for species descriptions, which are reliable and encompass the entire range of variation of the organism. Ideal criteria should be as objective as possible and give an all or none reaction. They should not be too sensitive to minor variations in media or methods, so that they would give uniform reactions when carried out in various laboratories throughout the world. One cannot expect to obtain the same brand of agar or variety of potato in all countries. Nor is it probable that all minute details of one investigator’s manipulation of a test be repeated in facsimile by another one.

More studies in the choice of criteria are necessary for their proper evaluation. New criteria need be sought and poor criteria dropped from the literature. One must be aware that all criteria cannot be expected to have universal application to all species; some criteria could serve to separate whole groups of organisms from each other, whereas others would be of value only for the separation of two species. Furthermore, the ideal criteria for any taxon should correlate with each other on any one member to set it off from another.

REFERENCES


An Inexpensive, Accurate “Injection Gun”

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Our investigations of the rickettsiosiostatic activities of compounds related to p-aminobenzoic acid² and the effects of tritium oxide on the growth of rickettsiae³ required that many different compounds or different levels of activity of tritium oxide be injected into embryonate eggs. Quantities of each compound or each activity of tritium to be tested in a given experiment were dissolved in an amount of distilled water such that each 0.4 or 0.2 ml of solution contained the amount of reagent to be injected per egg. Finger held, digit powered 5-ml syringes could not be controlled with sufficient accuracy. The use of a single 1-ml syringe filled to contain the correct amount of solution to be injected into each egg for a group of 30 eggs increased greatly the probability of bacterial contamination. The use of a 1-ml syringe for each egg was awkward and time consuming; the washing and sterilization of the 100 or more syringes resulting from the injection of 3 to 4 series of eggs required also much time. Automatic pipetting syringes could be adjusted to fill correctly, but, at the volumes used, were inaccurate on discharge.

In the light of the above, we have developed a simple, inexpensive, accurate, trigger operated “injection gun.” An exploded view of the gun assembly is shown in figure 1.⁴ The apparatus consists essentially of a caulking gun modified by the addition of two saddles to position and hold securely a 5-ml “multifit” syringe.⁵ Each squeeze of the trigger, using the large notches of the actuating rod, advances the plunger of the syringe a distance sufficient to discharge approximately 0.4 ml of solution. A single filling of the syringe contains sufficient solution, therefore, to inject 12 eggs. Several fillings sufficed to inject a given series (30 eggs) and this was accomplished in 4 min. By rotating the actuating rod, to engage the finer notches, each squeeze of the trigger discharges approximately 0.2 ml of solution.

Variations in the amounts delivered were determined by weighing 30 consecutive samples on an analytical balance and converting to corrected volumes. When

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⁴ Detailed construction plans can be obtained from: Dr. H. K. Ihrig, Research Laboratories, Allis Chalmers Manufacturing Company, West Allis, Wisconsin.

⁵ Becton, Dickinson and Company, Rutherford, New Jersey.
set to deliver 0.4 ml of solution the mean amount of solution delivered was 0.390 ml with a standard deviation of ±0.015 ml; set to deliver 0.2 ml, mean delivery was 0.201 ± 0.021 ml.

\[ \text{Figure 1. Injection gun} \]

**A Plaque Suppression Method for the Study of Antiviral Compounds**

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One of the serious limitations in any program designed to study natural biological materials (i.e., fermentation beers, plant extracts) as sources of antiviral substances is the inadequacy of the methods used to obtain quantitative estimates of the activity. After all, the compound of interest is likely to be a very small part of the complex material in which it is contained. Thus, extraction and purification studies in the absence of precise data as to quantity of active substance, whether the activity is due to single or multiple entities, and solvent extractability, become slow and laborious. Furthermore, without the kind of descriptive information paper chromatography can supply very early in the developmental stage, one may very well spend much time uselessly on repeat activities.

Attempts have been made by various investigators to obtain correlative responses of other biological systems to virus-inhibitors. Asheshov et al. (1954) studied the activities of fermentation beers of actinomycetes against bacteriophage and Fastier (1954) studied extracts of fungi, including yeasts, with only indefinite success when extended to animal viruses. B. P. Sagik (Unpublished Data) has compared the activity of chemicals and fermentation beers against bacteriophage and animal viruses and has found no significant correlation.

The development of a plaque method for measuring infectivity of animal viruses on susceptible cell monolayers (Dulbecco, 1952) has suggested adaptation of this method to the study of antiviral compounds. The criterion of virus inhibition would be the ability of the substance to suppress plaque formation. DeSomer

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