Grain and Synthetic Ethanol Production

**Grain Derived Ethanol:**
Ethanol can be manufactured from any carbohydrate source through the natural process of fermentation. In North America, the most common raw material for commercial scale production of fermentation grade ethanol is corn. Corn is mashed and the starch converted by enzymes to corn sugar. From there is it fed to yeast and fermented on an industrial scale to produce ethanol. The ethanol is removed at intervals and taken through a series of distillation steps to concentrate and purify the final product. The end result is high purity ethanol that can be used for food, pharmaceutical or industrial applications. Natural, grain derived ethanol is dehydrated using advanced molecular sieves. Through the physical process of removing water, 200 proof ethyl alcohol is produced.

**Synthetic Derived Ethanol:**
Ethyl Alcohol is produced synthetically from Ethylene. Ethylene is a basic chemical starting material for many two carbon molecules. For instance “polyethylene” is a polymer made from ethylene. Ethylene is derived on an industrial scale from coal, gas or oil. The creation and extraction of ethylene from these “pure” hydrocarbon sources is a story in itself. In our case, ethylene is derived from the process of “cracking” crude oil, a process where longer hydrocarbon chains are broken under temperature and pressure to create short, two carbon ethylene molecules.

Once the ethylene is isolated and purified it is subject to a process called “hydrolysis”. This means that water is added under temperature and pressure to create Ethyl Alcohol (a two carbon alcohol) from Ethylene (a two carbon hydrocarbon). Once the crude ethyl alcohol is produced it is put through a series of chemical processes to increase the yield and purity of the finished product. This process creates 190 proof (95%) pure ethyl alcohol, the balance being water. If 200 proof Ethyl Alcohol is desired then an “azeotroping” agent is added to break the ethanol-water bond and the water and the azeotrope is removed through a final distillation step to create pure, 200 proof Ethyl Alcohol.

**Is there a difference between grain derived and synthetic derived ethanol?**
Theoretically there is no difference between the two. A molecule of ethanol is the same no matter how it is produced. However, every production route (natural or synthetic) utilizing different raw materials (corn sugar or ethylene) and different equipment and processes (age and technology) will create different impurities in the finished product.

These impurities are found in the parts-per-million range (ppm) and are typically less then 0.002% (20 ppm). In the case of Ethanol if we measure purity to the third decimal place (99.998%) then we can begin to address the largest contaminants that are found (other contaminants being in the parts-per-billion range).
Therefore, small quantities of “trace” impurities can be used to identify the difference between grain derived and synthetic derived ethanol as well as between different production sites for this ethanol. This can only be done using sophisticated scientific instrumentation.

The largest contaminant for natural derived ethanol is methanol. It is typically removed with only trace amounts left in the product (less than 10 ppm = <0.001%). The largest contaminant for synthetic derived ethanol is isopropyl alcohol. It is typically removed with only slightly more left in the product (less than 25 ppm).

Other contaminants need very sophisticated equipment to isolate, identify and quantify them. In other words, they are at a level that is insignificant and below the normal detection limits of most scientific equipment. It is important to note however that these low level contaminants are completely “masked” when ethanol is denatured. Once this is done the other solvents added to ethanol “wipe out” any differences that are apparent or perceived.

In short, the difference between denatured ethanol derived from grain versus that derived synthetically is non-existent (negligible). The quality of the finished product is really a result of the purity of the denaturants and the purity of the starting material (ethanol).

This is why Pharmco Products Inc. and AAPER Alcohol offers a better choice. We are not only ISO9001: 2000 certified but we operate under Kosher, GMP and HACCP principles. Furthermore all our raw materials are tested to reagent grade standards. All our ethanol is tested to meet USP and ACS requirements, as are our denaturants. The finished product is also fully tested by our on-site lab prior to release.

For additional information visit our web sites at www.pharmco-prod.com or www.aaper.com or call our toll free number 800-243-5360 (Pharmco) or 800-456-1017 (AAPER) and ask for technical service.

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