

## **RANCIDITY VS. PURITY OF FISH OIL**

In follow-up to the general information we have provided on our Virgin Salmon oil and M.O.S.T. (Minimal Odor Superior Taste) quality fish oils, we are pleased to assist Doctors' Preferred with the following technical information about fish oil rancidity as provided by our Director of Quality Assurance, Ingjerd Lystad. As oxidation, rancidity, bad taste and bad odor are complex issues; the information will necessarily be a cursory review.

The biggest problem with deterioration in the quality of fish oil is rancidity. The main cause of rancidity is oxidation. The most common analytical assessments of oxidation are provided in terms of Peroxide Value(PV), Anisidine Value (AV), and Totox Value.

### **Peroxide Value (PV)**

It is generally accepted that the first compounds formed by oxidation of an oil are hydroperoxides. The usual method of hydroperoxide assessment is by determination of the Peroxide Value, which is reported in units of millimole of hydroperoxide per kilogram of oil (or expressed as milliequivalents of iodine per kilo of oil).

### **Anisidine Value (AV)**

The peroxides in an oxidized oil are transitory intermediates, which decompose into carbonyls and other compounds. This decomposition accelerates as the temperature is raised, and the PV of an oil may therefore be reduced or eliminated by heating the oil in the absence of oxygen. This is done as part of the refinement process. As a result of this refinement, however, there will be a lower level of natural anti-oxidants present in the oil. The peroxide decomposition products now in the oil may catalyze further oxidation, or alternatively, decompose and react further - giving rise to new off-flavor compounds.

A large portion of these non-volatile carbonyl compounds are formed by decomposed peroxides during the processing of a fish oil. This type of deterioration can be substantial in poorly processed fish oils, adversely affecting the future stability of the oil. The Anisidine assay measures the high-molecular weight saturated and unsaturated carbonyl compounds. The AV represents the level of aldehydes, principally 2-alkenals, present in the oils. **Please note that the natural lemon flavor we added to the products we manufacture for Doctors' Preferred will interfere with the Anisidine test result, causing it to be an unreliable test after we add the lemon.**

Since the Peroxide Value is non-linear in nature, meaning that it does not increase in a linear fashion over time, the Anisidine Value is a better indication of the freshness of an oil. Having said that, both measure specific oxidation values, which represent only two specific quality parameters of an oil.

### **Totox Value**

The Totox Value is used as a measure of the precursor non-volatile carbonyls present in a processed oil, plus any further oxidation compounds developed during storage. This value is determined by the following formula: Anisidine Value + 2PV.

### **Rancid Odor and Taste**

According to *Merriam Webster*, rancid is defined as: “having a rank smell and taste”. This is a definition we can all relate to. While an oil with high Peroxide Values and Anisidine Values tends to have strong odor and taste, so can an oil with low values. Again, oxidation is only one parameter in determining rancidity, and neither the PV nor the AV will provide a meaningful indication about the taste and odor of a fish oil. On the other hand, an oil with low odor and good taste will almost always have low Peroxide and low Anisidine Values.

We propose using Peroxide Values and Anisidine Values as important gauges, but only in the context of an oil that is not rancid (having no rank smell or taste). The specific limits we have set on our high quality oils are Peroxide Values of less than 3 when the oil leaves our factory, less than 5 before it is encapsulate, and less than 10 following encapsulation. Generally, the values are substantially lower than that.

The reason you can have low Peroxide and low Anisidine Values, and still have a rancid oil is that there are many more degraded components in fish oil that are created during decomposition, which do not show up in the PV and AV results. Various volatile oxidation products, such as dienals, are compounds that contribute to bad taste and smell.

While we could spend thousands of dollars per batch quantifying rancidity, the very best gauge is taste. The saying: “the proof of the pudding is in the eating” is very apropos as it relates to fish oil. If the oil tastes bad, it probably is bad. While we declare that a rancid taste indicates a poor quality oil, a fresh fish taste should not be construed as being bad. An example of a fresh fish taste is what you find in our Virgin Salmon Oil.

In conclusion, our M.O.S.T. quality fish oils offer a highly purified option for consumers concerned with rancidity and contamination – including oxidation. Similarly, our Virgin

Salmon Oil offers consumers a superior product in terms of freshness, source of material, and knowing the source of the oil and the waters the Salmon have been exposed to (these are Norwegian farm raised salmon in the North Sea Coast of Norway).

I trust the above will be of value to you and your colleagues as you evaluate our products, and consider the features and benefits they offer your customers.