HYPONATREMIA: DEATH BY WATER INTOXICATION

(1) When we think about death by water, we usually think of drowning. This is when water floods our lungs, preventing us from breathing air. However, there is another type of death by water that might be surprising to you; it's through drinking too much water. A poison is any substance that can cause a dysfunction in the body once it is consumed in large enough quantities. You might think that water is a harmless substance, but it can be a poison when too much of it is consumed. This condition is called hyponatremia, also commonly known as water intoxication.

(2) The symptoms of hyponatremia include nausea, vomiting, headache, confusion, lethargy, cramps, seizures, decreased consciousness and eventually coma and death if the case is severe enough. Many of these are neurological symptoms, meaning that it affects the nervous system, which includes the brain.

(3) How does drinking too much water cause these symptoms? The key isn't actually the water, it is the salt, or electrolytes, in your body. A healthy body has a balanced concentration of electrolytes, but when excess water is added, these electrolytes become diluted in the large amount of water. Hyponatremia literally means lack of salt. Water itself likes to move from an area of low electrolyte concentration to an area of higher electrolyte concentration within the body. As more water is consumed, it first gets dumped into the blood and dilutes the electrolytes in the blood. When these electrolytes become very diluted, then the place that has a higher concentration of electrolytes becomes the tissues surrounding the blood vessels. Since water prefers to move towards places with a higher concentration of electrolytes, the water will migrate, through a process called osmosis, from the blood into the tissues. The tissues will swell and expand to accommodate the extra water. So far, none of this seems life threatening, however, neuronal (brain) tissue is a different matter. The brain is the only organ encased within bone, so if brain tissue swells, it has nowhere to go and begins to become squeezed within its casing. This swelling is called cerebral edema and can result in the neurological symptoms previously listed.

(4) You might think it would be difficult to become hyponatremic. All you have to do is avoid drinking too much water to prevent this, however, every year hundreds of people accidently die of hyponatremia. The most common cases involve exercise-associated hyponatremia. When exercising, athletes lose a lot of water through sweat, and try to replace this with water or sports drinks during and after exercise. It's estimated that up to one sixth of marathon runners can become hyponatremic. Infants under 9 months old are also at risk of being hyponatremic because of their low body mass. It's easy for them to over consume liquids and if they are in distress, it's difficult for them to communicate this. People who use MDMA, a party drug commonly known as Ecstasy, can become hyponatremic. MDMA is often used during events with prolonged periods of energetic dancing, sweating and over-hydration. Also, people with certain psychiatric conditions, like psychogenic polydipsia, will feel a compulsion to drink large quantities of water, putting them at risk of hyponatremia. People who are unconscious in a hospital need to be cared for intravenously, meaning that they are delivered liquids and electrolytes right into their blood. If not monitored properly, they run the risk of developing hyponatremia. It is suspected that Andy Warhol, a famous artist, died due to hyponatremia after being admitted into hospital after routine gallbladder surgery.

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When admitted, he weighed 128lb and was given intravenous fluids during and after surgery. When he died shortly after, his body was 150lb which indicates that his body might have taken on a large volume of water. Sadly, there are also cases of death due to a form of child abuse that involves forcing children to drink excessive amounts of water and other liquids as a form of discipline and punishment.

(5) How much water is too much? Here are some examples. In 2002, 3 year old Rosita Gonzalez died when her babysitter forced her to drink 3 liters of water in a 4 hour period as a form of punishment. In 2007, 28 year old Jennifer Strange died after drinking 7.5 liters of water in a 3 hour period during a water drinking contest. In 2014, 17 year old Zyrees Oliver died after drinking 15 liters of water and Gatorade during and after a football practice.

(6) Treatment for mild hyponatremia involves restricting fluid intake until the body is able to remove most of the excess water in the urine naturally. It may also involve administering saline solution into the blood. Saline contains electrolytes to help restore the proper amount of salts in the body. Drugs like diuretics and vasopressin receptor antagonists can also be administered. Both of these drugs cause the kidneys to produce urine more rapidly and in greater volumes than it normally would. Healthy adult kidneys can produce 800mL to 1000mL of urine an hour, but these drugs will cause them to produce even more.

Article Questions

1) What do neurological symptoms mean and what are some neurological symptoms of hyponatremia?

2) How is brain tissue different from other tissues during hyponatremia?

3) The process of water migrating from areas of low electrolyte concentration to areas of high electrolyte concentration is called _____. _____ is the medical term for the swelling of the brain.

4) Why are athletes at risk of exercised-associated hyponatremia?

5) Why are infants under 9 months old at risk of hyponatremia?

6) How do diuretics and vasopressin receptor antagonists help counteract the effects of hyponatremia?