release in this system commences at 3 h and is almost complete by 10 h[14], these results would suggest that the drug acts as a general inhibitor of virus maturation rather than specifically blocking a single early event.

In order to study the effect of phenethyl alcohol on RNA and protein synthesis in chick fibroblast cells, 48 h monolayer cultures were washed in phosphate-buffered saline, then incubated in fresh growth medium, with or without addition of drug (10 m*M*), and supplemented with uridine-5-^{3}H (10 μc/ml, specific activity 5 c/mmole) and DL-valine-4-^{14}C (0.5 μc/ml, specific activity 36.6 c/mmole). At intervals, duplicate cultures were analysed for incorporation of radioactivity into RNA, protein, and the trichloroacetic acid (TCA) soluble nucleotide pool as described in detail elsewhere[14,16]. The incorporation of uridine into RNA was inhibited by about 50% at all periods studied, but this inhibition was largely accounted for by a decrease in the radioactivity of the TCA-soluble nucleotide pool (Table). This suggests that a primary effect of the drug is on the incorporation of uridine into the cell, and supports the notion that phenethyl alcohol exerts a primary effect on the cell membrane[13,17]. Protein synthesis was inhibited only slightly (Table); much greater inhibition of protein synthesis has been found in studies using actively growing suspended cell cultures and bacteria[10,11,13]. In the latter cases inhibition of protein synthesis was accompanied by decreased cell proliferation, whereas the monolayer cultures which we used were already in the stationary phase of growth. Thus our results are not inconsistent with the conclusion that phenethyl alcohol acts by affecting a cell membrane-associated process concerned with the control of cellular growth[13]. Further studies using phenethyl alcohol are being directed towards the interrelationship of influenza virus multiplication with cellular metabolism.

Effect of phenethyl alcohol (10 m*M*) on macromolecular synthesis in chick embryo fibroblast cells

Time (h)	Incorporation of ^{3}H-uridine				Incorporation of ^{14}C-valine	
	TCA-soluble nucleotides (cpm × 10^{-4})		RNA (cpm/μg × 10^{-1})		Protein (cpm/mg × 10^{-2})	
	Control	Treated	Control	Treated	Control	Treated
0.5	3.3	1.9	4.9	2.9	9.5	9.0
1.5	12.2	5.2	39.7	21.2	30.9	27.8
2.5	15.5	11.5	64.6	36.6	58.8	44.6
3.5	16.7	11.7	101.9	52.0	87.1	66.8

All values are means obtained from duplicate cultures.

Zusammenfassung. Phenethylalkohol wirkt virusstatisch und es wird vermutet, dass die mit der Zellmembran in Beziehung stehenden Vorgänge der Zellvermehrung beeinflusst werden.

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The Host-Parasite Interface of Strigeoid Trematodes

VIII. Surface Specialization of the Adhesive Organ of Cardiocephaloides physalis (Lutz, 1926)

Strigeoid trematodes (Platyhelminthes) possess a posterior hind-body and an anterior fore-body which bears, on its ventral surface, a ventral sucker and posterior to this, the adhesive organ, which is used to achieve very intimate contact with the host tissues. The fore-body is cup-shaped in some species[1] and in these the adhesive organ consists of 2 lobes and the parasite lies with the mouth of the fore-body cup pressed against the host gut mucosa so that the gut villus becomes drawn into the cup to lie between the 2 lobes. Previous electron microscope studies[2-6] have indicated that in certain strigeoid species the tegument of the adhesive organ lobes in contact with the host tissues is specialized to form a chambered, placenta-like surface[2].

Cardiocephaloides physalis is a poorly known form and it seemed appropriate to determine the presence of

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tegumentary specialization in this rare species. Professor J. G. BAER (Neuchâtel) presented me with several specimens collected from *Phalacrocorax bougainvillei* (Less) from the Guanape Islands (Peru). The material had been fixed in hot 10% neutral formalin and was still in the fixative when received. The histology of the adhesive organ and its attachment to the host mucosa has been described at the light microscope level by BAER[7].

The structure of the adhesive organ and the fore-body is illustrated by Figure 1. The adhesive organ is characteristic in that (a) the dorsal lobe is fixed to the cup wall along its dorsal edge and (b) a portion of the specialized

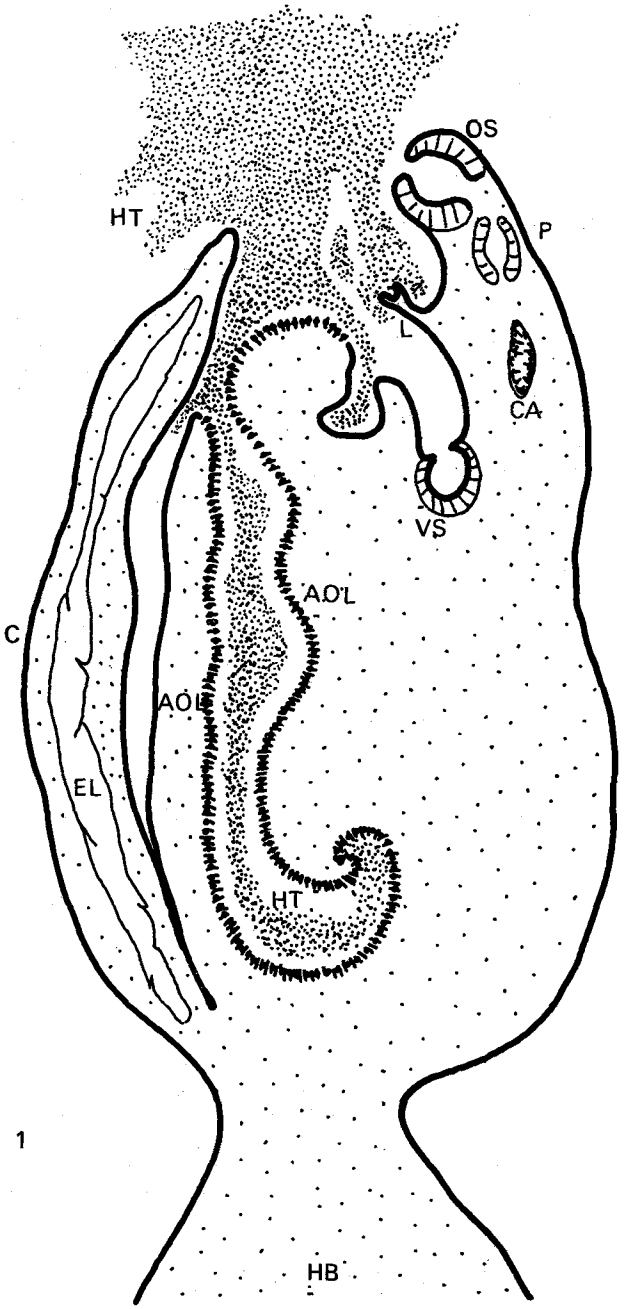

Fig. 1. Semi-diagrammatic drawing of sagittal section through the fore-body of *C. physalis*. The hind-body (HB) has not been included in full. The lateral and ventral surfaces of the fore-body are extended to form a cup (C) enclosing the 2 lobes of the adhesive organ (AOL). Note the plug of host tissue (HT) lying between the lobes. 'Normal' tegument is indicated by a solid black line; the specialized tegument, spined in certain regions, of the adhesive organ lobes by a broken dotted line. Also shown are the oral sucker (OS); pharynx (P); caeca (CA); lappets (L); ventral sucker (VS) and excretory lacunae (EL).

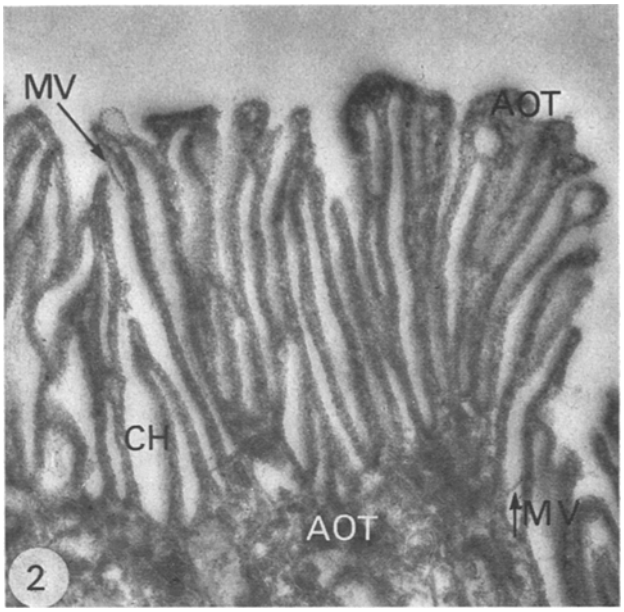

Fig. 2. Electronmicrograph of the specialized tegument of the adhesive organ lobes. The section is sagittal and shows the irregularly arranged walls (AOT) enclosing small chambers (CH) containing microvilli (MV). Stained with uranyl acetate and lead citrate. × 29,000.

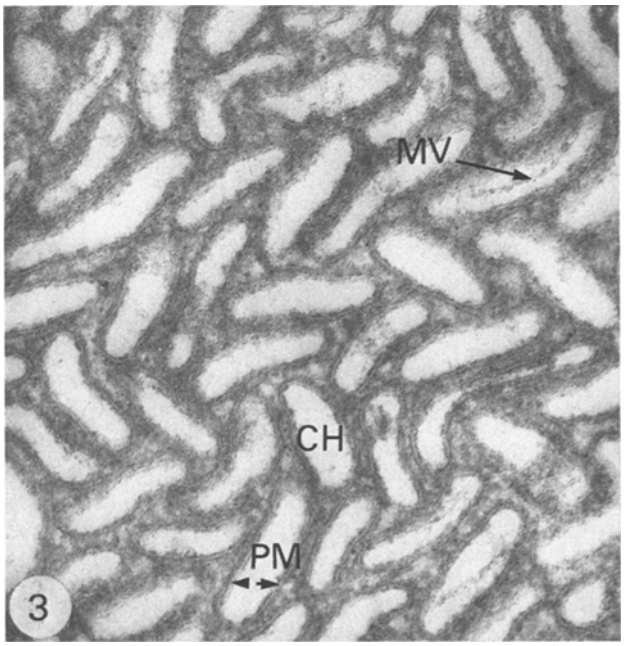

Fig. 3. Electronmicrograph of a transverse section through the chambers (CH) of the specialized tegument (AOT). Note that the chambers are lined with plasma membrane (PM) and contain microvilli (MV). Stained as in Figure 2. × 60,000.

surface is spined (Figure 4). The ventral lobe is free at its apex and lateral margins, but is fixed to and arises from the mid-ventral cup wall at its base. The host villus comes to lie between the apposing surfaces of the 2 adhesive organ lobes.

The outer and inner surfaces of the fore-body cup and the surface of the adhesive organ lobes adjacent to the cup wall are covered with 'normal'[8] cytoplasmic tegument. In contrast, the apposing surface of the lobes is covered with a specialized, chambered cytoplasmic surface (Figure 2). The chambers are covered with a unit plasma membrane and from the walls arise long slender microvilli (Figure 3). The walls of the cup and the adhesive organ lobes contain extensions of the excretory lacuna system and the walls of this are cytoplasmic and bear lamellae[9]. The host tissue plug, lying between the lobes, shows considerable lysis and in many cases the host capillaries come into close contact with the specialized adhesive organ surface (Figure 4).

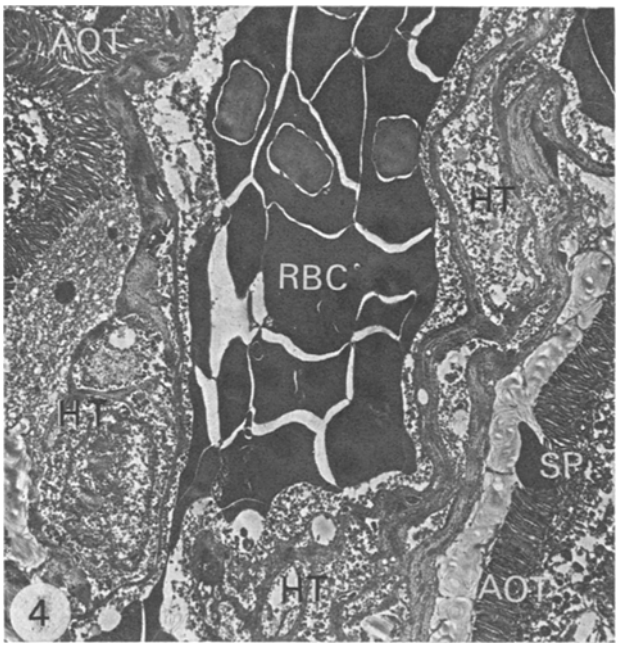

Fig. 4. Electronmicrograph of host tissue plug (HT) lying between the specialized surfaces of the adhesive organ lobes (AOT). Note that the host tissue contains capillaries and erythrocytes (RBC), which lie very close to the adhesive organ surface. Spines (SP) are present on a portion of this surface. Stained as in Figure 2. × 2000.

Surface specialization therefore, also exists in *Cardiocephaloides* and the nature of this surface suggests that it might play a vital, possibly placental role, in the absorption of nutrients from the host. The excretory lacunae, present in these lobes, might also aid in the translocation of absorbed nutrients. It is also worth mentioning that it is possible to use, for ultrastructural studies, material fixed in the field for other purposes, although it is suitable for the study of the more obvious ultrastructural features only[10].

Zusammenfassung. Die ultrastruktuelle Untersuchung des Haftorgans von *Cardiocephaloides physalis* (Trematoda) lässt eine mit Aushöhlungen versehene zellplasmatische Oberfläche erkennen, die mit der lamina propria der Wirtsdarmzotte (*Phalacrocorax bougainvillei*) in engstem Kontakt steht und möglicherweise Plazentafunktion besitzt.

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Properties of a Blue-Green Algal Sheath

Structures external to the cell wall (i.e. sheaths and capsules) are common among the Procaryota, although they are probably more typical of the blue-green algae (Myxophyceae) than the bacteria. In the latter group the sheath is a fairly well defined morphological feature – a hollow structure enclosing a chain of cells or a trichome[1]. It is chemically distinct from the capsule in *Sphaerotilus natans*[2]. In the blue-green algae all structures external to the cell wall, whether they be hollow tube-like structures with defined margins visible under phase-contrast microscopy (e.g. *Tolypothrix*) or less obvious, more mucilaginous, structures with indistinct outer edges (as in *Nostoc, Anabaena*), are referred to as sheaths. In studies of the sheath of an isolate prepared in this laboratory, referred to as strain FP23 (it is probably a *Nostoc* sp.), the sheath showed reactions typical of a bacterial capsule, and nigrosin showed a surprising affinity for protein absorbed by the sheath.

Filaments of a culture of FP23 in Knop's medium[3] possessed thick gelatinous adherent sheaths up to 25 μ in diameter. These sheaths become clearly visible under phase-contrast microscopy when 'stained' non-specifically with 0.1% bovine serum albumin (BSA) at pH 3.4 (Tomcsik and Guex-Holzer[4]). Presumeably, as suggested by Tomcsik and Guex-Holzer[4], the protein was forming a salt-like compound or precipitate in the sheath. Flushing such preparations with McIlvaines buffer at pH 7.2 removed the protein and the sheaths reverted to their normal poorly visible state under phase-contrast microscopy.

When BSA 'stained' sheaths at pH 3.4 were mounted in 1/3000 nigrosin they were found to be lightly positively stained. The depth of staining with nigrosin was variable,

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