acridine, and ethidium bromide showed little, if any, effect in the test system used. This is in accordance to previous reports[6-8], that acridines without an alkylating side chain are poor mutagens. Daunomycin and adriamycin, on the contrary, showed definite mutagenic activity which is more pronounced on strain TA1538 lacking the excision repair function (Table).

The above results clearly show that, for the antibacterial and mutagenic activity of anthracycline antibiotics daunomycin and adriamycin, it is important whether the tester bacterial strain has a normal or a defective excision repair system. In contrast, the acridine dyes do not show any differential effect on *uvrB* and *uvr*$^+$ strains.

Mutagenic activity of anthracycline antibiotics

Compound added	Amount (μg)	Revertant colonies from tester strain	
		TA1978 (*uvr*$^+$)	TA1538 (*uvrB*)
None (control)		2	3
Daunomycin	1	2	20
	3	5	46
	10	10	65
	30	11	400
Adriamycin	1	12	4
	3	10	10
	10	4	70
	30	7	33

Figures show the number of revertant colonies (histidine non-requiring) per petri plate and are the mean of 2 separate experiments.

Both groups substances are known to interact with DNA by simple intercalation without covalent bonds[1-5]. It has been claimed that DNA damaged by certain acridines with alkylating side chains is subject to repair by the bacterial excision repair system, while damage caused by simple intercalators is not[7,8].

The present results show that even some noncovalent intercalators, such as anthracycline antibiotics, may interact with DNA in a way which is relevant for the excision repair system. This fact may be related to the aminosugar residue of the two antibiotics, since antibacterial and mutagenic activity of simple acridine dyes is equally pronounced on bacteria with and without the excision repair system.

Studies are in progress for determining which kind of side chain, apart from the cases already known[6-8] and this report) confers to an intercalating agent a reactivity with DNA which is significant for the excision repair system of bacteria.

Summary. Daunomycin and adriamycin, are more mutagenic and antibacterial for a strain of *Salmonella typhimurium* defective for the *uvrB* gene than for its *uvr*$^+$ counterpart. Other intercalating agents, as some acridine dyes, affect equally the two bacterial strains.

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Tsetse Fly *Glossina morsitans morsitans* Produces Ultrasound Related to Behavior*

Several aspects of the behavior of the tsetse fly are unexplained. It is unknown how tsetse flies can survive low host densities and how, from an almost evenly and widely dispersed population in the bush[1] they can find each other for mating and formation of the wellknown 'following swarm of Swynnerton'. This behavior would suggest the existence of some form of communication among tsetse flies. So far as is known, tsetse flies do not possess sex pheromones[2,3]. Evidence of the emission of sound by tsetse flies was gleaned long ago and con-

* ICIPE publication No. 24.

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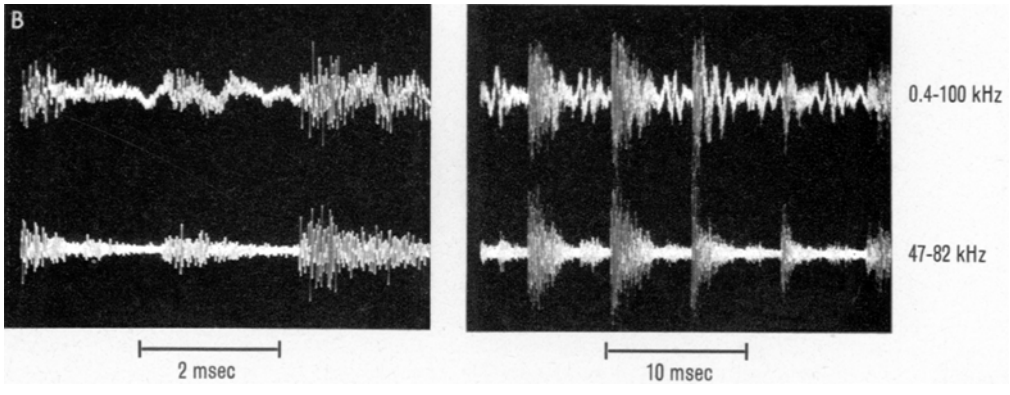

Fig. 1. Typical mating sounds. The amplification on the 47-82 kHz channel was twice that on the channel showing the full frequency range.

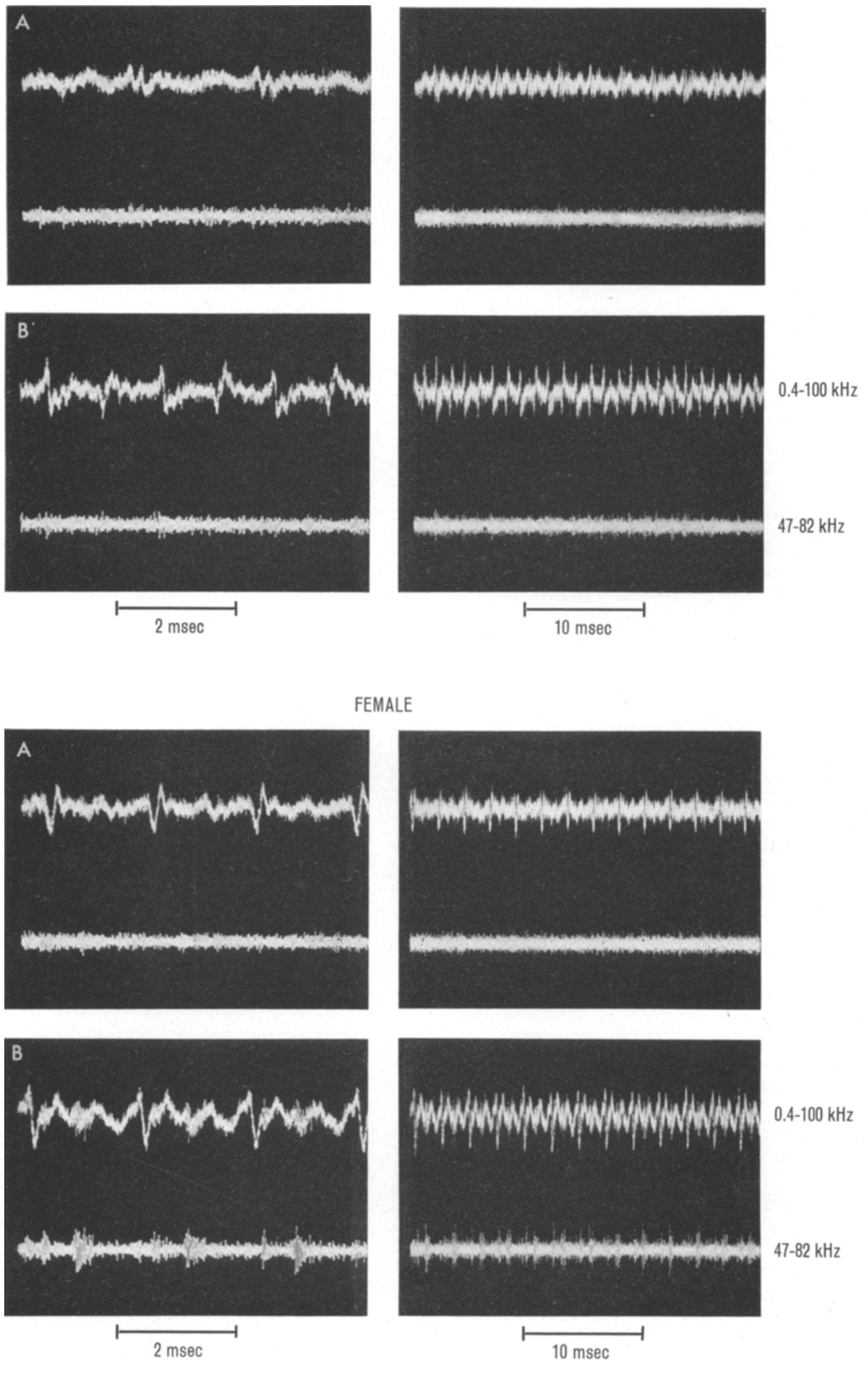

Fig. 2. Oscillograms of sounds produced by females and males before and after feeding on a rabbit's ear. The amplification on the high-frequency channel was twice that on the channel displaying the full frequency range.

sequently suggested as means of communication[4-7]. VANDERPLANK[8], after having observed that mating calls stimulate copulation, proposed that specific sounds may play a role in mating of tsetse flies. So far no experimental proof has been put forth showing that sound is used by the tsetse fly for communication.

In the present study we show that ultrasonic components (30-70 kHz) of the sound produced by *Glossina morsitans* are consistently different in character for mating as compared with feeding behavior. Furthermore, the character of the sound produced by males and females is different. We hypothesize on this basis that high frequency sounds may play an important role in communication among tsetse flies. Sounds in the frequency range above that audible to man are for several reasons more favorable for communication among insects than are lower frequency sounds; but these have not been investigated earlier in the tsetse fly.

Sounds from *Glossina morsitans* were recorded on magnetic type under laboratory conditions using Brüel & Kjaer $^1/_4''$ microphone (type 4135), Brüel & Kjaer microphone amplifier (type 2618) and a Precision Instrument tape recorder (type PI 6200) operated in direct modes with a tape speed of 37.5 inches per sec. A highpass filter (cut-off frequency 470 Hz) was inserted between the microphone amplifier and the tape recorder in order to remove low frequency noise. The recording system hence had a flat frequency characteristic between 470 Hz and 100 kHz (within less than $\pm$ 3 dB). One or more tsetse flies were kept in a small box covered with a nylon net from which the microphone was kept at a distance of 2–3 cm. The flies were fed by placing the box on one of the ears of a rabbit.

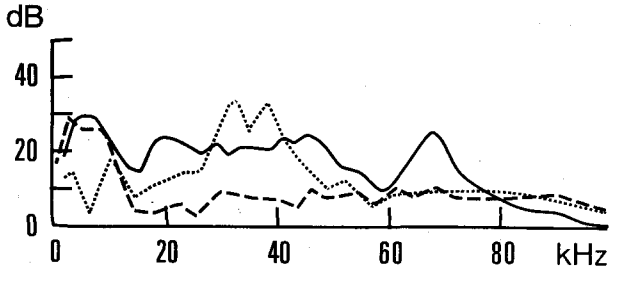

Fig. 3. Spectrograms of mating sounds (solid lines), feeding sounds; male (dashed line), female (dotted line) made from the tape recording using an audiospectrum analysis system with the tapes played back at 3.75″, i.e. 1/10 of the recording speed. The analyzer had a bandwidth of 250 Hz corresponding to a real analysis bandwidth of 2500 Hz. Integration time of the analyzer 400 msec corresponds to 40 msec real time. Zero dB corresponds approximately to 50 dB SPL, (decibel sound pressure level, logarithmic measure of sound pressure with a reference of 0.0002 μbar (2×10^{-5} N/m^2)).

Oscillograms of 2 typical mating sounds are shown in Figure 1, A and B, on 2 different time scales. The complete signal is seen in the upper trace, whereas the lower traces show the signal in the frequency band between 47 and 82 kHz. It follows from the lower traces that the sounds contain considerable energy in the high-frequency range and that this energy appears periodically as brief bursts. The periodicity varies from a few hundreds to about 1000 sec. Despite the individual variability, it is a consistent finding that mating sounds, in contrast to feeding sounds, are rich in high-frequency energy (Figure 1). It is not known whether the recorded mating sounds were produced by the male or the female. Recording from single females in connection with feeding shows that high-frequency components are much less significant than was the case during mating. In males (Figure 2) such high-frequency components are highly unusual.

The frequency spectrum of mating sounds has a significant peak in the high-frequency range (Figure 3), the exact location of which varies from time to time. The intensity of these high-frequency sounds is of nearly the same value as that of the low-frequency sounds. Figure 3 also shows spectra of typical sounds produced after feeding by a female and a male. The double peak between 35 and 40 kHz is characteristic for sounds produced by females in connection with feeding. The lack of high-frequency components in the sound produced by males is evident from this graph.

In short, the results show that the foundations for acoustic communication among tsetse flies (*Glossina morsitans*) indeed exist. To learn the reception and behavioral response of the tsetse fly to such sounds will be the purpose of future studies.

Summary. The spectrum of the sounds produced by the tsetse fly *Glossina morsitans morsitans* extends to above 80 kHz and the energy distribution between 20 and 70 kHz is related to behavior.

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Determination of the Total Number of Dissociated Cells Obtained from the Cerebral Hemispheres of Chick Embryos at Various Ages

Dissociated cells from the cerebral hemispheres of the chick embryo have been cultivated by a number of workers[1-3]. Development of the cultures seems to depend on various factors including the kind of substrate on which the cells grow, the composition of the nutrient medium, the age of the embryo at dissociation and the number of cells cultivated. This means that, while the effect of any one of the above parameters on the culture is being investigated, the others should be kept as nearly constant as possible. Because of cellular proliferation taking place in the developing embryo, the total cell count changes rapidly. Consequently one should have a reasonable idea of the number of cells at various ages, if

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