Musical composition by American Moravians from 1742–1842: Albert G. Rau and Hans T. David. An appropriation from the Penrose Fund of the American Philosophical Society was made to the Moravian Seminary and College for Women, of Bethlehem, Pa., for the purpose of making a critical catalogue of original compositions by American Moravians during the one hundred years from 1742 to 1842. Out of a mass of two thousand or more manuscripts found in various Moravian churches in Pennsylvania, Maryland and North Carolina, we secured some four hundred that were original compositions made in this country by sundry Moravian musicians for the enrichment of the liturgical seasons of the church. Most of these are anthems for four or eight voices, with orchestral accompaniment of strings, with the addition also of wood wind and brass in some cases. Of the ten men whose works we examined, five were born on this continent. The obvious musical continuity in the series indicates a transfer of musical technique from the older to the younger workers in very evident fashion. Only a few of the works are secular, but these are extremely interesting. Among them is a series of Parthien or suites for wind instruments, obviously used for serenading purposes, and a group of six quintets for two violins, two violas and violoncello, which have been definitely determined to be the oldest compositions in sonata form composed in America.

SPECIAL ARTICLES

THE OCCURRENCE IN NATURE OF "EQUINE ENCEPHALOMYELITIS" IN THE RING-NECKED PHEASANT

Three pheasants were received for diagnosis on October 6, 1938, from a locality in Connecticut. These birds had been on range and were found in a more or less helpless or partially paralyzed condition and died before being shipped. The sender, Mr. Edward H. Mulliken, reported the finding of dead wild birds as well as pheasants following the hurricane of September 21. These pheasants presented no gross lesions, though the brain substance was rather soft. This was attributed to post-mortem change, the birds having been three days in transit. In view of the paresis that had been observed, the brain of each was inoculated into white Swiss mice intracerebrally in groups of 4 to 6, using large animals about six months old. All these mice were either dead or moribund on the fourth day, there being no noticeable difference in the course of the infection in any of the three groups.

A fourth pheasant was found sick in the same region and was received dead on October 18. There was a caseous mass around the gall bladder, which had evidently been ruptured. A suspension of the brain of this bird also killed large Swiss mice on intracerebral injection in from 4 to 5 days. This strain was carried through a second passage in mice.

Culture media inoculated with infective brain from mice of each of these groups furnished no growth either on gross or microscopic examination. The infection from one of these four pheasants was chosen arbitrarily for serial passage in mice. Young Swiss mice weighing 12 to 15 grams died in about 48 hours after intracerebral and in 3 to 4 days after intraperitoneal injection. Many of the animals developed a flaccid paralysis of the hind legs, though a few showed hyperexcitability. Occasionally a mouse, apparently well, would go into a convulsion, leap into the air and die a few minutes later after the manner of mice infected with herpes. This strain has been carried through 10 passages in mice. The titre of the virus in the brain is high; the intraperitoneal injection of 0.2 cc of a 1 to 10,000,000 dilution of infective mouse brain killed 1 of 6 mice. Guinea pigs, injected subcutaneously or intraperitoneally with a heavy suspension of infective mouse brain, died within 2 to 4½ days.

The course of the pheasant infection in mice and in guinea pigs presented characteristics which are strikingly similar to those of equine encephalomyelitis. Dr. Peter Olitsky, of the Rockefeller Institute, kindly supplied serum of a rabbit immune to eastern encephalomyelitis. Small amounts of this serum (0.1 cc) afforded complete protection to mice against 100,000 minimal infective doses of virus of the pheasant strain. The virus and serum were mixed and injected intraperitoneally, without preliminary incubation, into young Swiss mice (12 to 15 grams).

A few tests have been made of the susceptibility of other birds to the virus from the pheasant, using an inoculum of infective mouse brain. Two adult quail which were injected intracerebrally died after 4 and 5 days and the virus was recovered by the inoculation of brain tissue into mice. Of two injected subcutaneously, one died after 5 and the other after 10 days. Mice remained well following inoculation with the brain tissue of the quail dying after ten days. Therefore, the cause of death in this bird is doubtful. Fifteen newly hatched Rhode Island Red chicks were obtained. The virus was carried serially in these chicks through 4 passages, chiefly by subcutaneous injection. In the first and second passage all the chicks died, but in the third and fourth the course of the infection became progressively more uncertain. Six chicks injected intracerebrally died in about 48 hours; 9 were injected subcutaneously and 7 died at varying intervals. The virus was recovered by the intracerebral injection of mice with the brain tissue of a chick dying in the fourth passage after subcutaneous injection. The susceptibility of young chicks and of adult birds of other species makes entirely understandable the massive concentration of the virus of equine encephalomyelitis which develops in chick embryos as contrasted with the low titre of the virus in the brain of horses. The susceptibility of many birds to certain strains of encephalomyelitis has been demonstrated experimentally; notably the pigeon,[1] a species of vulture, the stork, the duck, the goose, the European blackbird and the common harrier of Europe.[2]

On preliminary study of stained sections of brain and cord of the pheasant infected in nature, perivascular lesions are found distributed unevenly throughout the cerebrum and there is also a meningitis. Around the small blood vessels there are prominent infiltrations composed of lymphocytes, plasma cells and large mononuclears. Cells of the same types occur in the pia. Polymorphonuclear cells are so rare as to be demonstrable with difficulty. The brains of inoculated quail and chickens show less conspicuous lesions. The cerebrum of the infected guinea pig presents numerous ill-defined foci of polymorphonuclear infiltration, distributed superficially in the brain substance. The lesions of the mouse brain are less obvious and are chiefly of a degenerative nature.

Summary: The recognition of a series of cases of equine encephalomyelitis in pheasants adds valuable information concerning the distribution of this disease, and the designation "equine" becomes an unfortunate misnomer. Indeed, it may be seriously questioned whether the horse or other domestic animals play any essential rôle in assuring the perpetuation of this disease. The present demonstration of the natural occurrence of the infection in game birds and the experimental evidence obtained by Remlinger and Bailly of the susceptibility of migratory birds to certain strains of encephalomyelitis suggest an easy mode for the wide distribution of this virus. A search for spontaneous infection in migratory birds is indicated. Extensive surveys will be required in order to know just how widely the infection is spread in nature. It may be only under accidental circumstances or when the infection rises to a certain level that it overflows and becomes a serious problem as regards the horse and even the human being.

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THE ABSORPTION OF CARBON DIOXIDE IN PHOTOSYNTHESIS

IT is often stated that enzymatic processes are reversible. It is also a commonplace that photosynthesis is in many respects the reverse of respiration. Now there is every reason to believe that the CO_2 formed in oxidations arises from organic acids, probably by the same reactions as in fermentation, namely, from pyruvic acid by the action of carboxylase, from formic acid by the hydrogenlyase, from oxalacetic acid in its breakdown to pyruvic acid, from acetoacetic acid in the acetone fermentation, etc. What could be more natural than to suppose that in photosynthesis the absorption of carbon dioxide takes place in the reverse way, by combination with an aldehyde, or, more probably, with an organic acid, to produce a new carboxyl group? Specifically, a probable reaction is the combination of CO_2 with pyruvic acid to produce oxalacetic or perhaps with lactic acid to produce malic. The light reaction would then be the reduction, not of CO_2 as such, but of the carboxyl group.

This simple assumption would make the first reactions in photosynthesis much easier to comprehend. It is usually assumed, following Willstätter and Stoll, that the CO_2 combines with the chlorophyll, but for this there has never really been sufficient evidence. For formaldehyde ("activated" or otherwise) as the first reduction product of CO_2 there is even less evidence, and the persistence of these unsupported theories must be ascribed to the absence of any plausible substitute. It is hoped that the suggestion here made may provide a working hypothesis which at least is consistent with a number of facts.

Both in photosynthesis and chemosynthesis there is evidence pointing to such a reaction. In the *Athiorhodaceae,* in light, Gaffron[1] showed that CO_2 is absorbed in presence of mono- or di-carboxylic acids and there was a corresponding disappearance of carboxyl groups. In the *Propionibacteriaceae,* Wood and Werkman[2] have shown that CO_2 is absorbed, non-photosynthetically, probably by combination with an organic acid. The reversible equilibrium between CO_2, hydrogen and formic acid in *bacterium coli*[3] is also suggestive. Whether or no we may safely generalize from individual biochemical processes, it is a remarkable fact that recent work gives increasing evidence for the role of intermediate products themselves as catalysts or carriers in a catalytic cycle. There is the action of arginine in the formation of urea,[4] the dicarboxylic

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