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SUMMARY

Growths taken from the hydraulic suction auto-clean strainer of H.M.S. HERMES were found to be a mixed flora of hyphomycetes and ascomycetes; the former was identified as species of Aserillus while the latter proved to be a sporogenous yeast.

Tests carried out with various concentrations of "Panacide" Sodium showed that a concentration of 1 in 1000 was effective in killing the growths. Recommendations are made for cleaning the system and for adding and maintaining the required concentration of fungicide in the hydraulic fluid.
1. **INTRODUCTION**

A sample of biofoul growth taken from the forward hydraulic suction auto-clean strainer was received from C.D.L., H.M. Dockyard, Portsmouth, for examination. Subsequently, a visit by a member of H.M. staff was made to H.M.S. HERMES and samples of the growth were taken from the miscellaneous hydraulic tank and from the narrower gear tank. The latter was heavily contaminated with oil.

2. **MICROBIAL ORGANISMS**

On collection, the material consisted of silky felts of a pale greyish brown colour, which on drying, had a cheese-like consistency. Microscopical examination showed it to be a mixture of the vegetative stages of mycelial fungi and a yeast.

Streak cultures of the material were made on nutrient agar and incubated at 25°C for 14 days. Frequent sub-cultures were made and finally pure isolates of the mycelial species were obtained which were identified as *Aspergillus candidus* Link and *Aspergillus flavipes* (Baillie and Sorlott) Thaxter.

*Aspergillus candidus*, when pure, produces pale buff coloured colonies which have paler margins. The mould grows vigorously and quickly forms dense hyphal mat which eventually give rise to the silky felts found in the auto-clean strainer.

From the hyphal mat, numerous conidiophores arise which bear globular white masses of microscopic spores. These spores are extremely minute and the slightest air current is capable of carrying them over considerable distances. Fig. 2 shows several fruiting heads of *Aspergillus candidus*, each of which would be capable of producing many thousands of spores. *Aspergillus flavipes* is somewhat similar in appearance but produces columnar heads of spores, particularly in old cultures. The colour of the colony is buff or greyish buff, often tinted with pink or brown.

The yeasts element of the flora is probably a wild saccharomyces and gives the material its stickiness. This organism, shown in Fig. 2, is unicellular and the cells are broadly elliptical, 2-5μ long, 2-5μ wide and usually slightly broader at one end. Wild yeasts are common in Nature and it would be impossible to determine the origin of the infection. As the yeast constituted a very small proportion of the total bulk of material, its specific determination was not attempted.

3. **EXPERIMENTAL**

Previous research on a similar problem of mould growth in the hydraulic system of H.M.S. CENTUR (R.I.I., Report No.24/15/C December 1963) showed that of the several fungicides examined, "Panacide" Sodiu (sodium salt of 5:5' dichloro 2:2' dicydro diphenyl) was likely to solve the problem. Recommendations were therefore made that "Panacide" Sodium should be added to the glycerine/water mixture of H.M.S. CENTUR so that the resultant strength should be about 0.1%. Examination of the system 7 months after the initial addition indicated that this treatment had been successful.

Since, however, the system in H.M.S. CENTUR had been infected with a mixed flora of *Aspergillus* sp., quite different from that found in H.M.S. HERMES, experiments were carried out to determine whether, and at what concentration, "Panacide" Sodium would inhibit growth of the *Aspergillus candidus* yeast flora.

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For this purpose, "Panacide" Sodium was added to tubes of glycerine/water hydraulic fluid to give concentrations of 1×10⁻³, 1×10⁻⁴, 1×10⁻⁵, 1×10⁻⁶, 1×10⁻⁷, 1×10⁻⁸, 1×10⁻⁹, 1×10⁻¹⁰, respectively. Six 25 ml replicates of each were prepared. Controls without the addition of the fungicide were also set up. Spores from a mixed culture of the 

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_traces, however, might originate from particles that have become dislodged from inaccessible parts of the system by the operation of the pumps and have so escaped the original cleaning down.

In order to eradicate the infection completely it is recommended that the hydraulic fluid, together with the "Panacide" Sodium, should be changed every 3 months or, if this is not convenient, a further 1 pint of "Panacide" per 100 gallons of hydraulic fluid should be added, if traces of mould are observed.

"Panacide" Sodium is obtainable from Messrs. British Drug Houses Ltd., Pool, Dorset.

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FIG. 1. Aspergillus candidus Link, showing conidiophores with spores, taken from the suction auto-clean strainer of the hydraulic system. x 300

FIG. 2. Yeast cells found living with the Aspergillus in the hydraulic fluid. x 500
FIG. 3. Aspergillus/yeast flora growing on the surface of a glycerine/water mixture with various concentrations of "Panacide" Sodium. Concentrations of 1-500 and 1-1000 showed no growth. 1-2000 and 1-5000 showed very slight growth, below 1-5000 showed heavy fungal growth.
FIG. 4. Membrane filters on wort agar plates showing growth of *Aspergillus* sp., after being immersed in hydraulic fluid containing "Panocide" Sodium for 1 month. Concentrations higher than 1:1000 completely kill the spores, whereas 1:1-2000 or below the spores remain viable and eventually develop.
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