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# EDITORIAL

The role of nutrition in human acid-base homeostasis has been a subject of controversial discussion for almost a century. Although physiological research has shown that, in healthy humans, homeostatic mechanisms and the high capacity of the kidney to excrete acid prevent any directly measurable diet-induced alterations in blood pH that could have effects on health, a large number of diseases have been proposed to be a consequence of diet-induced disturbances in acid-base metabolism. This supplement takes up the controversy and tries to provide a scientific basis for a critical reevaluation of the link between diet and acid base homeostasis. Different areas of acid-base balance in mammals, of which most are attended with misconceptions and misunderstanding are covered. In particular the external balance of acids and alkali but also the contribution of bone buffering in metabolic acidosis are the subject of scientific review.

The physiology behind acid-base homeostasis is complex. It is based on simple physicochemistry as expressed by the Henderson-Hasselbach equation, but becomes quite complicated when the different body compartments and their biological buffering systems are taken into analysis. The key problem is that no easy measure to determine the actual acid-base status of an individual exists except when metabolic disturbances cause significant changes of blood pH and blood gases as found in cases of acute or chronic metabolic or respiratory acidosis or alkalosis. However, these severe and life-threatening conditions can rarely be brought into connection with the human diet and the alimentary intake of acid and alkali. But, as experimental studies suggest, even measuring blood pH in combination with blood gas analysis may not be sufficient in assessing acid base homeostasis since it can be in disequilibrium without any significant changes in extracellular pH or buffering capacity. In view of the controversial discussion on the role of diet in acid-base balance, the question arises of whether a diet-induced net retention of acid in a body compartment occurs and whether this has any further health-impairing effects.

In healthy humans fed diets that induce up to a 10-fold increase in urine net acid secretion, changes in plasma pH are barely detectable, thus, confirming the text book knowledge of a full compensatory balance. Similar studies in experimental animals challenged with a net acid load confirmed these findings but demonstrated also that an increased net acid excretion persisted even when dietary acid load was stopped while plasma acid-base parameters remained unchanged. This strongly suggests a net retention of acid in a body compartment and raises questions of whether this transient disequilibrium of acid intake and excretion without any detectable changes in blood pH and total $CO_2$ has biological consequences such as secondary effects for example on calcium homeostasis and bone mineralization. Experimental studies provided here in this supplement will address this issue on the cellular level.

A large body of epidemiological and experimental studies have demonstrated that nutrition has an important impact on the occurrence of various degenerative diseases. There is strong scientific evidence that a diet rich in fruits and vegetables is very protective against a wide variety of human diseases. Such a diet provides a high intake, for example, of vitamins, minerals, trace elements, secondary plant metabolites and fiber and almost every component in such a diet has been discussed to contribute or to be responsible for the health-promoting effects. However, a diet rich in fruits and vegetables usually also provides a surplus of base and therefore one may ask whether diet-induced alterations in acid-base balance have to be considered as addi-

tional factors in disease prevention. During recent years this question was taken up by various research groups, who have produced good scientific evidence for considering acid-base metabolism as another important facet of the dietary intervention for disease prevention.

In the autumn of 2000 an International Symposium on Acid-Base Metabolism, Nutrition – Health – Disease was held at the Technical University of Munich, Life and Food Science Center in Weihenstephan. This conference brought together scientists from Europe and the USA to present the newest results and discuss the impact of nutrition on acid-base balance. We are pleased to be able to bring the latest findings on acid-base metabolism and diet with this Special Issue of the European Journal of Nutrition to a wider readership and hope to stimulate further research on this topic of nutritional sciences.

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