Charcoal and «dialysis» are almost as old as civilization itself. The ancient Greeks and Romans were really «dialyzing» in their hot baths many centuries before the first dialytic apparatus was developed, although they were not fully aware of what they were doing or why it worked. Early attempts at renal care followed the Greco-roman period; hot baths were used to remove urea from patients. The hot water made the patient sweat profusely and, with the skin acting as a natural membrane, toxins would diffuse into the bath water. Another natural membrane used to eliminate toxic substances from the blood was the bowel. «Bodies that are to be purged must be rendered fluent... If the matters purged be such as should be purged, the patient profits and bears up well. If not, the contrary» advises Hippocrates (1, 2) in his famous «Aphorisms» (Fig. 1). Regimen and purging were used not only as a form of treatment, but, also, of maintaining health throughout the Hippocratic treatises. In our era the only natural membrane still used in nephrology and continuously gaining in popularity, is the peritoneum (3).

It is also interesting to note that the Scottish chemist Thomas Graham (4) was the first to use the term «dialysis» in modern medical literature (1854). In his paper «On Osmotic Force» he described the experiment of the movement of various types of solutes with different concentrations through a bovine bladder membrane (Fig. 2).

**THE USE OF CHARCOAL**

According to Herodotus (Fig. 3) the use of charcoal was known to the ancient Egyptians (5), but it is not known when the production of charcoal for domestic cooking, heating, metallurgical, glass-making and therapeutical purposes, originally began. The smelting of metals from their ores was practiced before 4000 B.C. when charcoal must have been the only material capable of producing the high temperatures

**ABSTRACT:** According to Herodotus, the use of charcoal was introduced in ancient Egypt; however only in 1773 Carl Wilhelm Scheele utilized it for adsorbing gases. Finally, Hippocrates Yatzidis in 1963 demonstrated its binding capacity for toxic substances of endogenous or exogenous origin and used it for hemoperfusion systems.

**Key words:** Charcoal, Hippocrates Yatzidis, Hemoperfusion
necessary. It has long been used as an adsorbent and as a first-aid treatment measure, but it was not until 1773 the greatest organic chemist of his time Carl Wilhelm Scheele (6, 7) employed it for adsorbing gases. The adsorbent properties of charcoal were studied 20 years later by Lowitz, and this knowledge was enthusiastically propounded about in 1830 by Touery, a French pharmacist (8). When his theories were questioned, he demonstrated his faith in them in a manner unlikely to be followed by modern clinicians. At a meeting in the French Academy he swallowed several times the lethal dose of strychnine, together with 15 g of charcoal. He remained unaffected by this heroic experiment, yet it did not impress the medical profession. Charcoal was then only occasionally used until it was introduced into clinical practice (8) for enterotoxin-induced diarrheas.

On the other hand, recent experimental studies (9, 10) showed that while charcoal’s adsorptive ability is high for many toxic substances of endogenous or exogenous origin in the blood, it is much less in the intestinal fluid. The difference seems to be due to a rapid absorption by charcoal of the intestinal fatty acids, which cover rapidly the surface of carbon granules and reduce its adsorptive capacity, especially for most of the known “toxic” substances.

Following systemic in vitro studies, it was demonstrated that some gommes constitute strong sorbents. Among them, a straight chain polymer of mannose derived from the seeds of ceratonia siliqua tree (locust bean gum) was proved very efficient to absorb urea, creatinine, uric acid, ammonia, phosphate and sodium chloride from the intestinal fluid of patients with advanced chronic renal failure. Prolonged intake of locust bean gum was well tolerated and patient showed no apparent toxic side effects. The only symptom noted was a laxative effect.

**HEMOCARBOPERFUSION**

The limited effect of oral charcoal in chronic renal failure, despite its significant adsorptive capacity, led the team of professor Hippocrates Yatzidis (9-14) to the use of charcoal in a hemoperfusion system. The technical aspects of this system were described at the first meeting of the European Dialysis and Transplant Association (9, 10).

Hemocarboperfusion (14) is a simple method for direct removal of various substances from the blood stream. It has been found to be effective in advanced renal failure (12) and in intoxication by many drugs (11). However, nephrologists still have reservations about the routine use of hemocarboperfusion in the treatment of chronic renal failure. The main reason seems to be the appearance of certain side effects,
such as a temporary drop of blood pressure, pyrexenic reaction, chills, thrombocytopenia, and charcoal fragmentation. All these side effects are of great importance when repeated treatment is needed, as in the case of terminal renal failure. Professor Yatzidis' blood charcoal depurator (12-14) consists of a polystyrene clepsydra-like case and two large nylon filters (Figs. 4, 5).

Hemocarboperfusion has been found to be effective for removing creatinine, uric acid, phenols, guanidine, organic acids, and possibly some other nondialysable substances. However, its adsorbing capacity is negligible on urea, electrolytes, and water. Therefore, it must be combined with renal hemodialysis or ultrafiltration and new forms of charcoal with higher absorptive capacities (13).

**CONCLUSION**

The historic review of charcoal from antiquity to artificial kidney is not purely of academic interest. The scientific work of using hemocarboperfusion with orally administered sorbents has not been in vain. Some of these sorbents (encapsulated carbon and oxidized starch) effectively remove urea, ammonia, potassium, or phosphorus from the gastrointestinal fluids (15-19) and their combination with hemocarboperfusion could lead to an alternative treatment for advanced renal failure and intoxification by many drugs.

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