

metal base for support. After the necessary openings are made in the egg shell according to conventional procedures, eggs are placed in contact with the rubber disc and the chorioallantoic membrane is dropped by pushing the button on the air valve which controls the source of vacuum. An air space of uniform size is formed rapidly and may be visualized continuously during the process in the beam of the candler. The size of the air space does not increase if the valve button is depressed for an extended period of time.

The advantages of using this apparatus are the following: (a) simplification of an exacting technique which may be performed by personnel with minimal experience, (b) greater control and uniformity in the dropping of the chorioallantoic membrane and the formation of the air space, (c) an increase in the number of eggs that may be processed per unit of time, and (d) the minimal cost of materials required to assemble the apparatus.

INTESTINAL FLORA OF SOME ANTARCTIC BIRDS AND MAMMALS¹

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Observations of apparent sterility of the feces of antarctic birds and seals were made from 1908 to 1912 by workers, such as Ekelöf, Gazert, and Pirie, and in later years by McLean (Australian Antarctic Expedition, Sci. Rep., Ser. C, VII, 1919) and Bunt (Proc. Linnean Soc. N. S. Wales, 80, 44-46, 1955). None of these workers mentioned culture methods other than aerobic plates, and crude anaerobic techniques. Only one microscopic examination of feces was described (Bunt, 1955). The methods employed were definitely inadequate to establish sterility.

During the course of a brief biological survey in the Ross Sea area of Antarctica in January and February of 1957, bacterial cultures were prepared from the large intestine, rectum, and feces of several native birds and mammals. These were an Adelie penguin, a South Polar skua, and two Weddell seals from McMurdo Sound, and an Adelie penguin from Cape Hallett. All of these had been feeding exclusively on fish, except for the skua, which had been feeding on seal meat. No bacteria were found growing in cultures incubated aerobically at 37 C or 55 C on nutrient agar, nutrient agar plus 0.5 per cent glucose, eosin-methylene-blue agar, or sea water agar plus 0.5 per cent glucose enriched with an extract of seal colon contents. The specimens were not sterile, however, since numerous bacteria were visible microscopically and shake cultures

in glucose agar showed abundant growth and gas formation.

Isolations were not made, but upon returning to Montana State College a frozen specimen of large intestine contents from a Weddell seal was given to Dr. L. DS. Smith for examination. From this were isolated several cultures. Of the organisms representing the eight most common colony types, four were found to be strains of *Clostridium perfringens*. Two of these strains were sufficiently virulent to produce fatal infections in guinea pigs on intramuscular inoculation. These virulent strains were found to be of type A on the basis of their toxin production. Of the other organisms one strain was identified as *Clostridium sordellii* and one as *Clostridium difficile*. The other two strains were not identified, although one was quite similar to *Clostridium setiense* which has previously been isolated from oysters by Prévot and Raynaud (Ann. inst. Pasteur, 70, 51, 1944). Many other species were probably present but no effort was made to isolate them.

The observation that only anaerobic bacteria could be cultivated from the intestinal contents of these animals and that Sieburth (J. Bacteriol., 77, 521-531, 1959) found anaerobic bacteria in all the antarctic birds from which aerobic bacteria could not be cultured may help to explain earlier reports of apparent sterility. There is, however, at least one other possibility which must be considered. This is the antibiotic effect of the algae in the digestive tract of the shrimp

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which make up a large share of the diet of antarctic birds and mammals during part of the year. Sieburth's study leads to the conclusion that if the intestinal tract is free of bacteria, it is probably due to diet, which is governed by species, time, and place. Such birds were not observed in his studies, however.

Whatever the cause for apparent sterility may

have been at the time of the earlier observations, the results obtained led to the conclusion that antarctic birds and mammals were unique in this respect. This was an unfortunate conclusion since adequate observations on the fecal flora of seals and fish-eating birds in temperate and tropical areas relatively free from human contamination are not available for comparison.