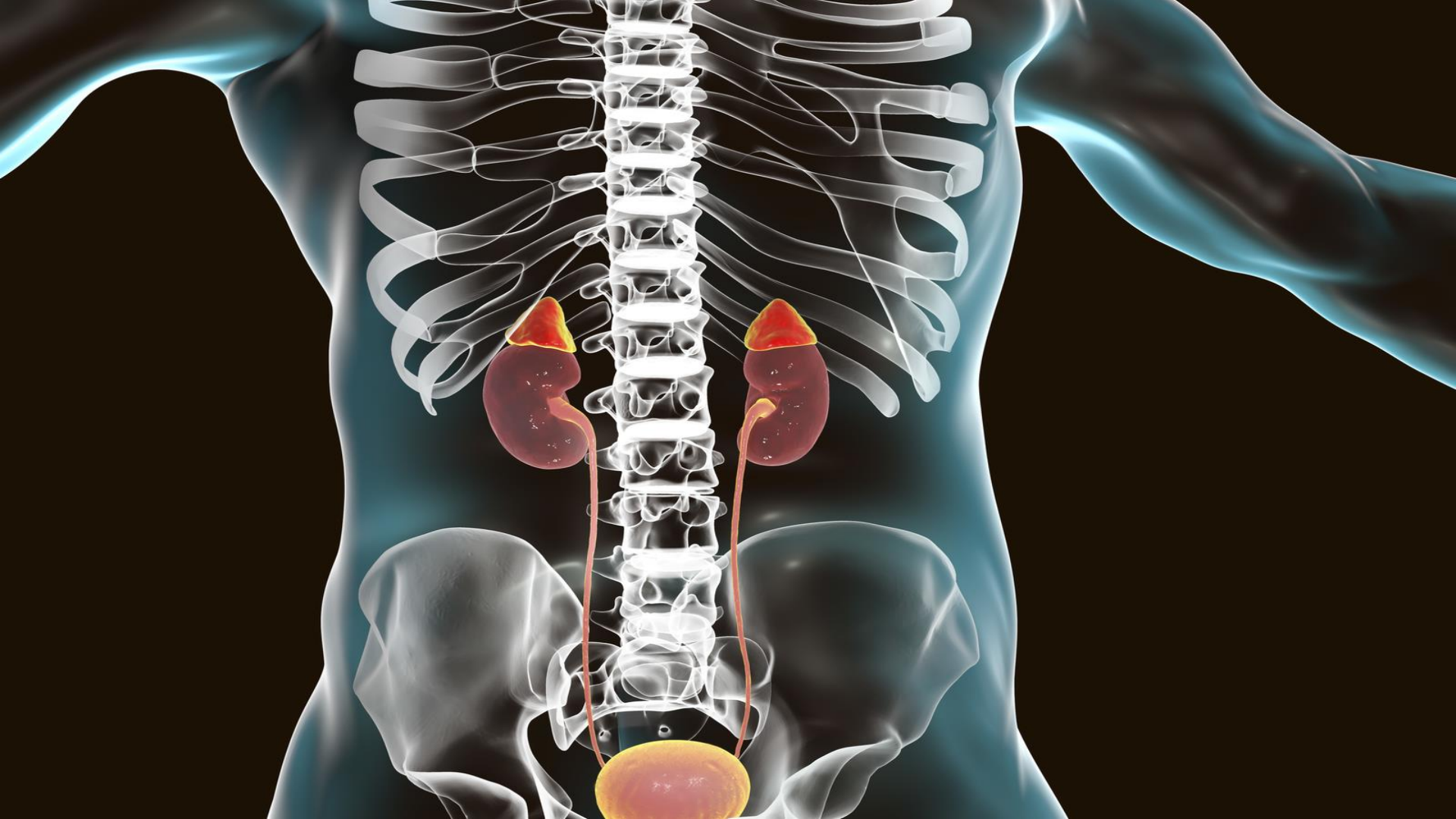
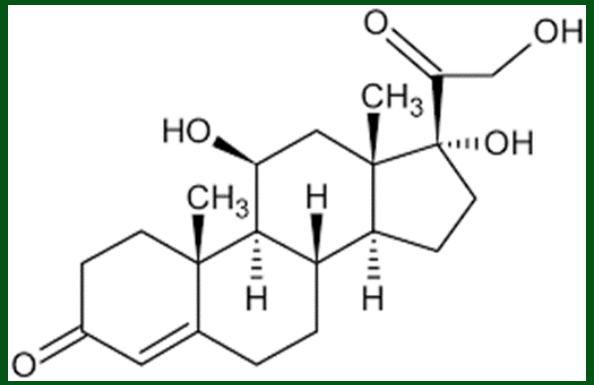


Interferences in Adrenal disorder Laboratory Tests 2023



Dr. Mehdi Hedayati

July 2023

Misinformation

- Misinformation is more dangerous than lack of information.
- This is because incorrect information can lead to harmful decisions and actions, while a lack of information may simply result in a missed opportunity.
- In some situations, a lack of information can be just as dangerous as incorrect information. For example, in medical emergencies, a lack of information on the patient's medical history can result in incorrect treatments or even death.
- In general, it is important to strive for accurate and complete information, but in situations where this is not possible, it is better to err on the side of caution and seek out multiple sources of information.

Law of Inversion

- Charles Munger is one of the most famous investors and investment managers in the world. He was born in 1924, in Iowa, USA. Munger graduated from the University of California in 1944 and then began his career as a lawyer. Throughout his professional career, he has become one of the best investors in the world.

- Munger has also been a board member of Berkshire Hathaway, Wesco Financial Corporation, Walt Disney Company, and dozens of other companies. He has also served as a director at Wells Fargo Bank, Delta Airlines, and Coca-Cola Company.

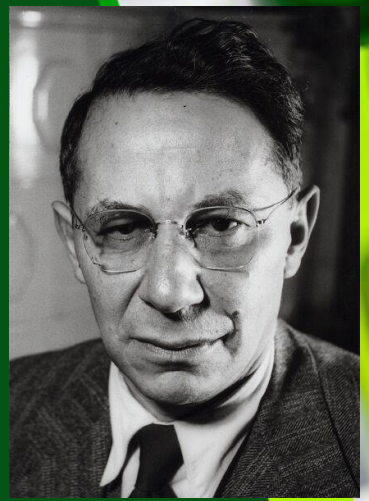
- Munger is also known as a philanthropist. He and his wife, Susan Buffet, are actively involved in charitable activities and donate their wealth to various educational, health, and other causes.

History of Adrenal gland

- All vertebrates have adrenal glands.
- The discovery of the cortical part of the adrenal gland was made in 1855 by Swiss physician Kocher and Australian physician Zeussler.
- One year later, French physiologist Claude Bernard introduced the central part of this gland.
- Hormones produced by these two parts play a role in managing stress, regulating the immune system, controlling metabolism, regulating blood pressure, and maintaining water and electrolyte balance.

History of Cortisol discovery & assay

- In 1933, a team of researchers led by Edward Kendall at the Mayo Clinic in the United States isolated a compound from the adrenal gland that they called "Compound F." They later discovered that Compound F was in fact cortisol, and published their findings in 1936.
- In 1950, Swiss chemist Théo Reichstein used chromatography to measure cortisol levels in urine samples. This was the first time that cortisol had been quantified using a chemical method.
- In the 1960s, the radioimmunoassay (RIA) method was developed for measuring cortisol levels.
- Since then, various other methods have been developed for measuring cortisol levels, including enzyme-linked immunosorbent assay (ELISA) and the best, liquid chromatography-tandem mass spectrometry (LC-MS/MS).



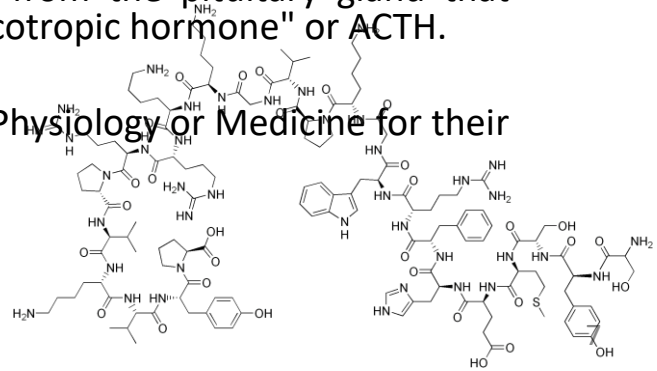
History of ACTH discovery

- The discovery of ACTH began in the early 1900s with the work of British physiologist Ernest Starling, who proposed the existence of a hormone that controlled the secretion of adrenal cortical hormones.

- In 1926, the American physiologist Philip Hench and his colleagues at the Mayo Clinic in Minnesota observed that extracts of the pituitary gland could stimulate the adrenal glands in animals, leading to the production of corticosteroids.

- In 1933, Swiss biochemist Maurice Rapport isolated a substance from the pituitary gland that stimulates the adrenal glands. He called this substance "adrenocorticotropic hormone" or ACTH.

- In 1950, Hench and his colleagues were awarded the Nobel Prize in Physiology or Medicine for their work on the discovery and clinical application of ACTH and cortisone



A list of laboratory tests that are commonly used to assess adrenal disorders:

1. **Cortisol level test**: This test measures the level of cortisol in the blood, urine or saliva. It can diagnose conditions such as Cushing's syndrome, Addison's disease, and adrenal insufficiency.
2. **Adrenocorticotropic hormone (ACTH) level test**: This test measures the level of ACTH in the blood. It is used to diagnose conditions such as Cushing's syndrome and Addison's disease.
3. **Aldosterone level test**: This test measures the level of aldosterone in the blood and is used to diagnose conditions such as hyperaldosteronism.
4. **Plasma renin activity (PRA) test**: This test measures the level of renin in the blood and is used to diagnose conditions such as hyperaldosteronism and adrenal insufficiency.
5. **Dehydroepiandrosterone (DHEA) level test**: This test measures the level of DHEA in the blood and is used to diagnose conditions such as adrenal insufficiency and congenital adrenal hyperplasia.

A list of laboratory tests that are commonly used to assess adrenal disorders:

6. **17-hydroxyprogesterone (17-OHP) level test**: This test measures the level of 17-OHP in the blood and is used to diagnose congenital adrenal hyperplasia.
7. **Plasma metanephrine and normetanephrine test:** This test measures the level of metanephrine andnormetanephrine in the blood and is used to diagnose conditions such as pheochromocytoma.
8. **Dexamethasone suppression test**: This test measures how the body responds to the steroid hormone dexamethasone. It is used to diagnose conditions such as Cushing's syndrome.
9. **ACTH stimulation test**: This test measures how the adrenal glands respond to ACTH. It is used to diagnose conditions such as adrenal insufficiency.
10. **Insulin tolerance test:** This test measures how the body responds to low blood sugar levels. It is used to diagnose conditions such as adrenal insufficiency.

Logic of Interference handling

1. The most closely related clinical branch to paraclinical is Endocrinology.
2. Adrenal function tests are essential for the diagnosis and management of adrenal disorders (cortex and medulla).
3. The accuracy and validity of these tests can be compromised by various internal and external factors.
4. Identification and control of these factors are possible through intervention.
5. Reduction or elimination of interfering factors can lead to cost reduction, time savings, and increased accuracy in the diagnosis and management of the disease.

Case (1)

In a 69-year-old woman who had an accident, a mass with dimensions of 23 × 16 millimeters was incidentally observed in the right adrenal gland during an abdominal CT scan. Laboratory investigation results were as follows:

- ACTH (242pg/ml; *N*: 5–46)
- Serum cortisol (16.1µg/dl; *N*: 3.7–19.4),
- Salivary cortisol (0.1µg/dl; *N*<0.28)],
- UFC (40µg/24h; *N*: <140)
- Aldosterone 4.4ng/dl (*N*: 3–35.5),
- PRA (1.78ng/ml/h *N*: 0.3–7.0)]
- 24-h urinary Metanephrines (168mcg/24h *N*: 50–825)

Follow up

- Repeat ACTH test (311 ng/L),
- Dexamethasone suppression test (1.4 µg/dL)
- ACTH stimulation test (12.8, 21.3, and 23.3 µg/dL at 0, 30, and 60 min)
- Adrenal antibody (negative)
- MRI of the pituitary gland (normal)
- 99mTc scintigraphy (normal)
- Using HBT test tube (ACTH level still 142 pg/mL).

Discovery of the cause

- In order to determine the likelihood of other antibody interference, the measurement of the three main immunoglobulin classes (IgG, IgA, and IgM) was performed by serum protein electrophoresis and the results were normal.
- However, the measurement of rheumatoid factor (RF) in the patient's serum was significantly high (RF 129 IU/ml; N<40), indicating the possibility of antibody interference with these immunoglobulin's.

Decision: Repeat the test using another method

- Repeat the ACTH test using a different method and instruments.

  Siemens Immulite 552 pg/mL and Diasorin LIAISON 4.4 pg/mL

  Siemens Immulite 302 pg/mL and Diasorin LIAISON 5.2 pg/mL.

Case (2)

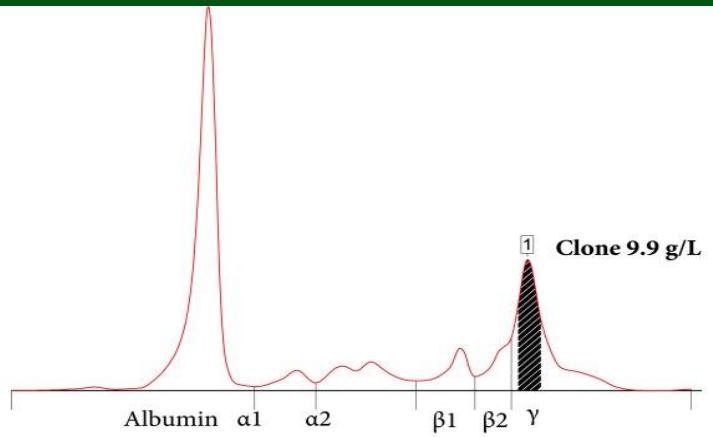
A 62-year-old woman was referred to the endocrine department for investigation of a significant increase in estradiol, progesterone, testosterone, and cortisol hormones.

- controlled type 2 diabetes and blood pressure.
- Have no liver disease or autoimmune disease.
- Menopause date at the age of 50.
- Not use any type of hormone replacement therapy or dietary supplements.
- She started menstruation at the age of 12, and her first pregnancy experience was at the age of 30.
- Except for recent mood changes, she is almost asymptomatic.
- Physical examination showed no significant findings.
- She has a general moderate obesity, but no clinical signs of hyperandrogenism or Cushing's syndrome.

Laboratory data

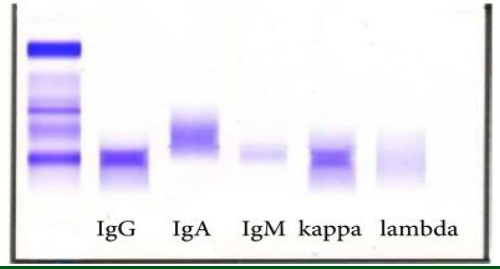
Estradiol, pmol/L	Serum	3073	18–201	Immunoassay, Roche Cobas 602
Progesterone, nmol/L	Serum	30 /L	0–5	Immunoassay, Roche Cobas 602
Total testosterone, nmol/L	Serum	4.1	0.1–1.4	Immunoassay, Roche Cobas 602
Bioavailable testosterone, nmol/L No HAMA, NO RF	Serum	1.75	0–0.43	Calculated using SHBG, total testosterone, and albumin; done with Roche Cobas 602 and 702
Cortisol, nmol/L	Serum	1250 at 10 AM 1433 at 3 PM	100–450 50–300	Immunoassay, Roche Cobas 602
DHEA-S, µmol/L	Serum	10.3	0.26–6.68	Immunoassay, Roche Cobas 602
17-OH-progesterone, nmol/L	Serum	2.5	0.6–5.2	Immunoassay, Roche Cobas 602
SHBG, nmol/L	Serum	34	20–130	Immunoassay, Roche Cobas 602
LH, U/L	Serum	16	8–59	Immunoassay, Roche Cobas 602
FSH, U/L	Serum	27	67–135	Immunoassay, Roche Cobas 602

Discovery of the cause



	%	reference range %	g/L	reference range g/L
Albumin	50,5	56.4 - 65.4	35,86	35.0- 51.8
Alpha 1	3,6	3.0 - 5.0	2,56	1.9- 4.0
Alpha 2	9,7	7.0 - 11.7	6,89	4.3- 9.3
Beta 1	6,4	5.1- 7.2	4,54	3.2- 5.7
Beta 2	5,9	3.0- 6.5	4,19	1.9- 5.1
Gamma	**23,9**	**9.0 - 19.2**	**16,97**	**5.6- 15.2**

Immunofixation: IgG kappa gammopahty



IgG :	17.7 g/L	(7-16)
IgA :	2.4 g/L	(0.7-4.0)
IgM :	0.3 g/L	(0.4-2.3)
Kappa :	**31.7 g/L**	**(3.3-19.4)**
Lambda :	17.3 g/L	(5.71-26.3)

Interfering factors in adrenal laboratory tests

1. Internal interfering factors (related only to the nature of the sample taken) such as heterophilic antibodies.
2. External interfering factors (not related to the nature of the sample and imposed from the outside) such as the time of sample collection or the temperature of sample storage.
3. Mixed factors may also be considered.

   Common interfering factors such as hemolysis.

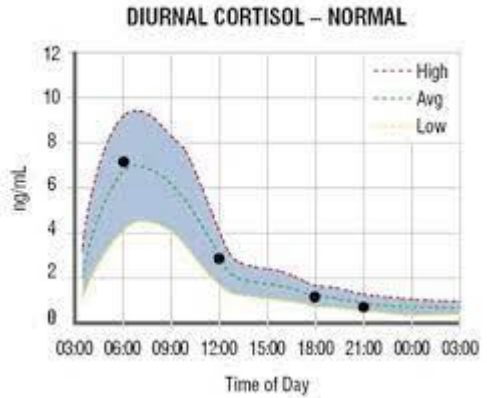
   Specific interfering factors such as some drugs.

1. Some potential interferences that can affect cortisol laboratory assays:

1. **Hemolysis**: Hemolysis, or the breakdown of red blood cells, can release hemoglobin into the sample and interfere with the cortisol assay.
2. **Lipemia**: High levels of lipids in the sample can interfere with the accuracy of the cortisol assay.
3. **Hyperbilirubinemia**: High levels of bilirubin in the sample can interfere with the cortisol assay.
4. **Medications**: Certain medications, such as glucocorticoids, can interfere with cortisol laboratory assays. Some other medications that can interfere with cortisol assays include phenytoin (anticonvulsant used to control seizures: falsely low cortisol levels), phenobarbital (seizures and anxiety: falsely high cortisol levels), and rifampin (antibiotic used to treat tuberculosis and other bacterial infections: falsely low cortisol levels). Estrogens: Estrogens, such as those used in oral contraceptives, can interfere with cortisol assays and result in falsely low cortisol levels.

1. Some potential interferences that can affect cortisol laboratory assays:

5. **Stress**: Stressful events can increase cortisol levels in the body, which can lead to inaccurate cortisol assay results.
6. **Diurnal variation**: Cortisol levels naturally fluctuate throughout the day, with the highest levels typically occurring in the morning and the lowest levels in the evening. Failure to collect samples at the appropriate time can lead to inaccurate results.
7. **Specimen type**: The type of specimen used for the cortisol assay can affect the accuracy of the results. For example, saliva cortisol assays may be affected by oral contamination or inadequate sample collection.



1. Some potential interferences that can affect cortisol laboratory assays:

8. **Heterophile antibodies** are another potential interference that can affect cortisol laboratory assays. Heterophile antibodies are antibodies that can cross-react with multiple antigens, including the antigens used in cortisol laboratory assays.
9. **Biotin interference** occurs because some cortisol laboratory assays use biotin-streptavidin technology. In this technology, biotin is used to label cortisol or cortisol-binding protein, and streptavidin is used to detect the biotin-labeled cortisol or cortisol-binding protein. When high levels of biotin are present in the sample, it can compete with the biotin-labeled cortisol or cortisol-binding protein for binding to streptavidin, leading to inaccurate results. To minimize biotin interference, it is recommended that patients avoid taking biotin supplements for at least 24 hours before cortisol laboratory testing. It is important to note that biotin interference may vary depending on the specific cortisol assay used and the biotin dose and timing of supplementation (Biotin. Avid binding constant 10^15 against average Ag.Ab Binding constant 10^7).

Interference caused by sample hemolysis

1. Hemolytic interference in immunassays can affect the accuracy and reliability of test results.
2. Hemolysis refers to the breakdown of red blood cells, which can release intracellular molecules such as hemoglobin into the serum or plasma, resulting in the presence of free hemoglobin in the sample (RBC: Hb 12-17.5 g/dL).
3. The presence of free hemoglobin can bind to antibodies or antigens in the immunoassay, affecting the detection and measurement of the target analyte, which can interfere with the detection and measurement of the target analyte. This can result in often higher or lower test results.
4. To overcome hemolytic interference, various solutions can be used, such as pretreatment of the sample to remove free hemoglobin or the use of hemoglobin-cleansing agents. Additionally, it is important to carefully control the samples and avoid excessive hemolysis during sample collection.

Interference caused by lipemic sample

1. Lipemic interference in immunassays can affect the accuracy and reliability of test results.
2. In samples with high levels of fat, fats can react with hydrophobic antibodies and antigens in immunassays and form undesirable complexes that can interfere with test performance. This can lead to false high or low test results depending on the type of immunoassay.
3. The mechanism of lipemic interference involves the interaction of fats with the components of the immunoassay. Fats can form complexes with the antibodies or antigens used in the immunoassay, which can interfere with the detection and measurement of the target analyte.
4. Various solutions can be used to overcome lipemic interference, such as pretreatment of the sample to remove fats (Cold, centrifugation, adsorb column) or the use of lipids-cleansing agents.

Interference caused by icteric sample

1. Increased bilirubin in the blood is a clinical condition that occurs when this yellow pigment in the blood becomes more than usual.
2. Increased bilirubin can bind to the antibodies/antigens used in immunassays and affect the detection and measurement of the target analyte, which can interfere with the detection and measurement of the target analyte. This can result in often higher or lower test results.
3. A high concentration, such as a detergent, can cause disruption of the antigen-antibody bond.
4. Various solutions can be used to overcome hyperbilirubinemic interference, such as pretreatment of the sample to remove excess bilirubin or the use of bilirubin-cleansing agents. Another solution is to modify the immunoassay protocol to reduce hyperbilirubinemic interference, such as using different buffers or optimizing assay conditions.

2. A list of interferences of ACTH (adrenocorticotropic hormone) Test

1. **Hemolysis**: Hemolysis, or the breakdown of red blood cells, can release hemoglobin into the sample and interfere with ACTH assay results.

2. **Lipemia**: High levels of lipids in the sample can interfere with the accuracy of the ACTH assay.

3. **Hyperbilirubinemia**: High levels of bilirubin in the sample can interfere with the ACTH assay.

4. **Medications**: Some medications, such as glucocorticoids, can interfere with ACTH laboratory assays. Other medications that can interfere with ACTH assays include dopamine, levodopa, and metoclopramide.

2. A list of interferences of ACTH (adrenocorticotropic hormone) Test

5. **Heterophile antibodies**: Heterophile antibodies are antibodies that can cross-react with multiple antigens, including the antigens used in ACTH laboratory assays. When heterophile antibodies are present in a patient's sample, they can bind to the antigens used in the ACTH assay and interfere with the accuracy of the results.

6. **Biotin supplement**: High doses of biotin supplements can lead to falsely high or falsely low ACTH levels, depending on the specific assay used. Biotin interference occurs because some ACTH laboratory assays use biotin-streptavidin technology.

7. **Inappropriate storage and transfer temperature**: ACTH samples should be stored and transported according to the manufacturer's instructions. Inappropriate storage and transfer temperatures can lead to degradation of the sample and inaccurate results (Chilled test tube, Refrigerated centrifugation, Antiprotease (aprotinin or EDTA)).

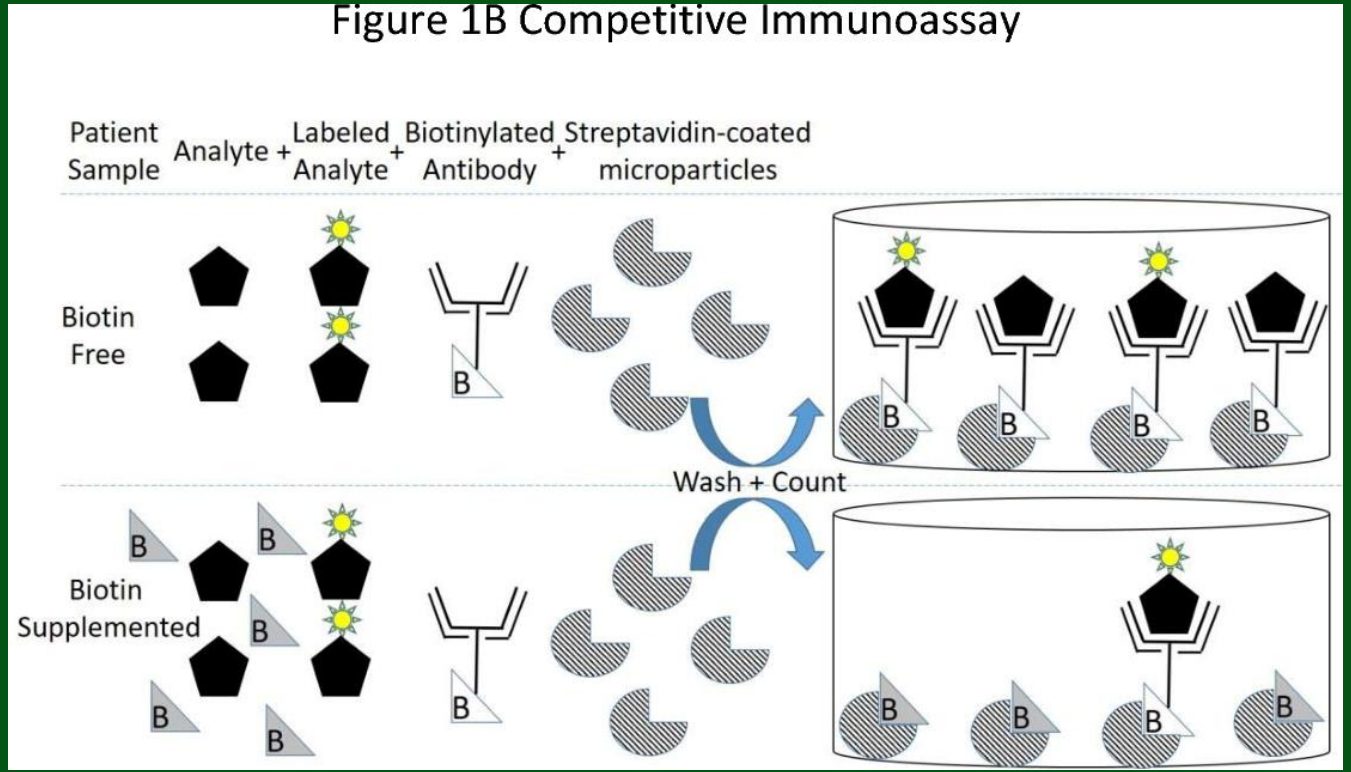
2. A list of interferences of ACTH (adrenocorticotropic hormone) Test

8. **Stress:** Stressful events can increase ACTH levels in the body, which can lead to inaccurate ACTH assay results.

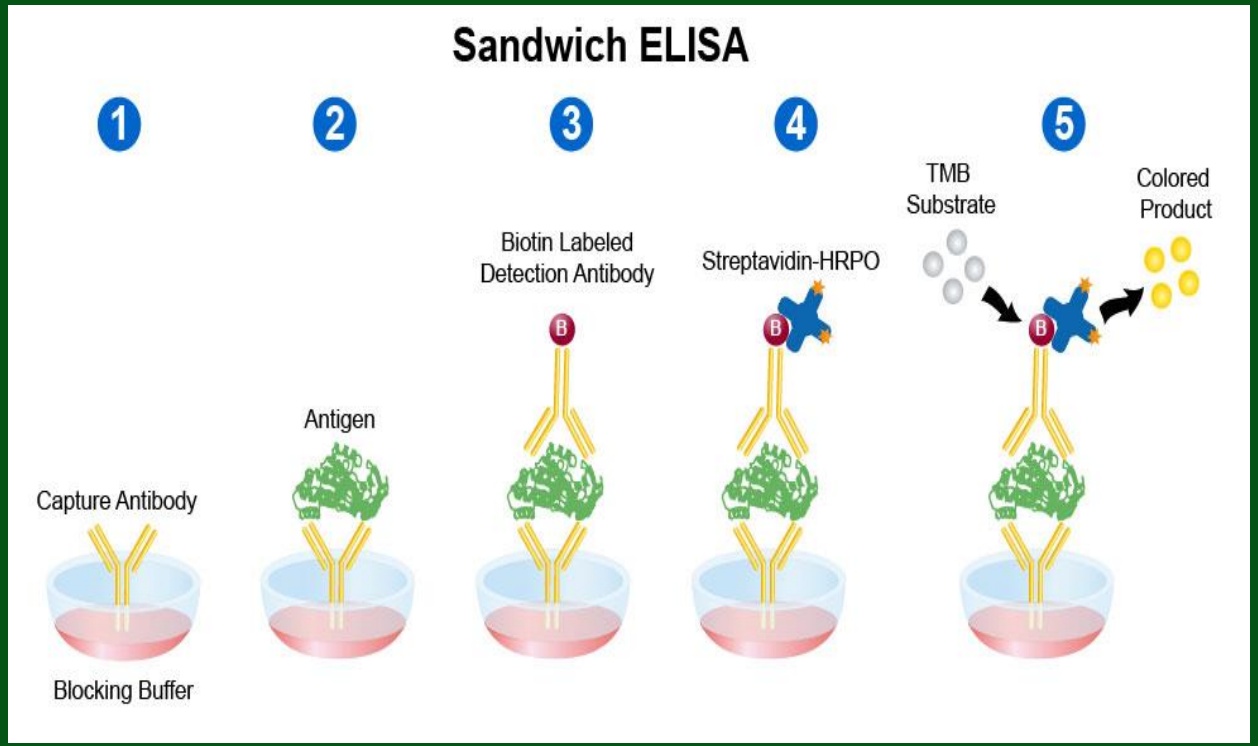
9. **Diurnal variation**: ACTH levels naturally fluctuate throughout the day, with the highest levels typically occurring in the morning and the lowest levels in the evening. Failure to collect samples at the appropriate time can lead to inaccurate results.

10. **Interference from other hormones**: Some hormones, such as vasopressin and somatostatin, can interfere with ACTH laboratory assays.

Biotin Interference in Cortisol assay



Biotin Interference in ACTH assay



3. A list of interferences that can affect aldosterone laboratory assays:

1. **Hemolysis**: Hemolysis, or the breakdown of red blood cells, can release hemoglobin into the sample and interfere with the accuracy of the aldosterone assay.
2. **Lipemia**: High levels of lipids in the sample can interfere with the accuracy of the aldosterone assay.
3. **Hyperbilirubinemia**: High levels of bilirubin in the sample can interfere with the aldosterone assay.
4. **Medications**: Some medications, such as diuretics, angiotensin-converting enzyme inhibitors (ACEIs), angiotensin receptor blockers (ARBs), and beta-blockers, can interfere with aldosterone laboratory assays.
5. **Heterophile antibodies**: Heterophile antibodies are antibodies that can cross-react with multiple antigens, including the antigens used in aldosterone laboratory assays. When Heterophile antibodies are present in a patient's sample, they can bind to the antigens used in the aldosterone assay and interfere with the accuracy of the results.

3. A list of interferences that can affect aldosterone laboratory assays:

6. Biotin supplement: High doses of biotin supplements can lead to falsely high or falsely low aldosterone levels, depending on the specific assay used. Biotin interference occurs because some aldosterone laboratory assays use biotin-streptavidin technology.

7. Inappropriate sample collection: Aldosterone levels can be affected by factors such as posture (upright), physical activity, and dietary salt intake. Failure to follow appropriate sample collection protocols can lead to inaccurate results.

8. Inappropriate sample storage and transport: Aldosterone samples should be stored and transported according to the manufacturer's instructions. Inappropriate storage and transfer temperatures can lead to degradation of the sample and inaccurate results.

3. A list of interferences that can affect aldosterone laboratory assays:

9. Methodological interferences: Some aldosterone laboratory assays may be subject to methodological interferences, such as variability in antibody specificity or cross-reactivity with other steroids.

10. Interference from other hormones: Some hormones, such as cortisol, can interfere with aldosterone laboratory assays.

4. A list of interferences of the Plasma Renin Activity (PRA) test:

1. Sample type: PRA testing requires a plasma sample, not a serum sample. Using the wrong sample type can lead to inaccurate results.

2. Sample collection: Improper collection of the sample, such as using the wrong anticoagulant or failing to adequately mix the sample after collection, can lead to inaccurate results (Recom: Lithium heparin).

3. Sampling time: The timing of the sample collection is critical because renin levels can fluctuate throughout the day. PRA levels are generally higher in the morning and lower in the evening. Failure to collect the sample at the appropriate time can lead to inaccurate results.

4. A list of interferences of the Plasma Renin Activity (PRA) test:

4. Medications: Certain medications can interfere with the accuracy of the PRA test. These include antihypertensive medications such as ACE inhibitors, ARBs, beta-blockers, and diuretics. Oral contraceptives, corticosteroids, and NSAIDs can also interfere with the results.

5. Heterophile antibodies: Heterophile antibodies are antibodies that can cross-react with multiple antigens, including the antigens used in PRA laboratory assays. When Heterophile antibodies are present in a patient's sample, they can bind to the antigens used in the PRA assay and interfere with the accuracy of the results.

6. Biotin supplement: High doses of biotin supplements can lead to falsely high or falsely low PRA levels, depending on the specific assay used. Biotin interference occurs because some PRA laboratory assays use biotin-streptavidin technology.

4. A list of interferences of the Plasma Renin Activity (PRA) test:

7. Inappropriate sample storage and transport: PRA samples should be stored and transported according to the manufacturer's instructions. Inappropriate storage and transfer temperatures can lead to degradation of the sample and inaccurate results.

8. Methodological interferences: Some PRA laboratory assays may be subject to methodological interferences, such as variability in antibody specificity or cross-reactivity with other proteins.

9. Dietary factors: Sodium intake and posture can affect PRA levels. High sodium intake can suppress PRA levels, while standing can increase PRA levels.

10. Renin-secreting tumors: Rarely, tumors that secrete renin can cause falsely elevated PRA levels.

•. 1990 Nov;16(6):862-70.
•. 1990 Nov;16(6):862-70.

5. A list of interferences of the Dehydroepiandrosterone (DHEA) level test:

1. **Sample type**: DHEA testing requires a serum sample. There may be differences in DHEA concentrations between serum and plasma samples, as the process of clotting can affect the levels of some hormones, including DHEA (J Am Coll Cardiol . 1990 Nov;16(6):862-70).
2. **Sample collection**: Improper collection of the sample, such as using the wrong anticoagulant or failing to adequately mix the sample after collection, can lead to inaccurate results.
3. **Sampling time**: The timing of the sample collection is critical because DHEA levels can fluctuate throughout the day. DHEA levels are generally higher in the morning and lower in the evening. Failure to collect the sample at the appropriate time can lead to inaccurate results.
4. **Medications**: Certain medications can interfere with the accuracy of the DHEA test. These include hormonal contraceptives, glucocorticoids, and androgenic steroids.

5. A list of interferences of the Dehydroepiandrosterone (DHEA) level test:

5. Heterophile antibodies: Heterophile antibodies are antibodies that can cross-react with multiple antigens, including the antigens used in DHEA laboratory assays. When heterophile antibodies are present in a patient's sample, they can bind to the antigens used in the DHEA assay and interfere with the accuracy of the results.

6. Biotin supplement: High doses of biotin supplements can lead to falsely high or falsely low DHEA levels, depending on the specific assay used. Biotin interference occurs because some DHEA laboratory assays use biotin-streptavidin technology.

7. Inappropriate sample storage and transport: DHEA samples should be stored and transported according to the manufacturer's instructions. Inappropriate storage and transfer temperatures can lead to degradation of the sample and inaccurate results.

5. A list of interferences of the Dehydroepiandrosterone (DHEA) level test:

8. Methodological interferences: Some DHEA laboratory assays may be subject to methodological interferences, such as variability in antibody specificity or cross-reactivity with other steroids.

9. Age and gender: DHEA levels can vary depending on age and gender. Females typically have higher DHEA levels than males, and DHEA levels decline with age.

10. Stress and physical activity: Stress and physical activity can affect DHEA levels, and failure to control for these factors can lead to inaccurate results.

11. Medical conditions: Certain medical conditions, such as adrenal insufficiency and polycystic ovary syndrome (PCOS), can affect DHEA levels.

6. A list of interferences of the 17-hydroxyprogesterone (17-OHP) level test:

1. Sample type: 17-OHP testing requires a serum or plasma sample. Using the wrong sample type, such as a urine sample, can lead to inaccurate results.

2. Sample collection: Improper collection of the sample, such as using the wrong anticoagulant or failing to adequately mix the sample after collection, can lead to inaccurate results.

3. Sampling time: The timing of the sample collection is critical because 17-OHP levels can fluctuate throughout the day. 17-OHP levels are generally higher in the morning and lower in the evening. Failure to collect the sample at the appropriate time can lead to inaccurate results.

4. Medications: Certain medications can interfere with the accuracy of the 17-OHP test. These include hormonal contraceptives, glucocorticoids, and androgenic steroids.

6. A list of interferences of the 17-hydroxyprogesterone (17-OHP) level test:

5. Heterophile antibodies: Heterophile antibodies are antibodies that can cross-react with multiple antigens, including the antigens used in 17-OHP laboratory assays. When heterophile antibodies are present in a patient's sample, they can bind to the antigens used in the 17-OHP assay and interfere with the accuracy of the results.

6. Biotin supplement: High doses of biotin supplements can lead to falsely high or falsely low 17-OHP levels, depending on the specific assay used. Biotin interference occurs because some 17-OHP laboratory assays use biotin-streptavidin technology.

7. Inappropriate sample storage and transport: 17-OHP samples should be stored and transported according to the manufacturer's instructions. Inappropriate storage and transfer temperatures can lead to degradation of the sample and inaccurate results.

6. A list of interferences of the 17-hydroxyprogesterone (17-OHP) level test:

8. Methodological interferences: Some 17-OHP laboratory assays may be subject to methodological interferences, such as variability in antibody specificity or cross-reactivity with other steroids.

9. Age and gender: 17-OHP levels can vary depending on age and gender. Females typically have higher 17-OHP levels than males, and 17-OHP levels decline with age.

10. Adrenal function: Adrenal function can affect 17-OHP levels. Conditions that affect adrenal function, such as congenital adrenal hyperplasia (CAH), can lead to elevated 17-OHP levels.

11. Stress and physical activity: Stress and physical activity can affect 17-OHP levels, and failure to control for these factors can lead to inaccurate results.

7. A list of interferences of Plasma metanephrine and normetanephrine tests:

1. Sample collection: Improper collection of the sample, such as using the wrong anticoagulant or failing to adequately mix the sample after collection, can lead to inaccurate results.

2. Medications: Certain medications can interfere with the accuracy of the metanephrine and normetanephrine test. These include alpha blockers, beta blockers, tricyclic antidepressants, and MAO inhibitors.

3. Dietary factors: Certain foods and beverages, such as coffee, tea, chocolate, and citrus fruits, can interfere with the accuracy of the metanephrine and normetanephrine test.

4. Heterophile antibodies: Heterophile antibodies are antibodies that can cross-react with multiple antigens, including the antigens used in metanephrine and normetanephrine laboratory assays. When heterophile antibodies are present in a patient's sample, they can bind to the antigens used in the assay and interfere with the accuracy of the results.

8. A list of interferences of the Dexamethasone Suppression Test:

1. Medications: Certain medications can interfere with the accuracy of the Dexamethasone Suppression Test. These include glucocorticoids, hormonal contraceptives, and some anticonvulsants.

2. Sample collection: Improper collection of the sample, such as using the wrong anticoagulant or failing to adequately mix the sample after collection, can lead to inaccurate results.

3. Sampling time: The timing of the sample collection is critical because cortisol levels can fluctuate throughout the day. Failure to collect the sample at the appropriate time can lead to inaccurate results.

4. Inappropriate dexamethasone dose: The dose of dexamethasone used in the test can affect the results. An inappropriate dose can lead to inaccurate results.

8. A list of interferences of the Dexamethasone Suppression Test:

5. Inappropriate test duration: The duration of the dexamethasone suppression test can vary depending on the specific protocol used. Failure to follow the appropriate test duration can lead to inaccurate results.

6. Medical conditions: Certain medical conditions, such as depression, anxiety, and alcoholism, can affect cortisol levels and lead to inaccurate results.

7. Stress and physical activity: Stress and physical activity can affect cortisol levels, and failure to control for these factors can lead to inaccurate results.

8. Dietary factors: Certain foods and beverages, such as coffee, tea, and alcohol, canaffect cortisol levels and interfere with the accuracy of the Dexamethasone Suppression Test.

8. A list of interferences of the Dexamethasone Suppression Test:

9. Heterophile antibodies: Heterophile antibodies are antibodies that can cross-react with multiple antigens, including the antigens used in cortisol laboratory assays. When heterophile antibodies are present in a patient's sample, they can bind to the antigens used in the assay and interfere with the accuracy of the results.

10. Inappropriate sample storage and transport: Samples should be stored and transported according to the manufacturer's instructions. Inappropriate storage and transfer temperatures can lead to degradation of the sample and inaccurate results.

11. Interference from other steroids: Some steroids, such as prednisolone, can interfere with the Dexamethasone Suppression Test and lead to inaccurate results.

9. A list of interferences of the ACTH stimulation test:

1. **Medications**: Certain medications can interfere with the accuracy of the ACTH stimulation test. These include glucocorticoids, hormonal contraceptives, and some anticonvulsants.

2. **Sample collection**: Improper collection of the sample, such as using the wrong anticoagulant or failing to adequately mix the sample after collection, can lead to inaccurate results.

3. **Sampling time**: The timing of the sample collection is critical because cortisol levels can fluctuate throughout the day. Failure to collect the sample at the appropriate time can lead to inaccurate results.

4. **Inappropriate ACTH dose**: The dose of ACTH used in the test can affect the results. An inappropriate dose can lead to inaccurate results.

9. A list of interferences of the ACTH stimulation test:

5. **Inappropriate test duration**: The duration of the ACTH stimulation test can vary depending on the specific protocol used. Failure to follow the appropriate test duration can lead to inaccurate results.

6. **Medical conditions**: Certain medical conditions, such as depression, anxiety, and alcoholism, can affect cortisol levels and lead to inaccurate results.

7. **Stress and physical activity**: Stress and physical activity can affect cortisol levels, and failure to control for these factors can lead to inaccurate results.

8. **Dietary factors: Certain foods and beverages**, such as coffee, tea, and alcohol, can affect cortisol levels and interfere with the accuracy of the ACTH stimulation test.

9. A list of interferences of the ACTH stimulation test:

9. **Heterophile antibodies**: Heterophile antibodies are antibodies that can cross-react with multiple antigens, including the antigens used in cortisol laboratory assays. When heterophile antibodies are present in a patient's sample, they can bind to the antigens used in the assay and interfere with the accuracy of the results.

10**. Inappropriate sample storage and transport**: Samples should be stored and transported according to the manufacturer's instructions. Inappropriate storage and transfer temperatures can lead to degradation of the sample and inaccurate results.

11. **Interference from other steroids**: Some steroids, such as prednisolone, can interfere with the ACTH stimulation test and lead to inaccurate results.

9. A list of interferences of the ACTH stimulation test:

12. Pituitary or adrenal abnormalities: Abnormalities in the pituitary gland or adrenal glands can affect cortisol levels and lead to inaccurate results.

13. Age and gender: Cortisol levels can vary depending on age and gender. Females typically have higher cortisol levels than males, and cortisol levels decline with age.

Four notes for Minimizing interference

Strategies for Minimizing Interference in Adrenal Disorder Laboratory Testing:

Several strategies can be employed to minimize interference in adrenal disorder laboratory testing. These strategies include:

1. Avoiding interfering medications and supplements: As mentioned earlier, certain medications and dietary supplements can interfere with adrenal function testing, leading to inaccurate results. Healthcare providers should be aware of the potential for interference when prescribing medications or recommending supplements to patients undergoing adrenal function testing. When possible, interfering medications or supplements should be discontinued or avoided before testing.

2. Timing the tests appropriately: Circadian rhythm and stress can affect adrenal function tests, leading to inaccurate results. To minimize interference due to circadian rhythm, cortisol testing should be performed in the morning, when cortisol levels are typically highest. Additionally, patients should be advised to avoid physical or emotional stress before testing, as stress can induce cortisol secretion and affect test results.

Navigating the pitfalls of adrenal disorder laboratory testing: Minimizing interference

3. Using appropriate sample collection and handling methods: Proper sample collection and handling methods are crucial for accurate adrenal function testing. Improper sample handling, storage, or transportation can lead to inaccurate results. For example, hemolysis can interfere with cortisol testing, leading to falsely elevated levels. Therefore, it is important to use appropriate collection tubes, avoid hemolysis, and properly store and transport samples to the laboratory.

4. Using reference intervals specific to the laboratory and population being tested: Reference intervals are used to interpret adrenal function test results and can vary depending on the laboratory and population being tested. Using inappropriate reference intervals can lead to inaccurate interpretation of test results. Therefore, it is important to use reference intervals specific to the laboratory and population being tested. This can be particularly important for populations with different baseline hormone levels or individuals taking medications or supplements that can affect hormone levels.

strategies for minimizing interference in adrenal disorder laboratory testing

In summary, strategies for minimizing interference in adrenal disorder laboratory testing include:

1. Avoiding interfering medications and supplements,
2. Timing the tests appropriately,
3. Using appropriate sample collection and handling methods,
4. Using reference intervals specific to the laboratory and population being tested.

By employing these strategies, healthcare providers can improve the accuracy of adrenal function testing and enhance the diagnosis, treatment, and monitoring of adrenal disorders.

Clinical Implications of Minimizing Interference in Adrenal Laboratory Testing

1. Improved accuracy of test results: Minimizing interference in adrenal function testing can improve the accuracy of test results, leading to more reliable and informative diagnostic information. Accurate test results can help healthcare providers make informed decisions about patient care and guide appropriate treatment and monitoring of adrenal disorders.

2. Better diagnosis, management, and monitoring of adrenal disorders: Accurate adrenal function testing is essential for the appropriate diagnosis, management, and monitoring of adrenal disorders. Minimizing interference in adrenal function testing can help healthcare providers accurately identify and diagnose adrenal disorders, leading to appropriate and timely treatment. Accurate and timely diagnosis can also help prevent complications and improve patient outcomes.

3. Reduction in unnecessary or inappropriate treatment: Inaccurate adrenal function testing can lead to unnecessary or inappropriate treatment of adrenal disorders. For example, false-positive results can lead to unnecessary procedures or treatments, while false-negative results can delay the appropriate treatment of adrenal disorders. Minimizing interference in adrenal function testing can help prevent unnecessary or inappropriate treatment and improve patient outcomes.

Further research to identify and minimize sources of interference

Although several sources of interference in adrenal function testing have been identified, further research is needed to identify other potential sources of interference and to develop strategies to minimize them. Future research could also focus on identifying the most accurate and reliable methods for measuring adrenal hormones and metabolites.

In summary:

1. Standardization of protocols for adrenal function testing
2. Integration of novel laboratory techniques (MS-MS)are future directions that can improve the accuracy and minimize interference in adrenal function testing.
3. Further research is needed to identify and minimize sources of interference and to develop the most accurate and reliable methods for measuring adrenal hormones and metabolites.
4. Addressing these challenges and future directions can help improve the diagnosis, management, and monitoring of adrenal disorders and ultimately improve patient outcomes.

Conclusion

1. Adrenal function testing is a critical component in the diagnosis, management, and monitoring of adrenal disorders.
2. Several endogenous and exogenous factors can interfere with the accuracy of adrenal function testing, leading to incorrect or misleading results, such as age, sex, circadian rhythm, stress, medications, dietary supplements, laboratory and collection method-related factors, and comorbid conditions.
3. The strategies for minimizing interference, a. avoiding interfering medications and supplements, b. timing the tests appropriately, c. using appropriate sample collection and handling methods d. using reference intervals specific to the laboratory and population being tested, can improve the accuracy of adrenal function testing.
4. The strategies discussed can minimize the effects of these factors, improving the accuracy of adrenal function testing and enhancing the diagnosis, management, and monitoring of adrenal disorders.
5. Accurate adrenal function testing can prevent unnecessary or inappropriate treatment, leading to improved patient outcomes.
6. Future directions for adrenal function testing include the standardization of protocols, integration of novel laboratory techniques to improve accuracy and minimize interference, and identify and minimize new sources of interference.

نتیجه گیری

1. تست عملکرد آدرنال یک بخش حیاتی در تشخیص، مدیریت و پایش اختلالات آدرنال است.
2. چندین فاکتور درونی و بیرونی می‌توانند در دقت و صحت تست عملکرد آدرنال تداخل کرده و باعث نتایج نادرست یا گمراه کننده شوند، مانند سن، جنسیت، ریتم سیرکادین، استرس، داروها، مکمل‌های غذایی، فاکتورهای مرتبط با روش آزمایشگاه و جمع آوری نمونه، و بیماری‌های همراه.
3. استراتژی‌هایی مانند اجتناب از داروهای و مکمل‌های تداخل کننده، تنظیم زمان مناسب تست، استفاده از روش‌های مناسب برای جمع آوری و پردازش نمونه، استفاده از محدوده مرجع مربوط به آزمایشگاه و جمعیت مورد آزمایش می‌توانند دقت و صحت تست عملکرد آدرنال را بهبود بخشند.
4. تست عملکرد آدرنال دقیق، می‌تواند جلوی درمان نامناسب یا نامطلوب را بگیرد و منجر به بهبود نتایج بیمار شود.
5. جهت‌گیری‌های آینده برای تست عملکرد آدرنال شامل استانداردسازی پروتکل‌ها، گنجاندن تکنیک‌های آزمایشگاهی نوین برای بهبود دقت و کاهش متداخل‌ها، و شناسایی و کاهش منابع جدید متداخل می‌شود.

Helpful Questions

1. What is the most common exogenous/endogenous factor that interferes with cortisol measurement?

Hemolysis and stress respectively.

2. Which of the medications can interfere with cortisol measurement?

Aspirin, Furosemide, Metformin.

3. What is the recommended time of day for cortisol measurement? What's the meaning of interference?

Morning, False negative or false positive.

4. What is the most accurate method for measuring cortisol?

Mass spectrometry.


THANK YOU
FOR
your
ATTENTION !
ANY QUESTIONS ?