make the entire chromatogram repellent to the locusts. Other solvents (petrol, ether, butanol, carbon tetrachloride, acetone) did not have this effect, and in these instances the locusts responded to one zone on each chromatogram with their complete testing behaviour which included the final bite. From these experiments it seemed unlikely that *Schistocerca* required an individual biting factor that Hamamura *et al.* have found necessary for satisfactory feeding by *Bombyx*.

Table 1. Classification of Feeding Stimulants based on the Behaviour of *Schistocerca* towards Plants

Behaviour of locust towards the plants	Olfactory stimulant	Gustatory stimulant	Classification of plant	Examples of plants in each category
Tests surface of plant and feeds	Positive attractant	Positive acceptant	Acceptable	*Dactylis Plantago Lamium Zea Tagetes*
Tests surface of plant, bites but does not feed	Positive attractant	Negative rejectant	Non-acceptable	*Myrica Lavendula Cupressus*
Locust turns away from plant	Negative repellent	Negative rejectant	Non-acceptable	*Myrica Lavendula Cupressus*

The R_F value of the active zone was not the same in each plant for equivalent solvent systems, so it was concluded that *Schistocerca* will respond to a number of attractants.

As Hamamura *et al.* have reported for *Bombyx*, the feeding stimulant is also found in the acetone extract, and filter paper circles with an acetone extract of an acceptable plant plus the ether extract of *Dactylis* induced the locust to feed (the ether extract was required to induce the locust to bite the substrate and so bring its oral receptors into contact with the surface of the filter paper). A comparison of the acetone extracts of a series of plants showed that there was more than one acceptant substance in some plants (*Dactylis* and *Trifolium* both had two), and in certain instances (*Lavendula*) a plant may have positive feeding stimulants present in its tissues although the effect of these substances is masked by negative feeding stimulants.

A classification of the feeding stimulants proposed to account for the observed feeding behaviour of *Schistocerca* towards possible food material is given in Table 1. (Note: Thorsteinson[2] adopted this classification after discussion with me.)

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MICROBIOLOGY

In vitro Species (or Type) Transformation among Strains of *Brucella*

Examples reported in the literature concerning mutation in *Brucella* organisms have been received with strong criticism[1,2] arising, apart from other reasons, from the scarce number of cases involved or based on the negative results of other workers[3].

This communication presents the results of my work in this field, fundamentally related to the taxonomy of this bacterial genus, with the purpose of offering support to one of the opinions in conflict. The observations seem to prove that *Brucella* is a group of micro-organisms of particularly labile character and not infrequently affected by transformation.

Early in 1958 it was unexpectedly noticed that three *Br. melitensis* recently isolated appeared to have changed their serological behaviour only by reacting with the monospecific *abortus* serum; when tested biochemically these strains reacted like *Br. abortus*. This observation was taken at first with great reserve as it could have obviously been caused by accidental error; but a similar finding, in cultures of old storage, was soon found in the German literature as reported by Roots and Sprockhoff[4]. Decisive evidence was, however, obtained from a group of five other *Br. melitensis*. These strains, while changing antigenically to *abortus*, retained their original biochemical characteristics, in this way assuming the pattern of Renoux's *Br. intermedia*. A search for variation was therefore decided: care was taken to prevent any labelling faults to take place during the transfers of the strains in stock and the whole collection of cultures was checked at least once or twice a year by the following tests: (*a*) acriflavine test (*S*→*R* variation); (*b*) urease test; (*c*) slide agglutination test (using monospecific sera diluted to end-titre according to my technique[5]). For a final identification the inhibition dye test was also applied using basic fuchsin and thionin at concentrations of 1/25,000 and 1/50,000 and also safranin at 1/10,000. This dye was found to be a very useful tool for differentiating *Br. suis* from any other *Brucella*.

During 1959 it was found that a group of 26 strains had changed their previous classification.

When recently my collection of cultures was typed by the four known bacteriophages—10/I, 24/II, 212/XV and 371/XXIX—isolated and kindly supplied by Prof. J. Parnas (to whom I am indebted) an unexpectedly high number of discrepant results were registered. I admitted that mutation could explain them. In fact when the cultures concerned were again characterized biochemically and serologically a second group of 38 converted strains emerged from: (*a*) the whole of (27) *Br. melitensis* showing phage-sensitivity; (*b*) part of the *Br. abortus* showing phage-resistance; (*c*) other strains.

Altogether 64 stock cultures, out of a collection of 300, have suffered species or type reversion. The changes were as follows:

(*a*) 35 *Br. melitensis* changed into: 12 *Br. abortus*; 9 *Br. intermedia*; 11 *Br. suis*; 3 *Br.* 'strain AM' (*Br.* 'strain AM' is a strain with the biochemical characteristics of *Br. abortus* but reacting serologically with the *melitensis* serum).

(*b*) The variation of 12 *Br. abortus* occurred thus: 4 strains (types I and III) into *Br. suis*; 1 strain type III into *Br.* 'strain AM'; 1 strain type I became biochemically atypical and was taken as variant '*abortus-suis*'; 6 strains suffered inter-type variation: 4 strains type III changed into type I, 1 strain type II into type I and 1 type I into type III.

(*c*) All the 16 *Br. intermedia* of my collection suffered variation and they were now: 10 *Br. suis*; 5 *Br. abortus*; 1 *Br. melitensis* (atypical).

(*d*) 1 *Br.* 'strain AM' changed into *Br. abortus*.

Multiple or successive mutation was also observed in some cultures.

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A Biochemical Test for Crown Gall Bacteria

Agrobacterium tumefaciens is the agent for crown gall disease of several plants, thus causing serious economic losses in many countries. Except for its phytopathogenic action, it does not display any characteristic physiological or morphological properties. Its final identification is established by experimentally induced tumours, a procedure which often demands too much time for quick intervention in an epidemic. A quick, easy and specific identification test would be very useful. We wish, therefore, to report that *Agrobacterium tumefaciens* and *A. radiobacter* produce 3-ketoglycosides from the correspond-

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