From the desk of Mogens Eliasen, for immediate release

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The Dangerous (?) Vitamin A

Vitamin A is essential to our dogs as well as it is to us. However, in large overdose, vitamin A is seriously toxic. There are natural sources of it that can kill both a dog and a person… Those sources are very exotic, though. You will not run into them by accident when feeding a normal and balanced raw diet.

First some facts

What was discover as "vitamin A" more than a 100 years ago has later turned out to be the chemical retinol (and a whole family of closely related chemicals that easily are transformed into retinol in the body), which is naturally occurring in almost all kinds of food. The primary sources are liver and eggs, but also all other kinds of organ meat and fat contain fairly large amounts.

Later yet, it has been discovered than other important nutrients, like the famous β-carotene (the coloring agent in carrots) can transform into retinol in the body. This makes up an additional supply of the vitamin. β-carotene is very abundant in almost all vegetable matter.

The standard measure of vitamin A is the IU (= "International Unit"), which is defined differently from vitamin to vitamin. For vitamin A, 1 IU = 0.3 microgram retinol. When beta-carotene is measured, the IU is still used, and each unit refers to the amount of β-carotene that transforms into 0.3 micrograms of retinol in the body.

Dogs need about 50 IU per day per kg body weight, but the optimal level is 100-200 IU. That is 1,000-2,000 IU for a 22 lb dog. For a golden retriever at a weight of 60-70 lbs, a daily dose of 3,000-6,000 IU would be adequate. For therapeutic purposes, a level of 2-3 times as much is sometimes used with no ill side effects.

Vitamin A accumulates in the liver where its primary use is. It plays a major role in digestion and in many different aspects of the metabolism, including also the function of the retina (hence the name). Because of the accumulated storage in the liver, our dogs (and we) can live without vitamin A for several weeks at a time, provided we have a good reservoir built up. But it also means that we can overdose by continuously getting more than what the body can handle…

Getting the vitamin A toxicity straight

Dogs' ability to handle excess vitamin A is at least at the same level as the human level, possibly significantly greater, because they are evolved as carnivores with access to sources of vitamin A that are very concentrated: the liver of other animals.

Merck's Veterinary Manual (the "bible" on drugs) says this:

For older children and for adults, you need more than 100,000 IU per day for several months before you start to accumulate any serious toxicity.

For infants, a level of 20,000-60,000 IU per day over 4 weeks or more can cause observable toxic effects.

20,000 per day for an infant of 8 lbs. is about 5,500 IU per kg – which is about 10 times as much as the therapeutic dose mentioned for dogs. So, this gives us a margin of at least a factor 10. In other words: doubling or tripling or quadrupling the intake of vitamin A does not cause any danger. We need to get to at least 25-50 times a normal level before we will see any negative effect in our dogs. For a golden retriever, we would need to reach 165,000 IU per day over several months in order to observe any problems…

Sources of vitamin that could be a concern

Stedman's medical Directory further says this, specifically about dogs:

"Vitamin A is one of the two vitamins[1] in which oversupplementation can have negative effects. However, we have never seen a case of oversupplementation causing toxicosis, and in dogs, toxicity has been demonstrated only under experimental conditions. Toxic doses of Vitamin A could produce muscle weakness and bone abnormalities. Realistically, oversupplementation or toxicity is virtually impossible unless mega-doses are given for long periods of time (months to years)."

Dr. Aggraval provided these data in "Science Reporter, October 1999":

Food source	*IU Vitamin A per gram in the food*	*Possibly dangerous amounts for a golden retriever eating this food daily for 2 months:*
Beef liver	550	300 g (=2/3 lb)
Cod liver oil	600	275 g (= 10 oz.)
Seal liver	450	367 g
(Human liver)	(575)	(N/A)
Halibut liver oil	30,000	5.5 g (= one spoonful!)
Southern Elephant Seal liver	1,160	142 g
Arctic Huskies liver	10,570	16 g
Arctic Bearded Seal liver	12,000-14,000	12-14 g (=1/2 oz.)
Polar bear liver	24,000-35,000	5-7 g (= a finger-size piece!)

Generally speaking, the dangerous levels come from the livers of the top arctic predators. The famous examples are the liver from polar bear and from Inuit sled dogs. Polar bear liver contains about 24-35,000 IU per g. So, it takes no more than a single mouthful to reach some very dangerous levels...

[1] The other one is meant to be vitamin D, but also vitamin C is dangerous for *dogs*.

Cod liver oil (which is a traditional source of vitamins A and D) contains 600 IU per g - which means you have to get the dog to drink a large cup per day of it in order to achieve any poisoning...

Halibut liver oil tops the list with about 30,000 IU per g! 500 times as much as Cod liver oil. *That* would be something to worry about: a spoonful could be dangerous if given daily for a couple of months.

As always, when we attempt something *unnatural*, we need to justify it. "More of a good thing" is *not* better than "just enough of that good thing". Any deliberate overdosing of vitamin A is irresponsible. Dogs on a well-balanced raw diet have no way of developing deficiencies of vitamin A, as just one or two meals of beef liver per month will suffice for the supply the dog needs.

However, as I hope is illustrated by the numbers, a doubling or tripling of the intake of vitamin A is *not* going to bring anyone in danger. We talk about 25-50 times the optimal daily dose before we have clinical toxicity. You can feed liver once a week and still add some cod liver oil or other fish oil without any danger – except if you get halibut oil.

It is reasonable to assume that there is a balance point somewhere between the optimal healthy dose and the dangerous dose where the body starts to suffer from the excess. Since it is the logarithm of a chemical's concentration that determines its energy (and hence its potential for doing damage), we can expect that this balance point of "maximum dose that will do no harm" will be about 30% of the way from the healthy dose to the known clinical problem-dose. Translated to numbers, this means that we should expect it around a 10-time overdose. Once again - expecting it at a doubling or tripling is simply not justified, unless we have evidence to support it.

As the numbers show, vitamin A is not dangerous enough to warrant any fear for overdosing with traditional and commonly available supplements, like common fish liver oils. Unless, of course, this oil is artificially fortified with extra vitamin A - or mixed with halibut liver oil! And, because the toxic effects accumulate/average over time, it takes a consistent totally-out-of-balance diet to do real damage. A single meal or two will not do it - unless you feed exclusively polar bear liver….

We have enough to worry about - and vitamin A is not a worthy candidate, unless you are into outrageous or exotic things.

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