Table 1. Effect of exposure to a trained fighter for two 5-minute periods a day, for indicated days, on monoamine oxidase activity in the hypothalamus, amygdala, and frontal cortex of defeated mice (± S.E.). Monoamine oxidase activity expressed in units in which 1 unit is equal to the amount of enzyme contained in 1 g of tissue which converts 1 μmole of 5-hydroxytryptamine to 1 μmole of 5-hydroxyindoleacetic acid in 1 hour.

Days	Monoamine activity		
	Hypothalamus	Amygdala	Frontal cortex
0	6.46 ± 0.31	5.65 ± 0.24	5.97 ± 0.94
1	8.75 ± .26	5.92 ± .78	5.91 ± .83
2	9.86 ± .70	6.07 ± .40	5.09 ± .18
4	5.68 ± .84	3.97 ± .70	6.53 ± .54
8	3.67 ± .92	4.16 ± .36	4.05 ± .46
14	7.28 ± .15	6.27 ± .93	5.05 ± .76
20	4.24 ± .24	3.79 ± .28	2.50 ± 1.13

amine oxidase deaminates only the physiologically important intracellular free monoamines.

We used *Mus musculus*, strain C57BL/6J. Before experimental data were gathered, a colony of mice was trained to fight according to the procedure of Scott (*5*); these mice were used in fighting encounters with experimental mice.

The experimental mice were weaned and isolated at 21 days of age. After 40 days of isolation, the mice which were not trained to fight were exposed to the trained fighters for two 5-minute periods each day for 1, 2, 4, 8, 14, or 20 days; controls were taken from the same group but they were not exposed to the trained mice. Twelve mice were each exposed at each of these periods for a total of 84 experimental mice. In addition, six mice were transferred from their isolation cage to the fighters' home cage but the fighter was not present at each of these periods. Twenty minutes after the last exposure to a fighter or after cage transfer, the mice were killed by decapitation and their brains were removed quickly; the hypothalamus, amygdala, and frontal cortex were dissected out, frozen in acetone dry ice, and weighed to the nearest 0.1 mg. These three brain areas were kept frozen for a maximum of 2 weeks, then they were analyzed for monoamine oxidase activity. The enzyme was assayed by the method previously devised in our laboratory (*6*). Data were analyzed statistically by means of a standard *t*-test.

Results indicate that monoamine oxidase increased significantly ($P < .005$) in the hypothalamus from 6.46 enzyme units (one unit is equal to the amount of enzyme contained in 1 g of tissue which converts 1 μmole of 5-hydroxytryptamine to 1 μmole of 5-hydroxyindoleacetic acid in 1 hour) to 8.75 and 9.86 at 1 and 2 days of exposure to fighters, respectively (Table 1). During the same period, however, no significant changes were observed in the amygdala and frontal cortex. These latter areas and the hypothalamus exhibited a significant ($P < .01$) decline in monoamine oxidase at 8 days; this decline was followed by a rise at 14 days with an additional significant decline by day 20 of continuous exposure to defeat. Generally, the data show that exposure to aggression profoundly affects the monoamine oxidase activity of the hypothalamus, amygdala, and frontal cortex of the defeated mice. Mice that were transferred to the fighters' cage did not exhibit any changes in brain monoamine oxidase.

The changes in monoamine oxidase activity may reflect the sum total of heightened neural activity associated with various brain areas during exposure to stress. Or changes in monoamine oxidase activity may reflect differential demand and synthesis of serotonin. It is also possible that during aggression stress there is a shift in serotonin from "bound" to "free" which must be oxidatively deaminated by monoamine oxidase.

Several investigators (*7*) have suggested that there are different monoamine oxidases from different amines or that there may be more than one active site involved in this enzyme. We used serotonin as the substrate in the monoamine oxidase analysis, and therefore, the monoamine oxidase activity measured was that for serotonin deamination.

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23 January 1967

Recommendations on Nomenclature of the Order Mycoplasmatales:

The need of international agreement on the nomenclature of mycoplasmas (pleuropneumonia-like organism, PPLO) has been felt for a long time and has been further accentuated by the rapidly increasing interest in this group of microorganisms. More particularly, there have recently been examples of new species being named without adequate descriptions and there have been other departures from the accepted Code of Nomenclature of Bacteria. Realizing that a chaotic situation was starting, the initiative was taken by a small group particularly interested in *Mycoplasma* taxonomy to take advantage of the New York Academy of Sciences Second Conference on the Biology of Mycoplasmas, held in May 1966, to establish a provisional Subcommittee on the Taxonomy of Mycoplasmatales. Subsequently, at its meeting on 23 July 1966, in Moscow, U.S.S.R., the International Committee on Nomenclature of Bacteria authorized this subcommittee and approved its recommendations.

The minutes of the meeting of the Subcommittee on the Taxonomy of Mycoplasmatales in May 1966 have been published in the *International Journal of Systematic Bacteriology* (*1*). The recommendations of the Subcommittee are summarized here together with further comments and advice, so that they may be brought to the immediate attention of as wide a circle of microbiologists as possible.

1) The Subcommittee noted that the system of classification and nomenclature of the mycoplasmas, based on the binomial system, that was proposed in 1956 by Edward and Freundt (*2*) has

since then received wide acceptance and has come into general use. It was recommended that the approach of these authors to a systematic nomenclature for the mycoplasmas receive support and be further extended in the future. This implies that the Principles, Rules, and Recommendations that are laid down in the International Code of Nomenclature of Bacteria (*3*) should hold for the nomenclature of mycoplasmas.

2) The recognition of a separate new class for the Order Mycoplasmatales is proposed. This is a revival of an old idea already suggested by Sabin in 1941 (*4*) and discussed also, among others, by Edward and Freundt in 1956 (*2*), who felt, however, that a decision on this problem should await further investigations. Since then further evidence in support of the segregation of the mycoplasmas from the Class Schizomycetes has accumulated. For example, recent biochemical studies tend to strengthen the fundamental importance of the requirement for sterols as a distinctive character shared by the vast majority of the mycoplasmas. Also, the absence of a cell wall and the mucopeptide polymer and its precursors distinguishes mycoplasmas from bacteria. Both of these characters, the requirement for sterols and the absence of a cell wall, place the mycoplasmas in some ways much closer to the protozoa than to bacteria, as pointed out by Hayflick and Chanock (*5*), although on the other hand mycoplasmas are distinguished from protozoa by their procaryotic cell structure. It might be further mentioned that analyses of the nucleic acid base composition (guanine + cytosine content) have demonstrated a fundamental genetic heterogeneity within the group, and have shown, moreover, that the G+C base ratios of some strains (species) are among the lowest reported for any microorganisms and lower than any known for eubacteria (*6*). This again would seem to be in favor of the classification of the mycoplasmas in a separate group on a high taxonomic level (Class), parallel to, but distinct from the Class Schizomycetes.

Obviously, by proposing a separate class for the mycoplasmas the subcommittee indirectly indicates its disbelief in the view that the mycoplasmas in general be regarded as fixed L-phase variants of bacteria.

3) The name Mollicutes has been proposed as a name for the new class by Edward and Freundt (*7*). This name is derived from the binary stem molli-cutis (Latin adjective *mollis* means soft, pliable, and Latin feminine noun *cutis* means skin), originally used by Edward when proposing the order name Mollicutales as an alternative to Mycoplasmatales (*8*). The adoption of Mollicutes as the name for the proposed new class would abide by the second alternative contained in Rule 2 of the International Code of Nomenclature of Bacteria (*3*) that reads: "The name of each taxon above the rank of order is taken preferably from a combination of characters covering the nature of the taxon as closely as possible, or from a single character of outstanding importance."

4) The Subcommittee believed that the broad heterogeneity that has been demonstrated to exist within the mycoplasmas—by conventional methods and more recently by nucleic acid studies—strongly suggests a further subdivision of the Order Mycoplasmatales into more families and/or genera. The Subcommittee had in mind here the taxonomic status, for example, of the saprophytic, nonsterol-dependent mycoplasmas presently classified as *Mycoplasma laidlawii*, and of the so-called T-strains. It was felt, however, that the possible establishment of a more elaborate taxonomic scheme for the mycoplasmas would be premature, and should await further investigations.

5) The fundamental importance of defining the criteria on which classification on the species/subspecies level should be based was emphasized. It was agreed to maintain, as a general principle, that, in defining these taxa, account should be taken of all available information about the microorganisms, with equal emphasis put on antigenic and other biological properties. Special mention was made of the probable significance of the nucleic acid homology test, as a technique by means of which true genetic relationships might be recorded (*9–12*). The Subcommittee learned that, so far, a remarkable correlation has been found to occur between currently adopted species classification of *Mycoplasma*, as based on conventional serological and biochemical methods, and the overall results obtained with the homology technique (*10, 11*). On the other hand, some reservations were expressed concerning the interpretation of the results obtained, and regarding the practical applicability of this technique for large-scale comparative studies. However, it was decided to encourage suitable laboratories to explore further the adequacy of the nucleic acid homology test as a possible supplementary basis for classification.

6) In conclusion, the Subcommittee wishes to urge microbiologists in the *Mycoplasma* field to satisfy, whenever publishing a new specific name, the following requirements. (*a*) To provide, together with the proposal for a new specific name, an adequate description that will allow laboratory identification of the new species, and its differentiation from other *Mycoplasma* species. An adequate description should include serological and biological characters as defined by currently available standard methods, and, ideally, it would imply a direct serological comparison with any previously established *Mycoplasma* species. It follows that a new specific name should not be published unless it is accompanied or preceded by an adequate description as defined here, and the designation of the type of the taxon. It must be emphasized that no priority or legal recognition can be given to specific names under the International Code of Nomenclature of Bacteria unless these are accompanied by an adequate description. (*b*) To supply immediately to a National Type Culture Collection a representative prototype strain (*13*). (*c*) To publish new specific names in suitable journals, that is, journals of a known wide circulation among microbiologists in general. Primary publication in journals devoted to highly specialized fields and of limited availability or in books, though formally accepted as effective publication, is to be deprecated. Where publication is effected in journals other than the *International Journal of Systematic Bacteriology* a note drawing attention to the publication should be forwarded to the Editor of the *International Journal of Systematic Bacteriology*. Reference may be made here to a pertinent Recommendation from the Botanical Code as quoted by the International Code of Nomenclature of Bacteria and Viruses (*14*) under "Annotations" to Rule 11. It reads: "Botanists and others are urged scrupulously to avoid publishing new names or descriptions in ephemeral publications, in popular periodicals, in any publication unlikely to reach the general botanical public, in those produced by such methods that their permanence is unlikely, or in abstracting journals."

Comment. It is fully realized that hardly any of the *Mycoplasma* species hitherto described do in fact strictly meet the requirements that are formulated in paragraph 6, *a*. It is appreciated, moreover, that self-evident though these requirements are in principle, it will prove difficult or even impossible for any single worker or group of workers to satisfy the demands. However, it is hoped that the gradual creation of a network of reference laboratories may help to ameliorate the situation in this respect and steps are being taken toward this end.

At any rate, rather than compromising too much with the above requirements, it would be wise policy to restrain one's taxonomic efforts and to publish any new isolates merely under their catalog designations, thus providing a useful and necessary means of reference until it is possible to provide a reasonably adequate description.

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13 March 1967

Sexual Reproduction in Histoplasma capsulatum

Recent successes (*1*) in stimulating sexual reproduction among the dermatophytes and related fungi inspired a search for the perfect state of fungi that cause systemic disease in man. One of the organisms under study was *Histoplasma capsulatum*, the etiologic agent of histoplasmosis, a pulmonary disease of global importance. Twenty-nine isolates of this mold, recovered from soil, bats, or humans, were grown singly or in combination on small pieces of sterilized chicken feathers or horse hairs placed on plates of moistened, sterilized soil.

Cleistothecia filled with asci and ascospores were formed by two of the isolates. With the aid of a micromanipulator, single ascospore cultures were obtained, and the organism was found to be homothallic.

The two cultures that developed the cleistothecia (H-2 and H-8) had been isolated from soil collected under a starling (*Sturnus vulgaris*) roost in Illinois (H-2) and from a case of histoplasmosis (H-8) in Puerto Rico.

The morphological characteristics of the cleistothecia and their asci were typical of the genus *Gymnoascus* of the family Gymnoascaceae. The perfect state of *Histoplasma capsulatum* is being studied.

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6 February 1967

Medial Superior Olive and Sound Localization

Harrison and Irving (*1*) show that some animals which are capable of localizing a sound source do not possess a medial superior olive. On this basis, the authors rule out the idea that the medial superior olive is essential for sound localization. However, the electrophysiological data which they cite (*2*), together with some recent behavioral data not available to them (*3*), suggest an alternative interpretation of the presence or absence of the medial superior olive in specific mammals.

In order to understand the contribution of the medial superior olive to sound localization, it is necessary to distinguish between the two potential cues in the stimulation reaching the ears, both of which vary with the azimuth of the source of a brief sound (*4*). The first of these potential cues is the difference in the time of arrival of the wave front at the two ears. This time difference, Δt, depends directly on the distance between the ears and inversely with the speed of sound in the conducting medium. Animals with small heads and aquatic animals with even moderately large heads are virtually deprived of this potential cue since the interaural distance is small or the speed of sound is too great.

The second potential cue for the localization of the source of a brief sound is the differences in the frequency spectrum of the stimulation reaching the two ears (*5*). The spectrum difference, $\Delta(fi)$, depends on the effectiveness of the sound shadow produced by the head and pinna. No animal is completely deprived of this potential cue, but since the effectiveness of the sound shadow decreases with a decrease in the proportion of high frequencies in the stimulation, animals (such as man) which are relatively insensitive to high frequencies are not exposed to a wide range in $\Delta(fi)$. Thus Δt is the more dramatic cue for azimuth in animals with wide-set ears while $\Delta(fi)$ is the more dramatic cue in animals with close-set ears, an aquatic habitat, or sensitivity to high frequencies.

The analysis of the Δt cue and the analysis of the $\Delta(fi)$ cue are accomplished by different structures in the auditory system. We have isolated Δt and $\Delta(fi)$ by delivering clicks through headphones worn by experimental ani-