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ST VINCENT'S PATHOLOGY

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ALBUMIN INFORMATION SHEET

GENERAL

Albumin is the most abundant protein in human serum. It has a molecular weight of about 65,000 and consists of 584 amino acids and contains no carbohydrate. Albumin is produced exclusively in the liver and secreted directly into the circulation. Physiological roles include maintenance of oncotic pressure (albumin provides 80% of the plasma oncotic pressure) and transport of small molecules such as calcium, unconjugated bilirubin, free fatty acids, cortisol and thyroxine. Albumin also binds drugs in the serum, eg phenytoin, warfarin, phenylbutazone and clofibrate.

The half-life of albumin in the circulation is about 20 days and the liver has large reserves of albumin synthetic capacity. Although albumin is the most abundant serum protein, it contributes little to the osmolality as the concentration is about 0.6 mmol/L when expressed in SI units.

Serum albumin is a useful marker of chronic liver disease and nutritional status, although consideration must be given to other factors contributing to the level.

HIGH ALBUMIN CONCENTRATIONS IN PLASMA

Elevated concentrations of albumin in plasma are caused by a relative loss of water. This occurs in dehydration, or with prolonged use of a tourniquet. There are no pathological conditions other than dehydration associated with a high albumin concentration. Note however that elevated albumin may indicate artefactual elevation of other analytes such as haemoglobin, lipids and calcium.

LOW ALBUMIN CONCENTRATIONS IN PLASMA

CAUSES OF LOW PLASMA ALBUMIN

Low concentrations of serum albumin may be caused by artefact, decreased albumin production, increased loss, or redistribution in the body.

- Artefact: usually due to drip-arm contamination of the sample.
- Decreased production: malnutrition, malabsorption, chronic liver disease (eg cirrhosis) or the acute phase response (eg with chronic inflammatory conditions such as end-stage kidney disease, chronic infection, cancer).
- Increased loss: protein-losing states (nephrotic syndrome, protein-losing enteropathy), severe burns, during operative procedures.
- Redistribution: during sepsis albumin may be lost into the extravascular compartment due to increased vascular permeability, in ascites due to an exudate albumin is lost into the abdominal cavity.

Note that low serum albumin does not occur in uncomplicated acute viral hepatitis, and a normal serum albumin makes the diagnosis of cirrhosis unlikely.

EFFECTS OF LOW PLASMA ALBUMIN

The effects of low plasma albumin are mainly related to maintenance of fluid in the circulating compartment. With reduced levels of serum albumin fluid may escape into tissues to cause oedema or into body cavities to cause ascites or pleural effusions. Extremely low albumin may also affect the delivery of nutrients to tissues by the formation of localised tissue oedema. Reduced or increased levels of albumin in a sample will affect the measurement of total serum calcium, with low albumin producing a low serum total calcium (and vice versa). These conditions do not indicate a disorder of calcium metabolism.

INDICATIONS FOR MEASUREMENT

Serum albumin is generally measured as part of Liver Function Tests (LFT). Specifically, albumin should be measured whenever liver disease is suspected, in cases of oedema, if malnutrition or malabsorption is suspected, or if a protein-losing state (nephrotic syndrome, protein-losing enteropathy or burns) is suspected. Albumin can be a useful monitor of these conditions but repeat measurements at intervals of less than 1 week are rarely indicated and longer intervals are appropriate in non-acute cases.

Albumin should also be measured whenever a total serum calcium is requested.

ALBUMIN IN OTHER BODY FLUIDS

Albumin is measured in urine, usually as the protein creatinine ratio in a spot sample, as the primary assessment for protein loss from the kidneys. It can also be measured in body fluids such as ascites and pleural effusions to assist with identifying the source of the fluid (i.e. exudate v transudate).