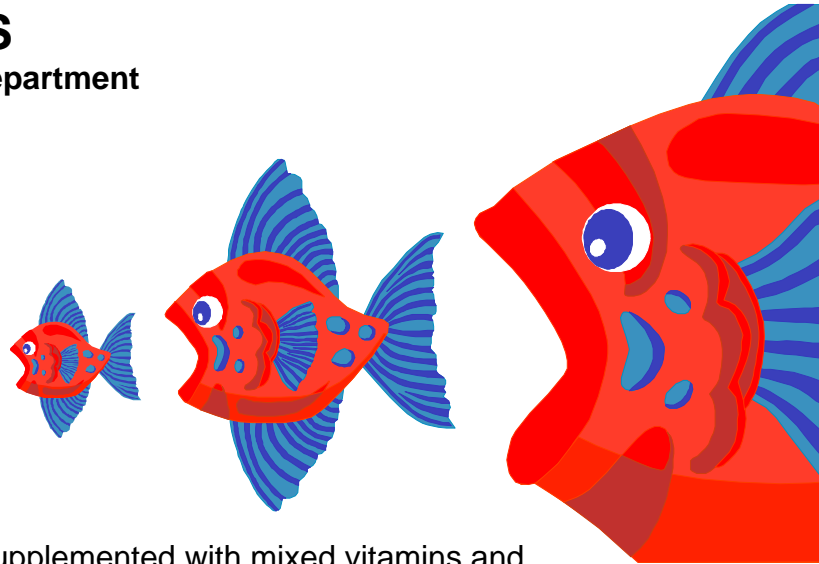


PROPER PISCIVORE PILLS

From of the Saint Louis Zoo Nutrition Department

**MULTI-
VITAMINS &
MINERALS??
Something
smells FISHY!!!**



Many piscivores (fish-eating species) are supplemented with mixed vitamins and minerals in captive feeding situations. There are lots of products on the market for this purpose. While this is absolutely necessary if animals are only being fed fillets (missing calcium/minerals from the bones) or eviscerated fish (missing vitamins from the liver and gut contents), animals that eat whole fish need only a couple of specific, supplemental vitamins: vitamins E and B1 (thiamin).

The polyunsaturated fats in fish (GOOD from a nutrition standpoint) also make them less stable, and more readily destroyed by oxidation (BAD from a nutrition standpoint). Vitamin E, a potent antioxidant nutrient present in fish tissues, can be used up in protecting these fats against oxidative degradation. We see lower levels of vitamin E in fish stored for longer periods of time – important because many of our feeder fish must be purchased seasonally and stored frozen. Lab studies show that a minimum 50 International Units (or IU) of vitamin E is needed per kg of fish consumed to protect against vitamin E deficiency.

Likewise, when a fish dies, its cells secrete thiaminase, an enzyme that starts the deterioration process – but also destroys thiamin. Different fish species have different levels of thiaminase activity; in feeding programs we add supplemental thiamin to all fish-based diets. The recommended level is 25 mg per kg of fish consumed.

On the other hand, vitamins A and D are found in high concentration in most fish liver (remember cod liver oil?), so adding additional supplements of these nutrients can lead to overdoses. Similarly, marine fishes (that have been properly thawed) contain adequate levels of salt – it's only when we water-thaw and/or feed fresh water species of fish that we might need to consider supplementing diets with salt.

Supplemental doses for different-sized animals vary depending on how much total fish is eaten daily. However, the same principles and concentrations apply across all species – mammals, birds, and reptiles – to balance out the known nutrients lacking in (frozen) fish-based diets. In the wild, foods aren't processed the same way, hence external supplements aren't needed – it's only when we've modified nature's food supplies that such additions are needed.