fundamental knowledge of this kind may bring not only the ability to assess potential harm to the foetus from drugs consumed by pregnant women, but also the opportunity to practise foetal therapeutics. Dr R. A. Chez (National Institute of Child Health and Development, Bethesda) looked forward to further procedures such as those now being developed to treat, for example, foetal erythroblastosis and respiratory distress in newborn infants through medication of the mother before birth.

WRASSES

Cleaning Symbioses

from our Marine Vertebrate Correspondent
THE discovery that some fishes enter into symbiotic relationships with others whereby they clean their hosts of parasitic and fungal infections was essentially a by-product of the development of compact underwater breathing apparatus. The freedom this gave to biologists to observe fish behaviour untrammelled by captivity quickly led to several observations of fishes, especially wrasses (family Labridae), which specialize in this symbiotic relationship. Many cases have been reported in tropical seas but recent studies show it to occur in temperate seas, as off New Zealand (see *Nature*, **238**, 433; 1972) and in European freshwater fishes (E. F. Abel, *Oecologia* (Berl.), **6**, 133; 1971). More recently G. W. Potts (*J. Mar. Biol. Ass. UK*, **53**, 1; 1973) has found that several north European marine fishes may be involved in cleaning symbioses.

Potts reports observing the shallow water wrasse *Centrolabrus exoletus* pecking at the sides of a ballan wrasse *Labrus bergylta* posturing in the fashion adopted by host fishes soliciting the attention of a cleaner. Three wrasses were inspected and cleaned by this *Centrolabrus* specimen, operating in a shallow sublittoral region on the Devon coast. Potts also reports cleaning behaviour by several species of wrasse, and other species, in the tanks of the public aquarium at the Plymouth Laboratory. The species involved were the goldsinny, *Ctenolabrus rupestris*, and the corkwing wrasse, *Crenilabrus melops*. Free-living specimens of the latter from the Plymouth region have been found to contain in their stomachs the externally parasitic praniza larvae of certain crustaceans, which suggests that cleaning symbiosis is part of the way of life of this species. In the aquarium *Crenilabrus melops* became active soon after the aquarium lights were switched on each morning and approached various fishes which responded by invitation postures. Many of the host fish carried the praniza larvae of the crustacean *Gnathia maxillaris*, adults of which live in the gravel of the

Corkwing wrasse, *Crenilabrus melops*.

aquaria. The wrasse were evidently removing these nocturnally-active parasitic larvae from their hosts.

It is doubtful, however, to what extent Potts's observations are referable to natural conditions. The fish associations of this aquarium—mackerel, black sea bream, red sea bream, plaice, ballan wrasse and corkwing wrasse are mentioned — are unlikely to be found in nature. The evident abundance of the praniza larvae of *Gnathia maxillaris* is also possibly an artefact of aquarium life. If anything, these observations suggest that even in temperate waters some wrasse species have a tendency to enter into a symbiotic cleaning relationship with other fishes. In free-living conditions this tendency may well remain mostly latent, but in the aquarium the adaptable, and opportunist, feeders such as *Crenilabrus* and *Centrolabrus* may take advantage of the opportunity to clean other fishes.

It is noticeable that most of the cleaners described among tropical (and the New Zealand) wrasses have contrasting dark markings, a condition which has led to the suggestion that cleaner fishes have distinctive "guild mark" coloration. Both the temperate European species which Potts has shown can act as cleaners have distinctive dark markings on the sides of the body. Other wrasses in British waters have similar dark contrasting markings either during their juvenile stage or throughout life. It would be worthwhile investigating whether they too act as cleaners, for whether they too act as cleaners.

TUMOUR VIRUSES

Origin of New Isolate

from our Cell Biology Correspondent
RD114 virus is a C-type RNA virus which contains 60–70S single stranded RNA and reverse transcriptase. It is liberated from RD114 cells which have a human karyotype and which were derived from a tumour induced in a kitten by inoculations of RD cells. RD cells were in turn derived from a human rhabdomyosarcoma; they have been adapted to continuous growth in culture and they do not liberate detectable C-type particles. This is, of course, a familiar story to anybody who has followed the search for human RNA tumour viruses, and the question of whether or not RD114 virus is of human origin or a feline virus or even some

recombinant human/feline virus is still open. What is known is that the antigens and reverse transcriptase of RD114 virus are not related either to the antigens and enzyme of feline leukaemia and sarcoma viruses nor to the antigens and enzyme of primate (woolly monkey and gibbon) C-type RNA viruses.

In an attempt to throw light on the question of the origin of RD114 virus Todaro *et al.* (*Proc. US Nat. Acad. Sci.*, **70**, 859; 1973) obtained RD cells from McAllister who, with his colleagues, isolated them as well as RD114 cells and RD114 virus and transplanted them into NIH Swiss mice that had been immunosuppressed with antithymocyte serum (AT). The immunosuppression, of course, allowed the human RD cells to grow in a heterologous species. The tumours that developed in immunosuppressed NIH Swiss mice inoculated with RD cells could be explanted and grown in culture or passaged in further mice.

Todaro found that a cell line established from a third generation transplant tumour liberated a C-type virus. RD cells as noted earlier do not liberate C-type viruses, and NIH Swiss mice have a low incidence of leukaemia and have never been reported to produce C-type viruses even though some viral information is expressed. What then is the origin of this virus, called AT124, which is liberated by RD cells after passage in NIH Swiss mice and how if at all, is it related to RD114 virus?

AT124 virus proved to have a host range comparable with that of RD114 virus. Both viruses grow well in cat, primate and human cells but fail to grow in murine cells including NIH/3T3 cells. AT124 virus, however, contains murine virus reverse transcriptase, or to be more precise reverse transcriptase sensitive to inhibition by antiserum raised against murine reverse transcriptase, whereas the reverse transcriptase of RD114 virus is not related by any known criteria to feline virus reverse transcriptase. AT124 virus particles also contain the group specific antigenicity unique to murine C-type RNA viruses, whereas RD114 virus particles do not contain the corresponding feline antigenicity. Finally AT124 virus can act as helper for the replication of murine sarcoma virus.

These data clearly indicate that AT124 virus is quite closely related to the murine leukaemia viruses; indeed it is possible that AT124 virus will prove to be an endogenous virus of NIH Swiss mice. A second explanation of the origin of AT124 virus is, however, more attractive. Todaro and his colleagues found that ten other sorts of human tumour cells could be transplanted into NIH Swiss mice but none of the tumours that arose in the mice liberated C-type virus. Neither do chronically immunosuppressed NIH Swiss mice liberate C-type particles. These observations in-