inhibition of these two organisms with the highest concentrations, but this result is insignificant when compared with the response of the aerobes. The repeated exposure of these latter clostridia to atmospheric oxygen at the three periods of recording may have affected their rate of metabolism in sufficient degree to cause the irregular effects produced.

From the data accumulated it appears that those organisms which require free oxygen for respiration are "smothered" by 2,4-D. They react in a manner similar to the germinating barley seeds as reported by Hsueh and Lou. Those organisms capable of anaerobic respiration only are not affected to any significant degree by 2,4-D.

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The Relative Sensitivities of Bacterial Viruses to Intense Sonic Vibration[1]

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It was thought that the multiplication of bacterial viruses might be followed up to the moment of natural lysis by sonically disintegrating infected bacteria at various times after infection. An electron microscope study of the debris might then reveal the various morphological stages in virus proliferation, while counts of infectious particles would permit estimation of the rate of appearance of mature particles. However, preliminary studies of T2 virus, which, because of its easily recognizable tadpole shape, would be ideal for this purpose, showed that it is even more rapidly disintegrated by sonic vibration than the host cells and, therefore, would be unsuited for the proposed investigation (*1*). In an attempt to find suitably resistant viruses we have followed the sonic inactivation of each of a set of 7 viruses (T1–T7) (*5*) active on *E. coli*, strain B. Since an interesting correlation between structure and sensitivity was obtained, we are recording the results here.

Forty-cc filtered samples of each of the bacteriophages were treated separately in the water-cooled cylindrical cup of a magneto-striction sonic oscillator manufactured by the Raytheon Manufacturing Company. Samples were removed at intervals and, together with the untreated control, were assayed for virus activity by the plaque count method. Samples of the host bacteria were treated in an analogous manner and their survivals determined by colony counts.

TABLE 1

Percentage Survival of Various Bacteriophages and of Their Host, *E. coli* Strain B, After Exposure to Intense Sonic Vibration

Length of exposure (min)	Bacteriophage							*E. coli* Strain B
	T1	T2	T3	T4	T5	T6	T7	
1	92	73	70	50	30	....	100	80
5	34	1.8	80	0.8	1.6	0.9	60	18
10	30	.07	80	0.009	0.07	0.008	40	1
30	10	..	40	....	....	....	12	0.016
60	1	..	0	....	....	....	1.1	....

In Table 1 are given the results of a typical series of experiments. It is seen that viruses T2, T4, T5, and T6 are more rapidly inactivated than the host bacteria, while the remaining three viruses, T1, T3, and T7, are remarkably resistant to sonic vibration.

These results are interesting in relation to the morphologies of these viruses as seen in the electron microscope (*2*). The resistant viruses T3 and T7 appear to be small spheres 450 A in diameter (*3, 4*) while T1 is a similar small sphere but with a faint, 1,200-A-long tail attached (*6*). In contrast, the vibration-sensitive viruses T2, T4, and T6 are relatively large, tadpole-shaped structures with frequently pointed heads 600×800 A, consisting of an internal structure and surrounding membrane to which a well-defined tail approximately 1,000 A long is attached (*2*). Likewise, the sensitive virus T5 has a large, round head about 900 A in diameter, also consisting of a membrane surrounding internal structures and with a faint tail some 1,700 A long attached (*2*). It seems likely that the sensitive viruses with their relatively large and complex structures are mechanically disintegrated by intense vibration, while the small, compact viruses are relatively resistant to the shearing forces existing during cavitation of the liquid in which they are suspended.

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In the oscillator (Type R-22-1) used for this work the vibrating system consists of a stainless-steel diaphragm which forms the base of the specimen cup and laminated nickel strips, the ends of which are attached to the diaphragm. The system is caused to vibrate by oscillating magnetic fields set up by a solenoid surrounding the nickel strips and on which the cup rests. A power supply operating on 110-volt, 60-cycle current and tuned to resonate with the mechanical system provides the driving power which is transmitted to the sample by the vibrating diaphragm. Cooling water flows through a jacket surrounding the cup and sprays over the nickel strips within the solenoid. The average temperature of the specimen is thus held to within a few degrees of that of the cooling water, even during cavitation of the liquid.