3.6: Cerebrospinal Fluid

Cerebrospinal fluid (CSF) is considered a part of the transcellular fluids. It is contained in the ventricles and the subarachnoid space and bathes the brain and spinal cord. The CSF is contained within the meninges and acts as a cushion to protect the brain from injury with position or movement. It has been estimated that this cushioning or 'water bath' effect gives the 1400g brain an effective net weight of only 50g.

The total volume of CSF is 150 mls. The daily production is 550 mls/day so the CSF turns over about 3 to 4 times per day. The CSF is formed by the choroid plexus (50%) and directly from the walls of the ventricles (50%). CSF flowsthrough the foramen of Magendie & Luschka into the subarachnoid space of the brain and spinal cord. It is absorbed by the arachnoid villi (90%) and directly into cerebral venules (10%).

The normal intracerebral pressure (ICP) is 5 to 15 mmHg. The rate of formation of CSF is constant and is not affected by ICP. Absorption of CSF increases linearly as pressure rises above about 7 cmH2O pressure. At a pressure of about 11 cm H2O, the rate of secretion & absorption are equal.

The CSF has a composition identical to that of the brain ECF but this is different from plasma. The major differences from plasma are:

- The pCO2 is higher (50 mmHg) resulting in a lower CSF pH (7.33)
- The protein content is normally very low (0.2g/l) resulting in a low buffering capacity
- The glucose concentration is lower
- The chloride concentration is higher
- The cholesterol content is very low

There are no lymphatic channels in the brain and CSF fulfils the role of returning interstitial fluid and protein to the circulation.
The CSF is separated from blood by the blood-brain barrier. Only lipid soluble substances can easily cross this barrier and this is important in maintaining the compositional differences.