

## **Hydrodynamic hypothesis as an attempt to explain the Uhthoff's phenomenon mechanism**

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The worsening of visual symptoms caused by heat and physical exertion in Multiple Sclerosis (MS) has been described in 1890 by Uhthoff and named by him in 1961. This condition was to become known as Uhthoff's phenomenon (Up), and was later found to be caused by a rise in body temperature. Over 80% of MS patients develop a panoply of neurological signs during hyperthermia, 60% of which are "new" to that patient. There are few theoretical explanations of pathomechanism of this phenomenon which is still controversial, i.e. decreasing of conduction in demyelinated optical nerve, effects of serum calcium, blockade of ion channels, circulatory changes, heat shock proteins, hyperpolarization reduced by blocking electroneutral Na<sup>+</sup> movement; and unidentified humoral substances. We would like to present our own original hydrodynamic hypothesis which is based on Bernoullies rule (1738) and the phenomenon of pressures equalization in the eyeball (intraocular and choroid blood pressure) in patients with arterial hypotension (Lauber 1936, Reese and McGavic 1942). This symptom could be intensified in MS patients in increased body temperature due to physiological blood circulation decentralization, or in bleeding (for example menstruation); hypovolemia with decreased blood viscosity and density in reduced haematocrit. It creates a relative ocular hypertension with intensified press on fundus with intraocular vessels, optic disc and retinal nerve fibers. This causes secondary intracranial pressure increase, due to Bernoullies phenomenon related to circulation of fluids between brain and eyeball, where obstructed intraocular flow determines an obstacle to a normal circulation in this hydraulic "cerebrophthalmic loop".