



**INE** | INSTITUTE OF  
NUTRITIONAL  
ENDOCRINOLOGY

# Micronutrients: Chloride

**Dr. Ritamarie Loscalzo**

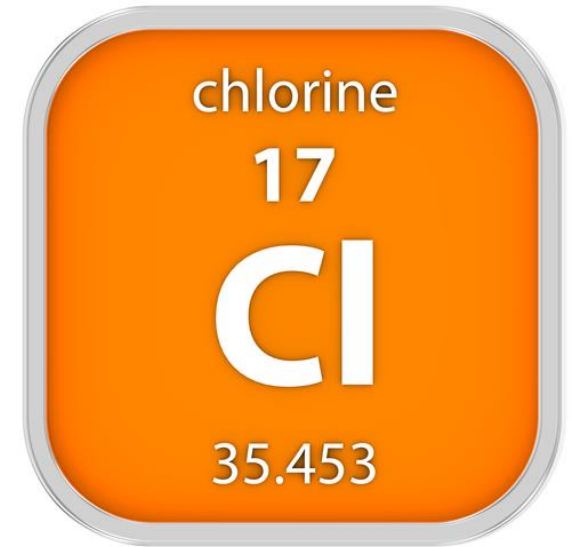


**Medical Disclaimer:** The information in this presentation is not intended to replace a one-on-one relationship with a qualified health care professional and is not intended as medical advice. It is intended as a sharing of knowledge and information from the research and experience of Dr. Ritamarie Loscalzo, [drritamarie.com](http://drritamarie.com), and the experts who have contributed. We encourage you to make your own health care decisions based upon your research and in partnership with a qualified health care professional. This presentation is provided for informational purposes only and no guarantees, promises, representations or warranties of any kind regarding specific or general benefits, have been or will be made by Dr. Ritamarie Loscalzo, her affiliates or their officers, principals, representatives, agents or employees. Dr. Ritamarie Loscalzo is not responsible for, and shall have no liability for any success or failure, acts and/or omissions, the appropriateness of the participant's decisions, or the use of or reliance on this information.



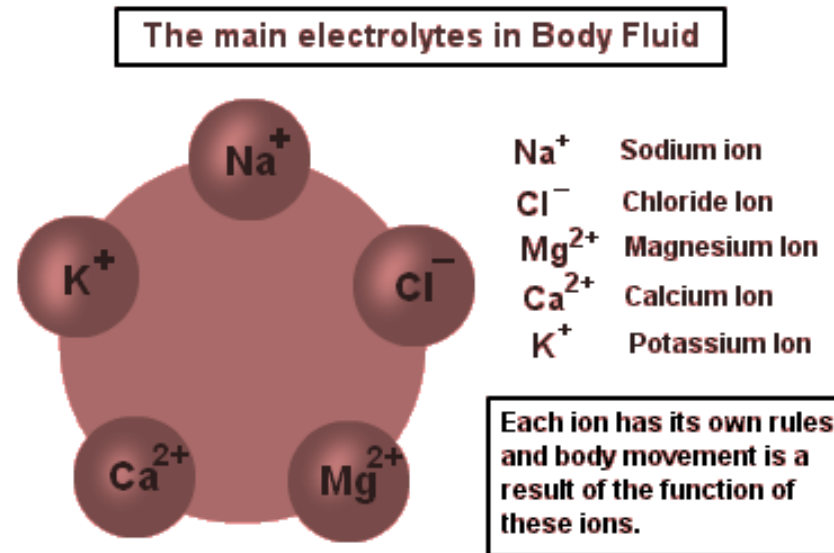
# Chloride General Info

- ✓ An electrolyte
- ✓ Involved in electrolyte balance
- ✓ Most abundant anion in body (93%)
- ✓ 88% extracellular
- ✓ Formed when the element chlorine gains an electron or when a compound such as hydrogen chloride is dissolved in water or other polar solvents.
- ✓ Usually associated with sodium
- ✓ Negative charge neutralized sodium's positive charge



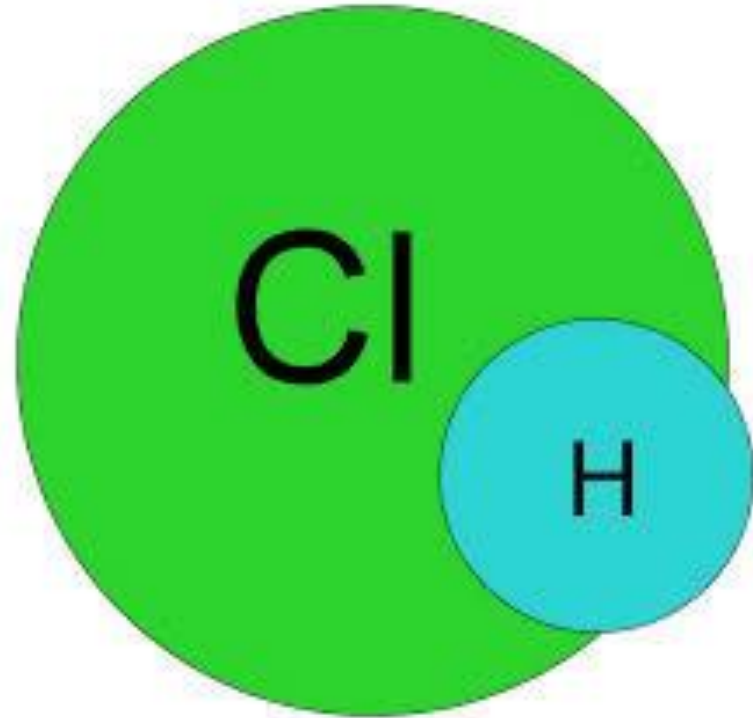
# Chloride as an Electrolyte

- ✓ Chloride is an anion
- ✓ An electrolyte is a salt or ion that is electrically-charged and moves to either a **negative (cathode)** or **positive (anode) electrode**:
- ✓ Ions that move to the cathode (**cations**) are positively charged
- ✓ Ions that move to the anode (**anions**) are negatively charged



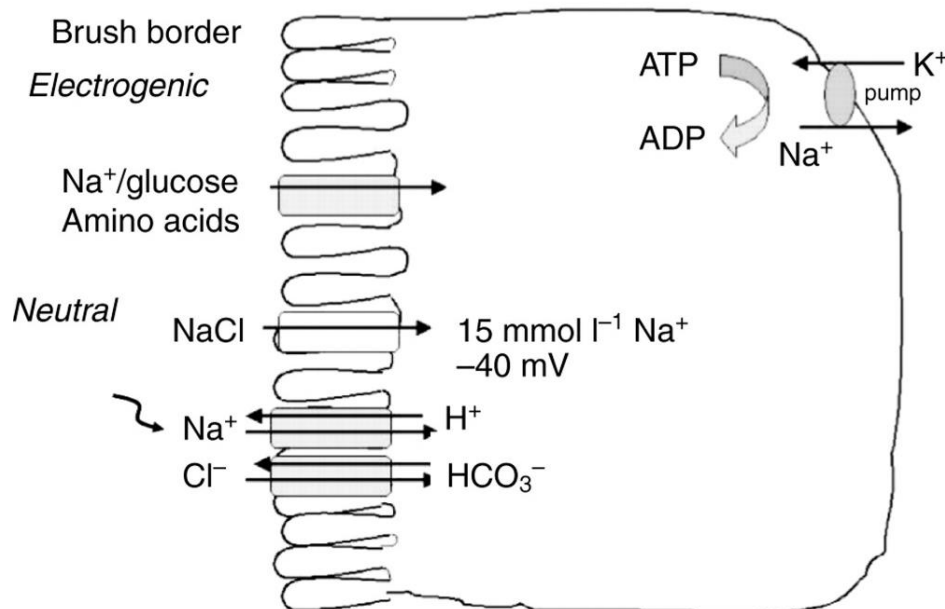
# Chloride Functions

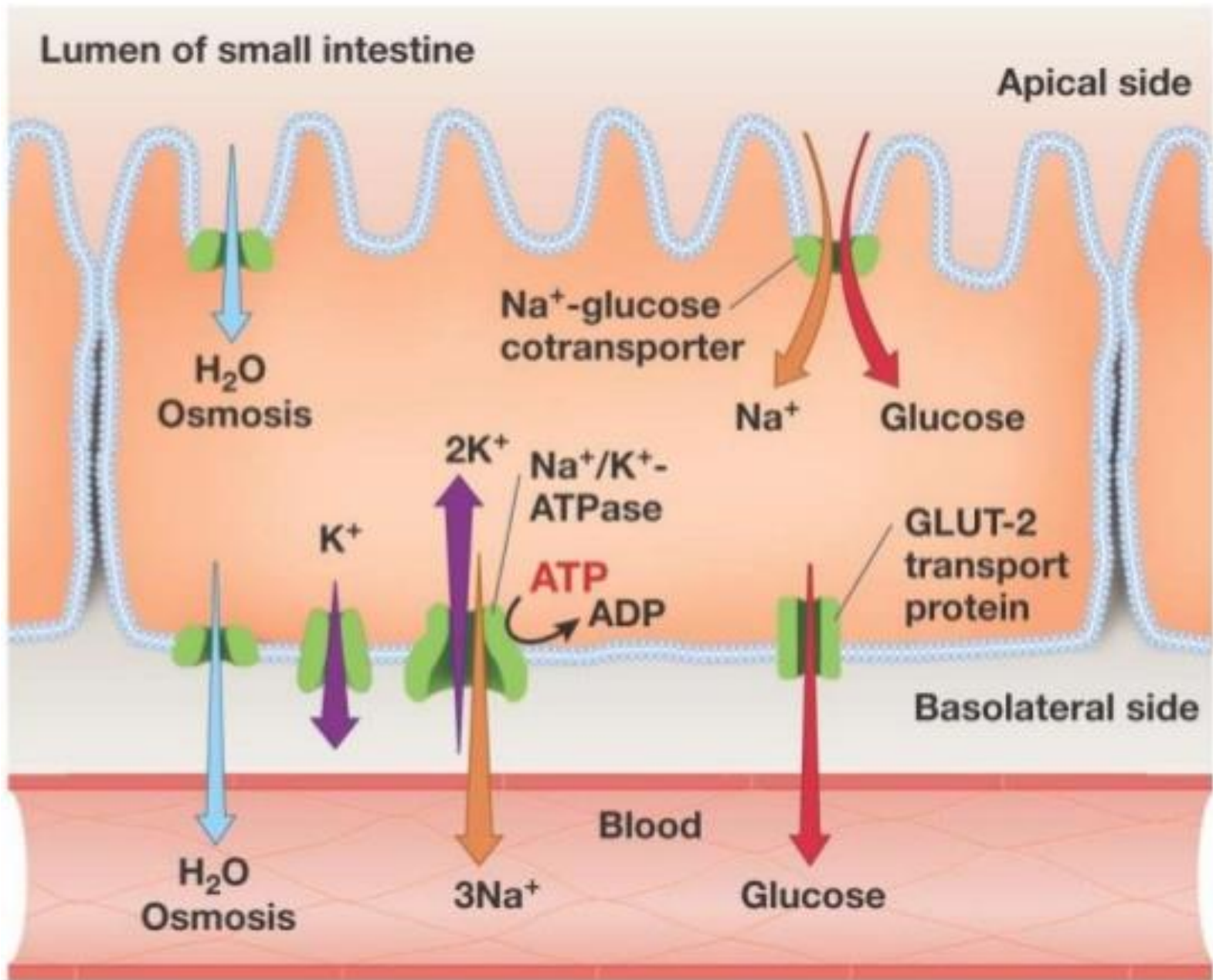
- ✓ Major electrolyte
- ✓ Ph balance
- ✓ Part of hydrochloric acid (stomach acid)
- ✓ Assists in phagocytosis
- ✓ Exchange anion for bicarbonate
- ✓  $\text{HCO}_3^-$  in red blood cells – in oxygen exchange
- ✓ Helps maintain proper blood volume,
- ✓ Helps maintain proper blood pressure



# Chloride Absorption

- ✓ Almost 100% absorbed in small intestine
- ✓ 3 major absorption pathways in intestine
  - **Na<sup>+</sup> – Glucose cotransport system:** follows NA passively through a paracellular, tight junction pathway
  - **Electroneutral Na<sup>+</sup> and Cl<sup>-</sup> cotransport system:** Small amount of CL absorbed this way
  - **Electrogenic sodium transport system:** follows sodium in this route



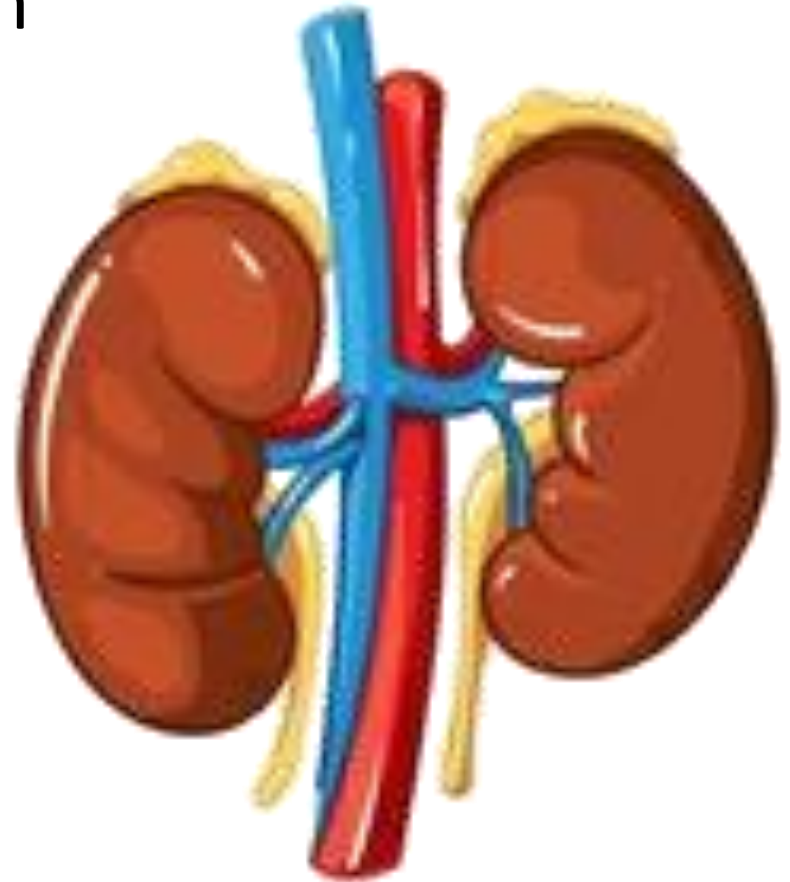


Copyright © 2008 Pearson Benjamin Cummings. All rights reserved.



# Chloride Excretion

- ✓ Small amount of excretion through three routes
  1. GI Tract
  2. Skin
  3. Kidneys (major)



# Causes of Chloride Deficiency

- ✓ Extensive sweating
- ✓ Prolonged endurance exercises
- ✓ Vomiting
- ✓ Diuretics
- ✓ Excess ADH (Anti-diuretic hormone)
- ✓ water overload
- ✓ wasting conditions
- ✓ extensive bodily burns with sequestration of extracellular fluids.



# Symptoms of Chloride Deficiency

- ✓ Alkalosis possibly as a result of excessive loss of sodium
- ✓ Muscle weakness
- ✓ Loss of appetite
- ✓ Irritability
- ✓ Dehydration
- ✓ Profound lethargy



# Adequate Intake of Chloride

Life Stage   Gender	Chloride Dosage   Day
Infants 0-6 mths	0.18* g
Infants 7-12 mths	0.57* g
Children 1-3 yrs	1.5* g
Children 4-8 yrs	1.9* g
Girls 9-13 Yrs	2.3* g
Boys 9-13 Yrs	2.3* g
Females 14-18 Yrs	2.3* g
Males 14-18 Yrs	2.3* g
Females 19-50 Yrs	2.3* g
Males 19-50 Yrs	2.3* g
Females 50-70 Yrs	2.0* g
Males 50-70 Yrs	2.0* g
Adults older than 70 Yrs	1.8* g
Pregnant Women 14-18 Yrs	2.3* g
Pregnant Women 19-50 Yrs	2.3* g
Lactating Mothers 14-18 Yrs	2.3* g
Lactating Mothers 19-50 Yrs	2.3* g



# Food Sources of Chloride

- ✓ Table salt
- ✓ Sea salt
- ✓ Seaweed
- ✓ Rye
- ✓ Tomatoes
- ✓ Lettuce
- ✓ Celery
- ✓ Olives



# Medications That Deplete Chloride

✓ Diuretics

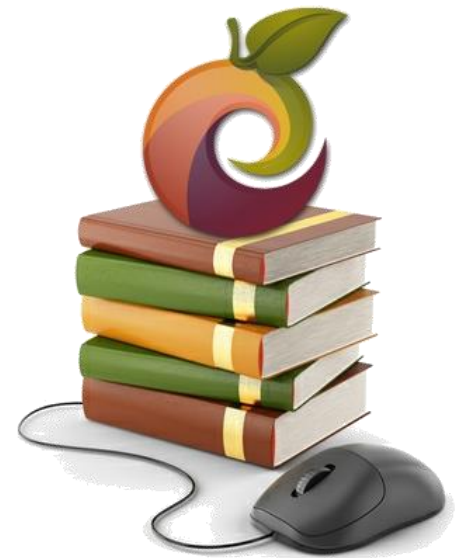


# Assessing Status of Chloride

- ✓ Serum level (100-106)
- ✓ Ratio to serum level of potassium and sodium
- ✓ Sweat
- ✓ 24 hour urine
- ✓ Diet journal
- ✓ Questionnaires and good history taking for signs and symptoms



# Resources



- ✓ *Advanced Nutrition and Human Metabolism – Gropper, Smith and Groff*
- ✓ <http://www.webmd.com/a-to-z-guides/chloride-cl>
- ✓ <http://www.traceminerals.com/research/chloride>

