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EDITORIAL

IMPORTANCE OF HYDRATION IN RENAL HEALTH

Dr. Tommaso Bochicchio Riccardelli

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Hydration and the kidneys are very closely associated. Renal function is critically dependent on hydration status due to the high flow and pressure requirements necessary to maintain glomerular filtration, good tube functioning and adequate urine production. At the same time, and as a result of this, it is the kidneys that control hydration status, understood as the constancy of the intracellular volume (water balance) and the extracellular volume (sodium balance).

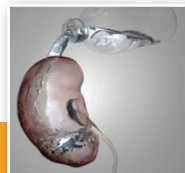
Adequate hydration prevents a series of common kidney conditions, such as renal lithiasis. The formation of stones in the urinary pathways depends on abnormal concentration of salts, normally calcium salts, and the formation and growth processes are critically dependent on urinary volume. Similarly, good hydration habits can decrease the prevalence of urinary tract infections, constipation, cephalgia and other conditions.

Hydration plays an important role in preventing kidney damage secondary to medication or potentially nephrotoxic substances that can cause acute kidney injury of varying severity. Some of the best examples are administration of radiology contrast medium and medications such as anti-inflammatories and various antibiotics, in which dehydration is a well-recognised risk factor.

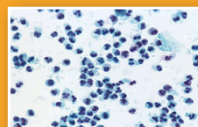
Chronic dehydration due to fluid intake deficit must be understood in terms of water balance. It is very important to assess risk factors such as ambient temperature, access to fluids, risk conditions, physical exercise, pre-existing illnesses, etc. One topic currently under intense study as a factor in chronic kidney damage is Mesoamerican nephropathy. In this condition, exposure of individuals to exhausting agricultural work in very high ambient temperatures, as in some parts of Central America, is associated with progressive and irreversible chronic kidney failure in which chronic dehydration is a recognised factor.

The possibility that water intake is associated with the progress of kidney disease is under investigation. Evidence suggests that higher water intake, as a preventive measure, may decrease glomerular filtration loss in adults. Further studies are needed to determine whether slight improvements in the rate of renal function decline can be attributed to fluid intake. In any event, there is clinical and experimental evidence to show that antidiuretic hormone levels (through copeptin measurement) is a condition associated physiopathologically with the genesis and perpetuation of kidney damage, including patients with polycystic kidney disease.

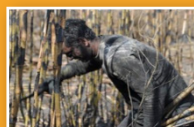
PROPHYLAXIS



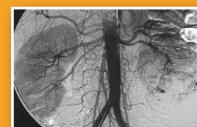
**URONEPHRO
LITIASIS**



**URINARY
SEPSIS**



**EXTREME
CONDITIONS**



**KIDNEY LESION
NEPHROTOXIC**



**POLYCYSTIC
DISEASE**



CIEAH NEWS

SYMPOSIUM "IMPORTANCE OF HYDRATION IN KIDNEY TRANSPLANT RECIPIENTS"

The CIEAH will be taking part in the symposium "Importance of Hydration in Kidney Transplant Recipients". The symposium will take place as part of the XXII Congress of the Mexican Society of Transplantation, which will be held in the city of Santiago de Querétaro, Mexico, from 17 to 20 October 2018.

More information:
<http://www.smt.org.mx/index.html>

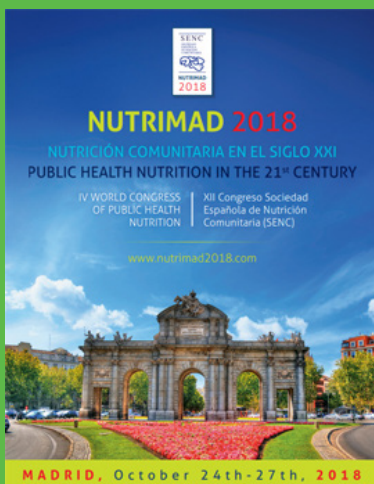


CIEAH EVENTS

SYMPOSIUM "HYDRATION AND HEALTH"

The CIEAH is organising the symposium "Hydration and Health" as part of the XII Congress of the Spanish Society of Community Nutrition (SENC), alongside the IV World Congress of Public Health Nutrition, which will be held in Madrid from 24 to 27 October 2018.

Más información
<http://www.nutrimad2018.com/>



HEALTH PROFESSIONALS CORNER

MANAGEMENT OF THE HYDRATION STATUS IN PATIENTS WITH CHRONIC KIDNEY DISEASE

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Chronic kidney disease (CKD) is determined by progressive and irreversible loss of renal parenchyma that can occur in a wide range of nephropathies. It is classified in five stages, phases or categories according to the estimated Glomerular Filtration Rate (eGFR).^{1,2}

Fluid balance is the term that describes the balance between water gains and losses. Gains come from food sources and ingested water, while losses are determined mainly by urine production and to a lesser extent by insensible losses (perspiration, respiration, faeces, etc.). In normal conditions, fluid homeostasis is achieved through brain mechanisms, the suprarenal glands and the kidneys. Thirst and secretion of aldosterone and antidiuretic hormone stimulate water intake and water and sodium reabsorption in the distal segments of the nephron.

Managing and controlling water volume must be an ongoing "goal" in renal and non-renal diseases at any stage that present with abnormal hydration status (HS) and for patients with CKD on renal replacement therapy, haemodialysis or peritoneal dialysis, or with renal transplant. To achieve this, clinics must continually assess HS. Normal HS (**euhydration**) indicates the absence of excess extracellular fluid volume (ECV) in a stable dynamic balance with the intercellular fluid volume (regulated by physiological mechanisms), while excess extracellular fluid volume indicates **overhydration** and ECV deficit is a sign of **dehydration**. Tissue adaptive capacity, or compliance, allows broad non-linear variations in fluid excess in the case of overhydration, but with dehydration these variations are very limited. That is, vo-

lume overload is better tolerated, whereas a relatively low fluid loss can endanger a patient's life.^{3,4}

Today there is a simple, accurate, quick, repetitive, non-invasive and inexpensive method to determine HS: Bioimpedance Electrical Analysis (BIA). Bioelectrical measurements provide information that can be critical for clinical assessment of patients. Two of these measurements are total tissue fluid content and body cell mass (BCM). The ratio between them, total tissue fluid content/BCM, determines and defines hydration, i.e., HS.

These principles are applicable to all patients with abnormal HS, normal kidney function or CKD at any stage. In these cases, patients must be returned to correct HS, indicated by **correct weight** and determined by normal extracellular volume, euhydration-euvolemia.

References

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3. Moore FD and Boyden CM. Body cell mass and limits of hydration of the fat-free body: their relation to estimated skeletal weight. *Ann N Y Acad Sci*. 1963;110:62-71
4. Guyton, AC, *Textbook of Medical Physiology* 7th Ed. Philadelphia, P.A. WB Saunders Co. 1986.

HYDRATION SCIENTIFIC LIBRARY

NEPHROPATHY LINKED TO GLOBAL WARMING

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Climate change has caused a significant rise in global mean temperature in the last century and has been associated with significant increases in the frequency and severity of heat waves. It has also been increasingly connected to detrimental human health. One of the consequences of climate-related extreme heat exposure is dehydration and volume loss, leading to acute mortality from exacerbations of pre-existing chronic disease and from outright heat exhaustion and heat stroke.

Recent studies have also shown that recurrent heat exposure with physical exertion and inadequate hydration can lead to chronic kidney disease. In the next 100 years, climate change and resulting water shortages are likely to affect a wide range of health issues associated with dehydration and heat stress, with risks increasing for cognitive dysfunction, malnutrition, water-borne infectious diseases, chronic kidney disease and other conditions.

A study directed by researchers of the Faculty of Medicine of the University of Colorado, in Aurora (USA), has shown

that global warming is causing an increase in the number of cases of chronic kidney disease in rural areas worldwide. Published in the «*Clinical Journal of the American Society of Nephrology*», the study shows a correlation between the increased prevalence of chronic kidney disease in various locations and dehydration and climate-related heat stress. A new type of kidney disease, occurring throughout the world in hot areas, is linked with temperature and climate and may be one of the first epidemics due to global warming. The risk for heat stress nephropathy has increased as a consequence of global warming and the increase in extreme heat waves, and this is having a disproportionate impact on vulnerable populations, such as agricultural workers. Decreasing precipitation is exacerbating this epidemic by reducing the water supply and water quality as temperatures rise.

This is the situation in areas such as Central America (Guatemala, Nicaragua, El Salvador) and Asia (Sri Lanka, Thailand), where there is a high prevalence of kidney disease mainly among people who harvest sugar cane and rice in high temperatures. These patients have minimal proteinuria in the ab-

sence of an active sediment, with biopsies revealing tubulointerstitial fibrosis and glomerulosclerosis. Attempts have been made to link this condition, known as Mesoamerican nephropathy, to toxins, pesticides, silicon and heavy metals, but no clear association has been found. However, evidence suggests that recurrent dehydration may play a role in this condition. Kidney damage appears to be a consequence of the recurrent increase in plasma osmolality, which triggers the release of vasopressin and activates the polyol pathway. Vasopressin exerts a harmful effect because it causes a haemodynamic change and oxidative stress on mitochondria. In addition, the polyol pathway increases the production of fructose that is metabolised in the proximal tubule, re-feeding on oxidative stress and resulting in greater inflammation. Thus it ends up causing chronic inflammation and tubulointerstitial and glomerular fibrosis. Frequent rehydration of these workers with sugary drinks only makes the situation worse by adding fructose as the key substrate of the damage.

In this context, epidemiological and clinical studies need to be carried out to document the presence of these epidemics and their magnitude and make health policy in the affected regions with greater emphasis on community interventions through actions to improve working conditions and ensure adequate hydration among the population.

References

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WEBSITE NEWS

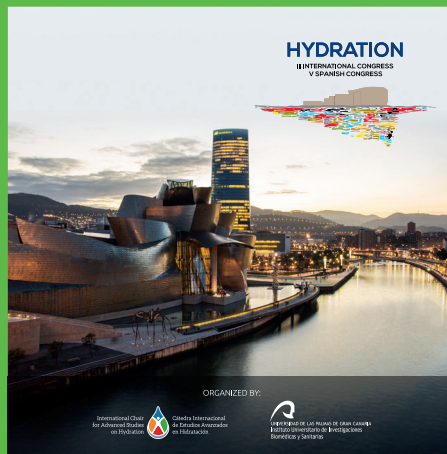
INTERVIEWS WITH EXPERTS IN THE MULTIMEDIA CONTENT SECTION OF OUR WEB SITE

The CIEAH is pleased to make available the videos of the interviews of invited experts at the **III INTERNATIONAL V SPANISH HYDRATION CONGRESS**, held in Bilbao from 13 to 15 May 2018, and the **EXPERT MEETING ON “HYDRATION AND SUSTAINABILITY”**, which took place as a pre-congress activity.

We have the opportunity to hear **Dr. Lluís Serra Majem**, Director of the International Chair for Advanced Studies on Hydration (CIEAH), and **Dr. Javier Aranceta Bartrina**, Chair of the Organising Committee of the III International V Spanish Hydration Congress, as they sum up the **highlights of the congress and the meeting of experts**.

We can learn more about the **importance of hydration in renal health** with **Dr. Tommaso Bochicchio**, Member of the Science Advisory Board, CIEAH. **Dr. Dolores Corella**, Professor of Preventive Medicine and Public Health, University of Valencia, talks about **nutrigenetics and hydration**.

Dr. Adam Drewnowski, Director of the University of Washington Center for Obesity Research, explains the relation between **nutritional balance and hydration**, and **Dr. José Jaime Sadhwani**, Member of the Science



Advisory Board, CIEAH, talks about one of the most important challenges of our society: **the future of water**.

Among the Experts who participated in the **Meeting on “Hydration and Sustainability”**, we have the chance to hear **Dr. Javier Benayas del Álamo**, from the Department of Ecology, Autonomous University of Madrid, talk about **access to water** and the Sustainable Development Goals.

Dr. Eloy García Calvo, Director of the IMDEA Water Research Institute, and **Dr. Gilberto Martel Rodríguez**, from the Department of Water, Technological Institute of the Canary Islands, help us to understand aspects of the **water footprint and efficient use of water**.

Speaking about the exciting world of **aquaculture and sustainable development**, we have the opportunity to hear **Dr. Lidia Esther Robaina Robaina**, Researcher at the ECOAQUA Institute, University of Las Palmas de Gran Canaria, and the finishing touch of this series of interviews is provided by **Dr. Teresa Sebastián Ortiz**, from the EcoDesign Department at ECOEMBES, as she explains **sustainable packaging** and its characteristics.

You can access all the interviews on our website at :

<http://cieah.ulpgc.es/en/scientific-knowledge/multimedia-content>

WHAT'S NEW?

SPECIAL ISSUE OF NUTRIENTS: “HYDRATION AND HEALTH: SCIENTIFIC EVIDENCE AND RECOMMENDATIONS”



nutrients

In the same way that Evidence-Based Nutrition (NUBE) was developed following the concepts of Evidence-Based Medicine (MBE), CIEAH aims to encourage the development of **Evidence-Based Hydration (HIBE)** by providing the best available scientific evidence to support the relation between hydration and health. As an emerging discipline in the field of NUBE, the Evidence-Based Hydration seeks to provide the best scientific evidence, taking into consideration a range of approaches (clinical, epidemiological, physiological, dietary/nutritional, community, business and catering) from all sources of hydration

and their relevance to the varying needs of the human organism. The interest created in NUBE in general and HIBE in particular, driven by the CIEAH and the Spanish Society of Community Nutrition (SENC), aims to address this diversity of approaches, helping to improve the quality of hydration research. The goal is to support health professionals, vulnerable populations and the general public by promoting an adequate level of hydration in a context of healthy lifestyle, while not losing sight of the social challenges around efficient use of water that must be tackled.

The objective of the special issue is to publish papers detailing the multidisciplinary aspects of hydration with regard to health, functionality, quality of life and sustainability. The key idea is to compile, through this special issue, a profile of all the topics presented at the III INTERNATIONAL V SPANISH HYDRATION CONGRESS, held in Bilbao, Spain, in 2018.

More information:

http://www.mdpi.com/journal/nutrients/special_issues/hydration_health