This synopsis is restricted to neurological diseases affecting the brain. This excludes disturbances affecting peripheral nerves and neural transmission within the spinal cord. Neurological diseases affecting the brain may be distinguished by their class of etiology. The disease may be (1) degenerative, (2) due to failures of blood supply, (3) due to inflammation and problems within the immune system, (4) due to tissue growth (tumors), and (5) directly due to external agents.

DEGENERATIVE DISEASES

In degenerative diseases, brain cells are damaged due to some endogenous reason affecting their metabolism or interfering with signal transmission. Some progress has been achieved in understanding the involved mechanisms, perhaps most of all in Parkinson’s disease, but nevertheless the causal agents have still remained obscure. A strong hereditary component is involved in Huntington’s disease and in some types of cerebellar degeneration. Some hereditary factors have also been demonstrated in Alzheimer’s disease and Parkinson’s disease, but only in infrequent subtypes of these diseases. The major obvious risk factor in the latter two diseases is age.

Alzheimer’s Disease

Alzheimer’s disease is the most common cause of dementia in elderly people. Pathological markers are plaques and tangles within neuronal tissue, above all within the temporal and parietal lobes, but these markers can so far be identified only by neuropathological examination, i.e., not while the patients are alive. Thus, standard criteria recommend diagnosis of “probable” Alzheimer’s disease by diagnosing dementia and excluding other possible causes of dementia (vascular encephalopathy, lack of certain vitamins or hormones, and other reasons). The main symptom is a deficit of working memory but, in order that Alzheimer’s disease (and dementia in general) be diagnosed, some second capacity in addition to memory must be affected.

Parkinson’s Disease

The cardinal symptoms of Parkinson’s disease are stiffness, lack of movement, and tremor during rest. There is often a
slight, diffuse impairment of cognitive functions, reminiscent of frontal lobe pathology. The main pathological mechanism is degeneration of dopamine-producing neurons in the brain stem (i.e., substantia nigra). Because of this, the basal ganglia lack the dopamine needed for their adequate functioning. The basal ganglia project in different ways via the thalamus to cortical areas. Dopamine replacement therapy may alleviate the symptoms for a number of years.

Other Degenerative Diseases

Cerebellar atrophy denotes a class of diseases, some idiopathic, some hereditary, that are characterized by impairments of movement precision and of balance, obviously related to shrinkage of cerebellar volume. Often, in the course of the disease, pathology progresses from the cerebellum to neighboring structures (olivo-ponto-cerebellar atrophy, OPCA).

Huntington's disease is a hereditary degenerative disease of the brain, focusing on parts of the basal ganglia (nucleus caudatus and putamen), producing hyperkinesia, akinesia, and dementia. A core symptom of the disease is excess movements (St. Vitus’ dance).

Progressive supranuclear palsy is characterized by palsy of vertical saccades, loss of voluntary facial movements, axial dystonia, gait disturbance, and dementia. Pathological alterations in several subcortical regions form the basis for these impairments.

In amyotrophic lateral sclerosis (ALS) there is degeneration of neurons of the pyramidal tract and of the consecutive spinal neurons, progressively reducing a patient's ability to move. Different from other degenerative diseases, ALS is neither hereditary nor a disease of old age, but has its peak of incidence during the fifth decade of age.

**Lesion of Cerebral Tissue Due to Failure of Blood Supply**

Brain tissue can be damaged by disorders of blood circulation in two ways: by infarction, i.e., some vessel is blocked such that tissue no longer has blood supply, or by hemorrhage, i.e., some vessel is ruptured, causing blood to overflow into brain tissue.

Infarction or hemorrhage affecting the cortex will cause well-delimited symptoms and syndromes. For example, lesions of anterior branches of the middle cerebral artery (MCA) may cause palsy of the contralateral arm, of the contralateral side of the mouth and (if in the left hemisphere in right-handers) Broca-type aphasia. Lesions of posterior branches of the MCA may cause Wernicke-type aphasia, if on the left, and disorders of spatial abilities, including neglect, if on the right.

**Inflammatory Diseases**

Inflammation of the brain may be acute, possibly life-threatening, in meningoencephalitis, and may be caused by bacteria and viruses (or, hard to distinguish clinically, by fungi). There are also chronic inflammatory-type processes caused by multiple sclerosis, by the human immunodeficiency virus (HIV), or by prions.

Multiple sclerosis (encephalomyelitis disseminata) is characterized by a diversity of symptoms, due to inflammatory-type lesions of neuronal axons and the insulating myelin, appearing and disappearing at a variety of cerebral, cerebellar, and spinal locations. The optical nerve is frequently affected as a first symptom.

The human immunodeficiency virus frequently affects the central nervous system and may cause cognitive impairment up to HIV-associated dementia, as part of the acquired immunodeficiency syndrome.
TUMORS

Tissue may grow within the head, thereby causing either unspecific symptoms (nausea, epileptic seizures, etc.) or symptoms specific to their location, in this case similar to consequences of infarction. Depending on the particular tissue, growth may be benign, i.e., slow and not penetrating other tissue, or malign, i.e., fast and infiltrating.

EXTERNAL AGENTS

The brain may be damaged by accidents and poisonous substances. The most important poisonous substance is alcohol, causing cerebellar dysfunction and, mediated by lack of vitamin B1, several symptoms summarized as Wernicke–Korsakow syndrome. In chronic alcoholics, acute alcohol withdrawal may lead to epileptic seizures.