Tracking MPG levels helps evaluate metabolic health, detect early signs of glucose dysregulation, and support long-term disease prevention.

Recommended Range:

- **Low:** 0- 70 md/dL
- **Suboptimal low:** 70-75 md/dL
- **Optimal:** 75-88 md/dL
- **Suboptimal high:** 89-99 md/dL
- **High:** > 100 md/dL

Source(s):

https://www.semanticscholar.org/paper/Type-2-diabetes%3A-prevention-in-people-at-high-risk/746375545c9891729601c3607239ccc4595373f9
https://pubmed.ncbi.nlm.nih.gov/10333902/
https://pubmed.ncbi.nlm.nih.gov/23647841/
https://www.semanticscholar.org/paper/6bb2371f0d6168ca3c8b7a7910714ce03e565a83

Uric Acid

Uric acid is a waste product found in the blood, created when the body breaks down purines, which are substances found in certain foods and drinks. Most uric acid dissolves in the blood, is filtered through the kidneys, and is excreted in urine. However, if the body produces too much uric acid or the kidneys do not excrete enough, uric acid levels can build up in the blood, leading to hyperuricemia.

Standard Range:

- Male:
  - 4.0-8.0 mg/dL
- Female:
  - 2.5-7.0 mg/dL

Recommended Range:

- Male:
  - **Low:** 0-3.4 mg/dL
  - **Optimal:** 3.4-7.0 mg/dL
  - **High:** > 7.0 mg/dL

- Female:
    - **Low:** <2.4 mg/dL
    - **Optimal:** 2.4-6.0 mg/dL
    - **High:** > 6.0 mg/dL

Source(s):

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7231289/
https://pubmed.ncbi.nlm.nih.gov/27533308/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8544513/
https://www.semanticscholar.org/paper/52b7184b6bd405e95f8eafe5633df04448598795
https://www.semanticscholar.org/paper/ce002803b14a24f436ad83186d6d66a13e125212

Nutrients

Arachidonic Acid/EPA Ratio (AA/EPA)

The EPA/AA blood test measures the ratio of eicosapentaenoic acid (EPA) to arachidonic acid (AA), providing insight into the body's inflammatory balance and cardiovascular health. EPA is an omega-3 fatty acid with anti-inflammatory properties, while AA is an omega-6 fatty acid involved in inflammation and immune responses. The balance between these fatty acids influences cardiovascular risk, inflammatory conditions, and overall metabolic health. Monitoring the EPA/AA ratio helps assess inflammation status, guide dietary and lifestyle interventions, and support long-term health and disease prevention strategies.

Standard Range:

- < 0.2

Recommended Range:

- **Optimal:** < 0.2
- **High:** > 0.2

Source(s):

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8871836/
https://pubmed.ncbi.nlm.nih.gov/38648883/
https://www.semanticscholar.org/paper/77aabd0c05850fe0651c2691c5947b617e8879dc
https://www.semanticscholar.org/paper/5fc713902b61da7eb78e987c88757682a1fc68f9

Ferritin

Ferritin is crucial for diagnosing and managing various health conditions related to iron metabolism. It acts as a buffer against iron deficiency and overload, serves as an early indicator of iron deficiency anemia, and can indicate conditions like hemochromatosis. Additionally, it is an acute phase reactant useful in diagnosing inflammatory diseases and is monitored in chronic diseases to assess iron status and guide treatment.

Standard Range:

- Male:
    - **19-59 Years:** 38-130 ng/mL
    - **>59 Years:** 24-380 ng/mL
- Female:
    - **19-40 Years:** 16-154 ng/mL
    - **41-60 Years:** 16-232 ng/mL
    - **>60 Years:** 16-288 ng/mL

Recommended Range:

- Male:
    - **Low:** 0-24 ng/mL
    - **Suboptimal Low:** 24-45 ng/mL
    - **Optimal:** 45-79 ng/mL
    - **Suboptimal High:** 79-380 ng/mL
    - **High:** 380 ng/mL
- Female:
    - **Low:** 0-16 ng/mL
    - **Suboptimal low:** 16-40 ng/mL
    - **Optimal:** 40-75 ng/mL
    - **Suboptimal High:** 75-200 ng/mL
    - **High:** >200 ng/mL

Source(s):

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8195161/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5629903/
https://pubmed.ncbi.nlm.nih.gov/28043306/
https://pubmed.ncbi.nlm.nih.gov/29070560/
https://irondisorders.org/iron-tests1/
https://pubmed.ncbi.nlm.nih.gov/24549403/
https://pubmed.ncbi.nlm.nih.gov/18835072/
https://pubmed.ncbi.nlm.nih.gov/28591160/
https://pubmed.ncbi.nlm.nih.gov/19203421/
https://pubmed.ncbi.nlm.nih.gov/7918045/
https://pubmed.ncbi.nlm.nih.gov/28591160/

Folate, RBC

Folate (RBC) is essential for diagnosing and managing health conditions related to folate metabolism. It reflects long-term folate status, aids in detecting folate deficiency, and helps assess risks for megaloblastic anemia. Additionally, it is crucial for evaluating neural tube defect risk in pregnancy and monitoring folate levels in chronic conditions affecting nutrient absorption. Since folate plays a key role in DNA synthesis and cell division, its measurement is valuable in managing conditions like malnutrition, malabsorption syndromes, and hematological disorders.

Standard Range:

- Male/Female: >280 ng/mL

Recommended Range:

- Male/Female:
    - Low: 0- 280 ng/mL
    - Suboptimal Low: 280-400 ng/mL
    - Optimal: > 400 ng/mL

Source(s):

https://www.ncbi.nlm.nih.gov/books/NBK294189/
https://pubmed.ncbi.nlm.nih.gov/25073783/
https://pubmed.ncbi.nlm.nih.gov/29477222/
https://pubmed.ncbi.nlm.nih.gov/29070560/
https://www.semanticscholar.org/paper/83aaa7e0f87359f6409a237477f3523af9e7666c
https://www.semanticscholar.org/paper/4b956ace8f91df67d1528a3c9289216a015895f9

Iron % Saturation

The percent iron saturation test, also known as transferrin saturation, measures the percentage of transferrin (a protein that transports iron in the blood) that is saturated with iron. This test helps assess how much iron is available in the body to meet its needs and is commonly used to diagnose and monitor iron-related disorders, including iron deficiency anemia and iron overload conditions.

Standard Range:

- Male:
  - 20-48%
- Female:
  - 16-45%

Recommended Range:

- Male:
  - **Low:** 0 - 20%
  - **Optimal:** 20-48%
  - **High:** >48%
- Female:
  - **Low:** 0-16%
  - **Optimal:** 16-45%
  - **High:** >45%

Source(s):

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4975278/
https://pubmed.ncbi.nlm.nih.gov/33422582/
https://www.semanticscholar.org/paper/a24e8ee476144c29a2bb0aa935f1d4933353352d
https://www.semanticscholar.org/paper/86a8e6ee01f2464013176beb0064f18b038cc111

Iron, Total

Iron is crucial for diagnosing and managing various health conditions related to iron metabolism. It plays a key role in oxygen transport and energy production, serves as an indicator of iron deficiency or overload, and helps detect conditions like anemia and hemochromatosis. Additionally, iron levels fluctuate with dietary intake, inflammation, and chronic diseases, making it an essential marker for assessing overall iron status. It is also monitored in metabolic and hematologic disorders to guide treatment and ensure proper iron balance in the body.

Standard Range:

- Male:
  - **20-29 Years:** 50-195 mcg/dL
  - **>30 Years:** 50-180 mcg/dL
- Female:
  - **20-49 Years:** 40-190 mcg/dL
  - **>50 Years:** 45-160 mcg/dL

Recommended Range:

- Male:
  - 20-29 Years:
    - **Low:** <50 mcg/dL
    - **Suboptimal Low:** 50-65 mcg/dL
    - **Optimal:** 50-176 mcg/dL
    - **Suboptimal High:** 176-195 mcg/dL
    - **High:** >195 mcg/dL
  - >30 Years:
    - **Low:** 0-50 mcg/dL
    - **Suboptimal Low:** 50-65 mcg/dL
    - **Optimal:** 50-176 mcg/dL
    - **Suboptimal High:** 176-180 mcg/dL
    - **High:** >180 mcg/dL
- Female:
  - 20-49 Years:
    - **Low:** 0-40 mcg/dL
    - **Suboptimal Low:** 40-60 mcg/dL
    - **Optimal:** 60-170 mcg/dL
    - **Suboptimal High:** 170-190 mcg/dL
    - **High:** >190 mcg/dL
  - >50 Years:
    - **Low:** 0-45 mcg/dL
    - **Suboptimal Low:** 45-60 mcg/dL
    - **Optimal:** 60-160 mcg/dL
    - **High:** >160 mcg/dL

Source(s):

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6390146/
https://testdirectory.questdiagnostics.com/test/test-detail/571/iron-total?cc=MASTER
https://www.semanticscholar.org/paper/6b7e0f5bb91e3f04ec1d384d68fea29afeee2d4e
https://www.semanticscholar.org/paper/6a15f57ce9ba6cdf3d77e88b4c84f953ed431ca8
https://www.semanticscholar.org/paper/6a15f57ce9ba6cdf3d77e88b4c84f953ed431ca8
https://www.semanticscholar.org/paper/b3aa39af32ca5f1d94ce2376d99b92555a6cfdf8
https://www.semanticscholar.org/paper/b7fe30efcb3c5811707d1e1750ff5099ef23fdaf

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Magnesium, RBC

The Magnesium, RBC test measures the concentration of magnesium within red blood cells, providing insight into magnesium status at the cellular level. Magnesium is a vital mineral involved in muscle and nerve function, energy production, and bone health. It plays a crucial role in cardiovascular function, enzymatic reactions, and maintaining electrolyte balance. Measuring magnesium in red blood cells offers a more accurate assessment of long-term magnesium status compared to serum levels. Monitoring RBC magnesium helps evaluate deficiencies, guide supplementation, and support overall metabolic and neuromuscular health.

Standard Range:

- 4.0-6.4 mg/dL

Recommended Range:

- **Low:** 0- 4.0 mg/dL
- **Optimal:** 4.0-6.4 mg/dL
- **High:** > 6.4 mg/dL

Source(s):

https://www.ncbi.nlm.nih.gov/books/NBK549811/
https://pubmed.ncbi.nlm.nih.gov/28140318/
https://www.semanticscholar.org/paper/Method-validation-of-an-Inductively-Coupled-Plasma-Bithi-Ricks/1c8aab39d7d2b0070c7f3748ec76e84be7a10c98

Omega 3: DHA

Omega-3: DHA is crucial for diagnosing and managing various health conditions related to cardiovascular, neurological, and inflammatory health. It plays a key role in brain function and development, serves as an indicator of omega-3 status, and helps assess the risk of cardiovascular disease. Additionally, DHA levels are linked to cognitive function, eye health, and anti-inflammatory processes, making it a valuable marker for evaluating overall wellness.

Standard Range:

- 1.2-3.9 %

Recommended Range:

- **Low:** 0- 1.2%
- **Suboptimal Low:** 1.2-3.0%
- **Optimal:** 3.0-4.0%
- **High:** > 4.0%

Source(s):

https://testdirectory.questdiagnostics.com/test/test-guides/TS_OmegaCheck/omegacheck
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6261399/
https://www.semanticscholar.org/paper/2dc3138930c12826863fff987763f16739f6f244
https://www.semanticscholar.org/paper/15b0189cd20ac4b1d3105cd963cbbd14d99443e0
https://www.semanticscholar.org/paper/3952952a6ab04e2508cee538d82afcaf35eb09db

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Omega 3: DPA

Omega-3: DPA is a crucial biomarker for assessing cardiovascular, inflammatory, and overall metabolic health. DPA, a long-chain omega-3 fatty acid, plays a key role in reducing inflammation, supporting heart health, and aiding in cellular function. It serves as an intermediate between EPA and DHA, contributing to the body's ability to maintain optimal omega-3 levels. Monitoring DPA levels can help evaluate cardiovascular risk, inflammation status, and dietary omega-3 intake, guiding nutritional and therapeutic interventions to support long-term health.

Standard Range:

- 0.8-1.8 by %

Recommended Range:

- Male:
    - **Low:** 0-0.1 by %
    - **Optimal:** 0.1-1.5 by %
    - **High:** > 1.5 by %
    - **Female:**
    - **Low:** < 0.1 by %
    - **Optimal:** 0.1-0.5 by %
    - **High:** > 0.5 by %

Source(s):

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7922349/
https://www.semanticscholar.org/paper/695c58b9ddaaedf64ba5dc03f3ce4e6875ba9e7f
https://www.semanticscholar.org/paper/673f022aea1f7d04982c42251580a9de39925ed2

Omega 3: EPA

The Omega-3: EPA blood test measures the concentration of eicosapentaenoic acid (EPA), an essential omega-3 fatty acid that plays a critical role in reducing inflammation, supporting cardiovascular health, and maintaining cellular function. EPA is involved in the production of anti-inflammatory eicosanoids, which help regulate immune responses and protect against chronic diseases. It is primarily obtained through diet and supplementation. Monitoring EPA levels provides insight into inflammatory balance, cardiovascular risk, and overall metabolic health, helping to guide dietary and therapeutic interventions for optimal wellness.

Standard Range:

- 0.2-1.5%

Recommended Range:

- **Low:** 0-0.2%

- **Optimal:** 0.2-1.5%
- **High:** > 1.5%

Source(s):

https://healthmatters.io/understand-blood-test-results/epa
https://www.semanticscholar.org/paper/2dc3138930c12826863fff987763f16739f6f244
https://www.semanticscholar.org/paper/df911dc183a396c20b49f48043ae6f6228547028

Omega 3, Total (EPA + DPA + DHA)

The Omega-3 Total blood test measures the total concentration of omega-3 fatty acids in the blood, providing insight into cardiovascular, inflammatory, and overall metabolic health. Omega-3 fatty acids, including EPA, DHA, and DPA, play a crucial role in reducing inflammation, supporting heart and brain function, and maintaining cellular integrity. These essential fatty acids are primarily obtained through diet and supplementation. Monitoring total omega-3 levels helps assess nutritional status, evaluate cardiovascular risk, and guide dietary and therapeutic interventions to promote overall health and well-being.

Recommended Range:

- **Low:** 0-4.0%
- **Suboptimal low:** 4-8%
- **Optimal:** 8-12%
- **High:** > 12%

Source(s):

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10602979/
https://www.semanticscholar.org/paper/2dc3138930c12826863fff987763f16739f6f244
https://www.semanticscholar.org/paper/1d2afea5fb5a3fb9d691b51a70026cc45e61c5c3
https://www.semanticscholar.org/paper/3952952a6ab04e2508cee538d82afcaf35eb09db

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Omega 6: Arachidonic Acid

The Omega-6: Arachidonic Acid (AA) blood test measures the concentration of arachidonic acid, an essential omega-6 fatty acid involved in inflammation, cellular signaling, and immune function. AA plays a crucial role in producing eicosanoids, which regulate inflammatory and immune responses, blood clotting, and vascular function. While necessary for health, excessive AA levels relative to omega-3 fatty acids may contribute to chronic inflammation and increased cardiovascular risk. Monitoring AA levels helps assess inflammatory balance, guide dietary and lifestyle interventions, and support overall metabolic and cardiovascular health.

Standard Range:

- 5.2-12.9%

Recommended Range:

- **Low:** 0-5.2%
- **Optimal:** 5.2-12.9%
- **High:** > 12.9%

Source(s):

https://healthmatters.io/understand-blood-test-results/arachidonic-acid
https://www.semanticscholar.org/paper/9136ee1c6d2abd4dbdfda839f62d78905799ce73
https://www.semanticscholar.org/paper/9136ee1c6d2abd4dbdfda839f62d78905799ce73

Omega 6: Linoleic Acid (LA)

The Omega-6: Linoleic Acid (LA) biomarker measures the level of linoleic acid, an essential polyunsaturated fatty acid, in the blood. Linoleic acid is a key component of cell membranes and plays a vital role in inflammation, cardiovascular health, and overall cellular function. It is obtained through dietary sources such as vegetable oils, nuts, and seeds. Once consumed, linoleic acid can be metabolized into other bioactive compounds that influence immune function and inflammatory responses. Maintaining an optimal balance of omega-6 to omega-3 fatty acids is important for overall health.

Standard Range:

- 18.6-29.5%

Recommended Range:

- **Low:** 0-18.6%
- **Optimal:** 18.6 - 29.5%
- **High:** >29.5%

Source(s):

https://healthmatters.io/understand-blood-test-results/linoleic-acid
https://lipidworld.biomedcentral.com/articles/10.1186/s12944-024-02246-2#:~:text=Intake%20of%20LA,-In%20North%20America&text=The%20Acceptable%20Macronutrient%20Distribution%20Range,22%20g/d%20of%20LA.

Omega 6/Omega 3 Ratio

The ratio of Omega-6 to Omega-3 fatty acids is crucial for maintaining overall health. An imbalanced ratio, skewed heavily towards Omega-6, can lead to chronic inflammation and a host of related health issues such as cardiovascular diseases, mental health problems, and chronic diseases like obesity, diabetes, and certain types of cancer. Historically, human diets had a balanced ratio, but modern diets have dramatically shifted this balance, increasing the risk of these health issues.

Standard Range:

- 5.7-21.3

Recommended Range:

- **Optimal:** 1:1 - 4:1
- **Suboptimal High:** 4:1-21.3:1
- **High:** > 21.3:1

Source(s):

https://testdirectory.questdiagnostics.com/test/test-guides/TS_OmegaCheck/omegacheck
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8504498/
https://pubmed.ncbi.nlm.nih.gov/12442909/
https://www.semanticscholar.org/paper/1b197a141ef224ad3c60db23f926312385d67589
https://www.semanticscholar.org/paper/0ad7ccf2675d4218799c22748956753b3e32800e
https://www.semanticscholar.org/paper/eb5571ab7859585666442e001c62480187a8c2f4

Total Iron Binding Capacity (TIBC)

Total Iron Binding Capacity (TIBC) is crucial for diagnosing and managing conditions related to iron metabolism, such as anemia, hemochromatosis, and other iron-related disorders. It helps in assessing iron status, monitoring treatment efficacy, evaluating nutritional status, and understanding liver function.

Standard Range:

- Male:
    - 250-425 mcg/dL
- Female >20 Years:
    - 250-450 mcg/dL

Recommended Range:

- **Low:** 0- 240 mcg/dL
- **Optimal:** 240-450 mcg/dL
- **High:** > 450 mcg/dL

Source(s):

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5635795/
https://pubmed.ncbi.nlm.nih.gov/21450624/
https://pubmed.ncbi.nlm.nih.gov/28043306/
https://www.semanticscholar.org/paper/86a8e6ee01f2464013176beb0064f18b038cc111
https://www.semanticscholar.org/paper/4deb6047876941cdb98d349cf8369ac4e95df872

Vitamin B12 (Cobalamin)

Vitamin B12 is essential for red blood cell formation, DNA synthesis, neurological function, energy production, and heart health. Deficiency can lead to anemia, neurological issues, cognitive impairments, and increased risk of heart disease. Awareness and adequate intake are crucial for preventing health issues, especially for vegetarians, vegans, older adults, and individuals with certain medical conditions.

Standard Range:

- 200-1100 pg/mL

Recommended Range:

- **Low:** 0-200 pg/mL
- **Suboptimal low:** 200-300 pg/mL
- **Optimal:** 300-900 pg/mL
- **Suboptimal high:** 900-1100 pg/mL
- **High:** > 1100 pg/mL

Source(s):

https://austinpublishinggroup.com/nutrition-metabolism/fulltext/ajnm-v2-id1020.php#:~:text=The%20vitamin%20B12%20standard%20reference,weakness%20and%20depression%20%5B10%5D.
https://www.ncbi.nlm.nih.gov/books/NBK441923/
https://www.semanticscholar.org/paper/922696559d352bc1adf6b02aaa043bc0cbb582cf
https://www.semanticscholar.org/paper/0fddc24bec386cdb2f921cb7548d3aaca0fa05c6
https://www.semanticscholar.org/paper/56aa187bc4184ebfa0d9c92fe9bf066d67b890a0
https://www.semanticscholar.org/paper/99ac8882ea9ca1814bc4ed018eeea3d25fda97dc

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Vitamin B6

Vitamin B6 is essential for amino acid metabolism, neurotransmitter synthesis, hemoglobin production, immune function, and hormone regulation. Deficiency can lead to neurological issues, anemia, weakened immune system, and dermatological problems.

Standard Range:

- 2.1-21.7 ng/mL

Recommended Range:

- **Low:** 0- 2.1 ng/mL
- **Optimal:** 2.1-21.7 ng/mL
- **High:** > 21.7 ng/mL

Source(s):

https://testdirectory.questdiagnostics.com/test/test-detail/926/vitamin-b6-plasma?p=r&q=Vitamin%20B6,%20Plasma&cc=MASTER
https://journals.lww.com/md-journal/fulltext/2021/10080/vitamin_b6_as_a_novel_risk_biomarker_of_fractured.35.aspx#:~:text=The%20expression%20of%20vitamin%20B6%20has%20a%20clear%20correlation%20with,MTRR%20of%20patients%20with%20osteoporosis.
https://www.ncbi.nlm.nih.gov/books/NBK470579/
https://www.semanticscholar.org/paper/e30c75e76fd4788fd09755aa1ea04f5af12a684f
https://www.semanticscholar.org/paper/020435d8c8cc1db03047a7e889839f18baa4e140
https://www.semanticscholar.org/paper/126ff9a638c67a0bd2568c3fa5f29ad247c6a246

Vitamin D 25-OH Total

Vitamin D 25-OH Total is crucial for diagnosing and managing various health conditions related to bone health, immune function, and overall wellness. It acts as a key marker of vitamin D status, helps assess the risk of deficiency or insufficiency, and is critical in diagnosing conditions like osteoporosis and rickets. Additionally, it plays a role in immune system regulation and can indicate the presence of inflammatory or autoimmune diseases. Vitamin D levels are monitored in chronic diseases to assess bone health, guide treatment for deficiencies, and optimize overall health.

Standard Range:

- 30-100 ng/mL

Recommended Range:

- **Low:** 0- 20 ng/mL
- **Suboptimal low:** 20-30 ng/mL
- **Optimal:** 30-50 ng/mL
- **Suboptimal high:** 50-100 ng/mL
- **High:** 100 ng/mL

Source(s):

https://www.health.harvard.edu/blog/vitamin-d-whats-right-level-2016121910893
https://www.aafp.org/pubs/afp/issues/2009/1015/p841.html
https://www.semanticscholar.org/paper/288bdc67929b365bc486000f5ce5c37c1f5e64a1
https://www.semanticscholar.org/paper/dda5442c213dd45ea901eda70755f1215d90d980
https://www.semanticscholar.org/paper/e114fda8172aa1bbd7a65d5eb8e09001c05a7b42
https://www.semanticscholar.org/paper/cfd369c6355d3c7a201862dc58246d979e2f8117
https://www.semanticscholar.org/paper/d3da05d40feb9633837b4da8203a5e32590c8076
https://www.semanticscholar.org/paper/bed66955ab2b77555c3851057e2de3a65c7e74c1
https://www.semanticscholar.org/paper/0882e894abc2075e495552afd0af35ca6fa76f07

Vitamin D, 25-OH, D2 (QuestAssure D)

(as a reflection of total Vitamin D) Includes Vitamin D, 25-OH, Total Vitamin D, 25-OH, D3 Vitamin D, 25-OH, D2

This is measured as Total Vitamin D

The Vitamin D, 25-OH, D2 (QuestAssure D) test measures the total level of vitamin D in the blood, including both vitamin D2 and vitamin D3. Vitamin D is a crucial nutrient that supports calcium absorption, bone strength, immune function, and overall health. It plays an essential role in maintaining healthy bones and muscles, regulating cell growth, and reducing inflammation. Sufficient vitamin D levels are important for preventing deficiencies that can lead to bone disorders such as osteoporosis and rickets. This test helps assess vitamin D status and guide appropriate supplementation or treatment.

Recommended Range:

- **Low:** <20 ng/mL
- **Suboptimal Low:** 20-35 ng/mL
- **Optimal:** 35-50 ng/mL
- **Suboptimal High:** 50-100 ng/mL
- **High:** >100 ng/mL

Source(s):

https://www.semanticscholar.org/paper/Vitamin-D-Deficiency%2C-Metabolism-and-Routine-of-its-Afrozul-Chareles/b1126db694cfc609681235961a5e62a48cc5c202
https://pubmed.ncbi.nlm.nih.gov/20556359/
https://www.semanticscholar.org/paper/651d7fa885551a9866e4a38ff1c1cf7885bfe23d
https://www.semanticscholar.org/paper/82e922cfcba895f364d870bafeab015ccddb5c19
https://www.semanticscholar.org/paper/651d7fa885551a9866e4a38ff1c1cf7885bfe23d

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Zinc

The zinc blood test measures the level of zinc in the blood. Zinc is an essential trace element that plays a crucial role in numerous physiological functions, including immune response, DNA synthesis, cell division, wound healing, and protein synthesis. It is also important for proper growth and development during pregnancy, childhood, and adolescence.

Standard Range:

- 60-130 mcg/dL

Recommended Range:

- **Low:** 0-60 mcg/dL
- **Suboptimal low:** 60-70 mcg/dL
- **Optimal:** 70-120 mcg/dL
- **Suboptimal high:** 120-130 mcg/dL
- **High:** > 130 mcg/dL

Source(s):

https://www.elsevier.es/en-revista-annals-hepatology-16-articulo-zinc-supplementation-its-benefits-in-S1665268121002489#:~:text=%E2%80%A2%20Fasting%20Serum%20zinc%20levels%20every%203,every%203%20months%20(aim%20%3E%20120%20ug/dl)
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7689236/
https://www.semanticscholar.org/paper/ca27515a9ccf02763749089d2d3618879df20e57
https://www.semanticscholar.org/paper/406996e908055f9d8ae6bd8e6a4e4ab945c81239
https://www.semanticscholar.org/paper/88c3c25e0cffc172cfef6700ebd9831f1e02b9e7