



Calculating Percentage of Saline Solutions for Biomedical Measurements

Introduction

We use the term “**tonicity**” to describe the relative concentrations of salts found in saline solutions. A saline solution is said to be “**isotonic**” if it has the **same relative concentrations of salts** that are found in **body fluids**, which ends up being approximately **9 grams of salts per liter of fluid, or 0.9% w/v**. A solution is said to be “**hypertonic**” if it has more solutes in solution than body fluids (i.e. concentration greater than 0.9%). Likewise, a solution is said to be “**hypotonic**” if it has less solutes in solution than body fluids (i.e. concentration less than 0.9%).

Electrode gels, pastes and creams must be **electrically conductive** in order to achieve their intended purpose of transducing biopotentials to recording instruments. Such products are made electrically conductive by adding salts to some form of solution, suspension, or colloid. The conductivity of a gel, cream, or paste relates directly to the concentration of solutes (i.e. salts) found in the solution. Some applications, such as recording the Galvanic Skin Response, require a hypotonic solution, so as not to adversely interfere with the underlying biological process being measured. Other applications, such as EEG or ECG recording, require strongly hypertonic solutions for best results, so that the electrical signals can be efficiently transduced to the recording instrumentation.

Method

To derive the 0.9% value (w/v) of isotonic saline, simply take 9 grams and divide by 1000 ml (1 L), and multiply by 100.

$$\text{ISOTONIC SALINE} = 0.9\% \text{ value (w/v)} = 9 \text{ grams salts} / (1000 \text{ mL distilled water})$$

In a more general sense, the percent concentration of solute in a solution is found by dividing the weight of solute by the volume of solution, and multiply by 100 to obtain a percentage.

EEG Application

For EEG applications, a saline solution with a concentration of approximately 2.5% works well. A solution of sodium chloride in water can be prepared very easily for use in EEG applications. To prepare a solution of 2.5% sodium chloride in water, simply take 2.5 grams of sodium chloride (e.g. table salt, non iodized) and dissolve it in 1 liter of water, or roughly 1 teaspoon of sodium chloride per 200 ml solution.

$$\text{EEG SALINE} = 1 \text{ teaspoon table salt} / 200 \text{ ml distilled water}$$

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