soot particles was noted in the control experiments when saline was substituted for plasma.

In the course of incubations carried out for periods of from 3 to 192 hours, it was demonstrated that the degree of elution of polycyclic aromatic hydrocarbons from soot by plasma paralleled the elution of these compounds by nonpolar solvents (petroleum ether and ether) from activated alumina.

The carcinogenic implications of the elution of 3,4-benzpyrene from soot by plasma proteins warrant review. In urban air, pollutants have been shown to inhibit ciliary action so that abnormal deposition and retention of soot particles occur. Phagocytosis of soot particles occurs, and the elution of benzpyrene from the soot by the intracellular proteins results in abnormally high local concentration of desorbed polycyclic aromatic hydrocarbons, including 3,4-benzpyrene. An environment favorable to the biological activity of the carcinogenic hydrocarbons results.

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Tests for Digestion of Algal Polysaccharides by Some Marine Herbivores

Although algae form the primary diet of many marine animals and digestion of some components of algae in the gut is apparent from an examination of the changes undergone during passage in the gut, it is of interest to know whether the enzymes of the gut, or of the glands attached to it, digest the algal constituents. Purification of some of the algal carbohydrates (*1*) has made it possible to study digestion of these substances by extracts of the gut wall. The gut extracts of three herbivorous forms in Monterey Bay were therefore tested for their ability to digest several algal carbohydrates.

In each case the gut, thoroughly washed with sterile sea water, was ground with sand in chilled buffer at a *p*H equivalent to that found in the gut as well as at *p*H values slightly to either side of it. After incubation of the extract and carbohydrate (under toluene) for a period of time which varied from 4 or 5 hours to 1 day, the quantity of reducing sugar released during digestion was tested by the Somogyi method (*2*). In all cases the blank, consisting of the sum of the reducing sugar of gut extract in buffer and of a mixture of the test carbohydrate in buffer, was subtracted from the reducing sugar found in the mixture of carbohydrate, extract, and buffer in which digestion was occurring. Because the rate of digestion is affected by temperature, preliminary tests were made to ascertain the optimal conditions for digestion when digestion of a substance occurred readily, and the same conditions were then provided in other cases.

Intestinal extract of the purple sea urchin, *Strongylocentrotus purpuratus,* proved incapable of digesting laminarin and fucoidin, although previous experiments (*3*) indicated its ability to digest iridophycin. A bacterial suspension from the gut of the urchin, however, digests the entire algae and their various constituents.

Puggetia producta, the kelp crab, while apparently omnivorous, eats algae in aquaria, when starved. Tests with extracts of its digestive gland showed it to have a potent amylase which quickly digests starch and glycogen but has no action on laminarin, fucoidin, agar agar, carragheenin, and a *Gigartina* polysaccharide. Failure to find positive results in these cases might have been due to improperly designed experiments, but the positive results obtained with *Cryptochiton* extracts on some of these polysaccharides, when similar techniques were used, makes it seem probable that the crab does not digest these constituents by virtue of its own enzymes if, indeed, these constituents are digested in its gut at all.

In the giant chiton, *Cryptochiton stelleri,* the digestive tract extract was found to have a very active amylase which readily digests starch and glycogen (*p*H 5.8 for the "stomach" extract and *p*H 6.8 for extract of the intestine). Tests showed that the chiton stomach extract digested the algal polysaccharides laminarin and fucoidin and that the extract of the intestine affected the first but not the second; digestion proceeded at a reasonable rate, comparable to that for digestion of starch and glycogen in some cases, somewhat more slowly in others. Since the action of the intestinal extract was less marked, tests with it were discontinued. However, the extracts of stomach were ineffective on cellulose, agar agar, iridophycin, carragheenin, and sodium alginate.

It is therefore possible that many of the algal constituents are not digested by herbivores and are passed out as part of the "roughage" of the diet. Certainly, when some marine herbivores are abundantly supplied with food in aquaria, they pass feces which contain many portions of ingested algae still colored and intact (*3*). They may therefore be able to use only the more readily available materials such as protein and floridean starch (in red algae), which are present in small amounts, necessitating intake of a large bulk of algae. However, young growing tips of algae contain a large percentage of proteins (*4*), and after feeding of proteins to some marine forms, the content of nonprotein nitrogen in their body fluid rises markedly (*3, 5*). On the other hand, it is also possible that bacteria in the gut of many marine herbivores digest constituents of the algae which the herbivore is unable to digest. While microbes capable of digesting various algal polysaccharides can be isolated from the gut and are sometimes present in large numbers (*3, 6*), they may occur as contaminants, and it is difficult to be certain that they perform this role. Even bacteria in the vertebrate rumen are able to digest some algal polysaccharides (*7*).

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