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Abstract

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- (1) Electron-microscopic findings of virus-like particles in lymph nodes of patients with acute leukaemia.
- (2) Isolation of nucleic acids with cytopathic properties from human tumours.
- (3) Development of mammary tumours in mice injected at birth with extracts of a variety of human tumours; the uninoculated controls showed an insignificant tumour incidence

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VIRUSES AND CANCER

The discovery of many new tumour viruses has established beyond doubt that the virus is a common cause of neoplastic disease in plants, amphibians, birds and mammals. There is as yet no experimental proof available that any one type of human cancer is induced by a virus, although it would be strange if nature were to divide so sharply the origin of cancer in animals and man. Several reports strongly suggest the presence of tumour virus in human neoplasms. These include :—

- (1) Electron-microscopic findings of virus-like particles in lymph nodes of patients with acute leukaemia.
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- (3) Development of mammary tumours in mice injected at birth with extracts of a variety of human tumours; the uninoculated controls showed an insignificant tumour incidence.

However, the problem of applying the important precedents established by animal experiments to man presents many difficulties.

It may be that the long association of tumour virus(es) with the human host make it difficult to reproduce the disease in other than a human milieu and it is probable that if cancer is to be proved viral in origin, the proof will have to be indirect based on :—

- (1) Repeated isolation of the same virus from similar tumours.
- (2) Supporting serological studies.
- (3) Other techniques evolved from animal experiments.

The indirect evidence will be truly convincing if procedures based upon it are effective in the prevention or treatment of human cancer.

Tumour viruses may spread in the same way as any other virus, through contact between animals or by secretions and excreta. Experiments have also demonstrated that some tumour viruses may exist in animals in a latent form and may be transmitted from one generation to another. It may be that common viruses, following a sojourn in cancer cells can acquire, by the process of transformation, the ability to induce malignancy. Whatever implications concerning treatment may be implicit in these suggestions, it must be remembered that the cause of cancer is not a single problem; it is many problems. It concerns the multitude of factors that enable cells to proliferate, it concerns the factors that enable some proliferating cells to invade and destroy the host. These factors whether they be particular viruses, radiations, chemicals, or

endogenous agents, may only be acting as stimuli that initiate proliferation, much in the way that the orderly sequence of events leading to the complete formation of an individual is initiated by the fertilization of the egg. However, these agents cannot cause cancer *without* the cell to play the major role and the ultimate cause of cancer must be sought *within* the cell. These cellular mechanisms are still unknown. When they have been elucidated, it may be simple to treat the disease. The value of studying aetiological factors is in the information that they can supply regarding the intracellular mechanisms of carcinogenesis.

PSYCHOSES AND THE NEUROHUMORAL AMINES

The role of serotonin and other neurohumoral amines in the above connection is currently being related, if only tentatively, to the activities of the reticular formation.

The significance of this structure is much disputed, but it is usually described as a central network of grey matter, with pathways extending in both directions through the spinal cord as well as the bulbar, pontine and mid-brain levels. Impulses ascending the lemnisci to bring information of sensory stimulation excite also the mid-brain reticular formation which in turn arouses the cerebral cortex via the diffuse thalamic projection system. Activity in this system is characterised by the waking EEG pattern.

Serotonin, adrenaline and nor-adrenaline are three related substances which occur in many parts of the central nervous system in parallel concentrations. The highest concentrations occur in the hypothalamus, the mid-brain and the floor of the fourth ventricle.

Because of the considerable emphasis that has been placed on the role of serotonin and adrenaline in psychosis, the role of other neurohumoral amines has been relatively neglected. This is particularly true with regard to acetyl choline, which is localised in very much the same regions as the others mentioned. Cholinesterase inhibitors can produce both stimulatory and inhibitory effects at all levels of the nervous system, including severe psychotic episodes induced by extremely small doses.

These areas mentioned within the brain are associated functionally with the autonomic system and with the regulation of emotion, while the hypothalamus is closely connected also with the thalamo-cortical relay of the reticular activating system.

The interaction of the autonomic and central somatic nervous system may be illustrated by the actions of adrenaline. This compound is liberated into the blood-stream during emotional states, the stimulus being neural; the compound in its turn acts upon the C.N.S. The central effects comprise a direct action on central neurons, and secondary effects due to carotid sinus stimulation. The secondary effects are inhibitory upon both the spinal cord and the cerebral cortex, while the direct neural action of adrenaline is eventually to accelerate the activity of the cortex and to facilitate conduction within the spinal cord.

The excitatory actions of adrenaline are brought about simultaneously, it is said, by the reticulo-cortical and reticulo-spinal systems, and serve to heighten considerably the level of activity of the whole somatic system.

Recent studies of sensory physiology lend support to Huxley's view that the brain normally seeks to concern itself only with what is biologically useful and that it is actively engaged in suppressing from consciousness the majority

of irrelevant sensations which it receives. It may also be, as he believes, that hallucinogens can exert their effect by interfering with this mechanism.

Certainly, such drugs as mescaline and lysergic acid diethylamide (L.S.D.) do induce states reputed to be similar to those present in schizophrenic disorders, and L.S.D. is used to induce mental recall in abreaction.

Of greater interest now is the hypothesis that the tranquilising action of drugs such as reserpine is due to the release of serotonin from a bound form in the brain and other tissues. Conversely, the hallucinogens have supposedly been shown to act by antagonising the normal functions of serotonin.

Regardless of the eventual proof or disproof of this hypothesis, which seems entirely based upon circumstantial evidence, it has been established that certain types of psychotics are made more amenable to psychotherapy by administration of synthetic tranquilisers. Hence it remains possible that the hypothalamus and the thalamo-cortical projection may by a mechanism involving these neurohumoral amines be implicated in the development of psychotic states.

A TIME TO WEEP

“That was an affecting moment in the history of the Prince Regent, when the First Gentleman of Europe burst into tears at a sarcastic remark of Beau Brummell’s on the cut of his coat.”

It can be deduced from the affecting scene thus described that at one time it was not considered unmanly to cry. Since the Prince Regent’s time, however, England has suffered under Dr. Arnold of Rugby, and the Stiff-Upper-Lip school of Philosophy—which has done much harm.

An illustration of this is the late 19th century corruption of the famous words of the dying Nelson. As every schoolboy knows, these were, “Kiss me, Hardy,” and as every doctor should appreciate, they were not effeminate, but wholly natural in the mouth of an agonised and dying man. But our 19th century predecessors, suffering as we now can see from an overdose of suppressed effeminacy, shrank from the natural and came out with the unlikely suggestion that the words were in fact “Kismet, Hardy!”

The purpose of this article is to voice a plea that weeping be once again considered normal. Tears have been shed in all great moments of history; Caesar wept on hearing of the treacherous assassination of Pompey; Napoleon wept at the destruction of the Imperial Guard at Waterloo; and the characters in Dicken’s novels weep nearly all the time. Let me end with these immortal words of the great Huxley:—

*“Your maiden modesty would float face down,
And men would weep upon your hinder parts.”*