



DOSAGE & TOXICITY

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Understanding the principles of dosage and toxicity is essential to all of the biological and human sciences; therefore, it also is essential to skincare since it deals with human biochemistry. A lack of understanding of these principles can lead to improperly labeling as toxic ingredients that are beneficial when used in the proper doses. The same holds true for ingredients used in skincare. This paper will describe proper dosage and how it relates to toxicity in an effort to illustrate how many otherwise beneficial skincare ingredients can be mislabeled as toxic due to a lack of understanding of these principles.

Every natural substance that is used for therapeutic benefit also has a toxic dose. Even medications often found at a pharmacy or grocery store shelves have a dose at which toxicity occurs; however, if the dose being used is far less than the toxic dose, there is no problem. For example, Vitamin C (as well as some of the other compounds in citrus fruit) will cause diarrhea, stomach upset, and even vomiting, if ingested in extremely large amounts. While this might be toxicity, no one would suggest that vitamin C should never be used for therapeutic benefit.

All substances have what is termed an LD50. In medical toxicology, this is the dose that, when administered to a large group of animals (or humans), will cause lethality (death) in 50% of that group. To evaluate toxicity, one must compare the LD50 to the therapeutic dose. If the LD50 is less than the average therapeutic dose, then toxicity occurs before therapeutic effects and the substance should be avoided. If the LD50 is much greater than the therapeutic dose, then the substance is very safe and can be administered to a patient in large amounts without fear of toxicity. One such substance in this category is penicillin, which has an LD50 approaching infinity and a therapeutic dose that is much lower. If LD50 is very close to the average therapeutic dose, then the medicine must be managed carefully. For instance, Digoxin is a medicine commonly used for some heart conditions, congestive heart failure, and to regulate the heart rate. This medicine is very valuable for its therapeutic effects, yet it also can be toxic and should be monitored by a physician. However, to say it should never be used or to ban its use would be a great disservice to patients whose lives have been remarkably improved with the use of this medicine.

Propylene glycol (a botanical ingredient, sourced from vegetable oils – i.e. corn oil) is an example of a cosmetic ingredient that has been criticized. Propylene glycol is used in antifreeze and the fact that antifreeze is harmful when ingested is used to “prove” that this ingredient is toxic. The implication is that it should never be used on the body in any form. This is extremely misleading because Propylene glycol has usefulness in human medicine if used correctly and in proper doses. For example, compounding pharmacists commonly use propylene glycol as a “vehicle” for natural hormone therapy. The natural hormones (such as progesterone, estrogen, DHEA, or testosterone) are placed in a pharmaceutical base containing propylene glycol because it is one of the very best substances for increasing absorption of natural hormone through the skin. Other medicines used in topical form, such as NSAIDs (ibuprofen, naprosen and others), are also used with Propylene glycol because of the clear advantages obtained by making the preparation in this way. In fact, if Propylene glycol were not used, the medicine would not be absorbed effectively.

In sum, it is important to critically evaluate the labels of medicines, skincare products, and foods to determine the safety and efficacy of the ingredients used in these products. To evaluate correctly, a fair amount of knowledge about the ingredients is required. Additionally, the principles of dosage and toxicity are essential in understanding whether an individual ingredient is harmful or whether herapeutic benefit and has been simply mislabeled as toxic.