

## Commentary: Acute kidney injury after cardiac surgery—Is the “-omics” way the right way?

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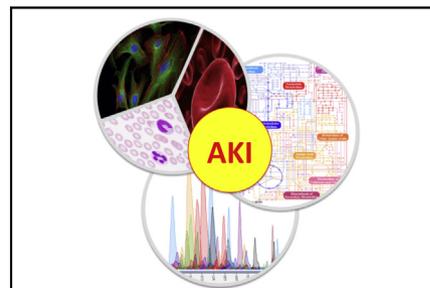
Acute kidney injury after cardiac surgery (CS-AKI) has been the subject of an intense research activity in the last 2 decades. Its role in worsening the patients’ prognosis after heart surgery is well established.<sup>1,2</sup> Despite existing data about acute kidney injury, the quest for the Holy Grail of early diagnosis and effective treatment is ongoing.

In this issue of the *Journal*, Shen and colleagues<sup>3</sup> conducted ionomic analysis on 261 patients who underwent cardiac surgery. Urinary ionomics has been used to identify patients at high risk for the development of acute kidney injury after cardiac surgery. Shen and colleagues<sup>3</sup> present an index, termed in the article the *urinary ion index* and derived from mathematical and statistical elaboration of such data, that able to discriminate with a good performance those patients who will have CS-AKI develop.

As with the genome, proteome, and metabolome, it is possible to define an “ionome,” the mineral nutrient and trace element composition of an organism that represents the inorganic component of cellular and organismal systems. This is a dynamic network of elements that are controlled by the physiology and biochemistry of the human systems, which are ultimately controlled by the genome and by the response to environmental solicitations.<sup>4</sup>

The ionomics approach presented in this article can yield a new point of view for CS-AKI. Unavoidably, however, it presents a partial picture of this pathologic condition. Indeed, cardiac surgery and extracorporeal circulation represent a strong perturbation for the entire system; in response of a such perturbation, all biologic systems have a natural trend to the equilibrium, closely related to the pre-surgical functional status of the subject.

It is clear that the complex nature of the systems interaction in human beings can be evaluated entirely only by a holistic approach realized with all “-omics” procedure



The -omics and acute kidney injury (AKI).

### Central Message

The application of “-omics” could open new horizons in the fight against acute kidney injury after cardiac surgery.

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applications. In a general -omics perspective, the increased risk of CS-AKI should be framed in the whole health history of the patient, including the prenatal and perinatal periods, because many perinatal perturbations could change kidney functionality, and this alteration could remain unrevealed until a dramatic event in the patient’s later life stresses the kidney function.<sup>5</sup>

The correlations between -omic subjects should be also taken into account. There are critical potential relationships between element and molecular alteration, and a proper approach should consider the networking of the different classes of molecules operating in human systems.

Ionomics can give a lot of information about some mechanism of CS-AKI, and this study in our view will start a rich line of research. All the -omics approaches—metabolomics, proteomics, genomics, and also ionomics—can be considered a new holistic way to identify the subset of patients at higher risk of development of postoperative complications, making it possible to perform tailored interventions.

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