Pigeon Racing: Breast Muscles and the Fuels for Flight - Part 2

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In migratory birds, it is known that abdominal or "migratory" fat is distinguished from fat that collects beneath the skin ("winter" fat). Winter fat is used mainly for insulation against the cold. Migratory fat accumulates rapidly in large amounts just prior to migration, and is exhausted at the end of migration. These findings suggest that it is likely that the fat we build each week as fuel for racing in pigeons is of the "migratory" type, because of its rapid accumulation in the body cavity in the few days before shipping, and its subsequent utilisation during the race.

Of significance to fanciers was an important study by US scientists in 1967. The results revealed that intravenously injected glucose tagged with a radio-active label (attaching a radio-active label to the glucose allowed these scientists to follow the glucose and determine its fate in the body), was incorporated into fatty acids in the liver within three minutes in hungry young pigeons, and that the content of fatty acids in liver reached a plateau in 15 minutes. Significant appearance of fatty acids in blood and fat depots was seen first at 15 minutes after the injection, and their concentration rose continuously throughout the two-hour experimental period.

Obviously, the pigeons in this study were utilising glucose very rapidly in the production of fat -key information for our purposes. This study also confirmed the fact that the regulation of fat production in the pigeon occurs in the liver.

Incidentally, in less than two hours after feeding glucose, either as the sugar given in water, or after the conversion of starch from grains into glucose in the intestines, there is also rapid production of glycogen by the liver of birds. Some glycogen is stored by the liver and some is exported in the blood to muscles and other tissues as a source of energy. For example, glucose is the major source of fuel for the brain. So the feeding of carbohydrate-rich grains -wheat, oats, barley, maize -- is an important step in supplying glucose, which in turn is readily converted in the liver to glycogen and the important fatty acids, the key fuel for prolonged flight. Obviously, the use of glucose in the drinking water prior to shipping adds very much to this entire process.

Another important point to re-iterate in this discussion is that fat production by the liver of birds is greatly increased when levels of carbohydrate in the ration are high. So, if you feed high-fat grains in any amount -- grains such as peanuts or sunflower seeds, etc. -- especially toward shipping day, be sure that you also feed lots of cereal grains, eg, maize, wheat, rice, etc..

Now what is the role of **protein** in the racing bird? This is an important point because a number of fanciers continue to feed high levels of peas and beans as fuel for racing. Protein is highly important in the maintenance and repair of damaged muscle and other tissues. It is not an energy food and would not be used as such by the bird for flight except when all reserves of fat and carbohydrate are completely depleted. The bird that returns home days or weeks late with wasted breast muscles has likely had to resort to using the

protein of muscle as a source of energy -- hence the wasting. So much of the muscle has been used as a desperately needed source of energy that it may never return to normal. On the subject of using protein for the maintenance and repair of muscle, an interesting study done by Dr George in migrating Canada Geese showed that at the end of Spring migration, there was considerable damage and degeneration of the major breast muscles, likely as the result of the stresses of wear and tear that can occur during prolonged flight. These findings in migrating geese might just be applicable to racing pigeons after they have flown a race of any distance, but might be most important when races are tough. Perhaps any tough short or long race might result in similar degenerative changes in our racing birds. Thus, it would seem logical to me that the sooner these potentially damaged muscles are repaired and restored to normal, the sooner is the bird likely to return to good racing condition.

If high-protein grains are to be fed during the racing season for the repair and maintenance of muscles and other tissues for example, it seems logical then that they should be fed earlier rather than later in the week -- to allow for rapid repairs to possibly damaged muscle. Logically, repairs should come first, followed a bit later by a build-up of fuel for racing. This doesn't mean that fanciers can't use the traditional light to heavy feeding schedule to prepare birds for the next race, but it seems reasonable that any repair of damaged muscle should occur before that muscle is refuelled.

Recall also that feeding high levels of protein will decrease the amount of fat the liver is capable of producing -- another good reason not to feed high levels of protein at the end of the week toward shipping day. Because a number of the highfat grains such as peanuts, sunflower seeds, etc., fed toward shipping day, are also high in protein, I would suggest that they be fed in moderation, not as a cropful.

At the same time, we should be certain that the amount of carbohydrate in the diet is at a high level, ie, by the use of a high proportion of cereal grains, especially grains like maize, wheat, oats and rice, for example. Glucose or honey could be added to the drinking water to help supply the extra carbohydrate needed in the production of fat. (Note: Don't put glucose or other sugars in the water day after day. Use these sugars for only a day or two at a time, to prevent the growth of yeasts and mould in the crops of your birds, since these yeasts, etc. use the sugar as nutrients for their own growth, and can invade the wall of the crop at this time.) These measures would take advantage of the fact that when the level of carbohydrate in the ration is at a reasonably high level, increased dietary fat does not seem to interfere with fat production by the liver of birds.

One other intriguing but practical method to improve fat production in racing pigeons could be the use of the sugar fructose. Fructose is available as a powder and can be found in health food stores as well as grocery stores. Compared with table sugar, fructose may be expensive. Another practical source of fructose is honey which contains about 40% fructose and 30% glucose.

Why use fructose, when glucose seems to be the major sugar in the body of birds, the liver of which has a significant ability to convert glucose to fatty acids in a very short period of time? First, some background. Most grains, especially the cereal grains, contain a high per centage of starch, that, as we have seen, is a complex chemical structure composed of many individual units of the sugar, glucose. When the starch in grains is digested by pigeons, it is fractionated by digestive juices in the intestines into glucose, which is then absorbed through the intestinal wall into the blood stream and transported to the liver.

It is known that in birds, the absorption of glucose from the intestine into the bloodstream

far outstrips the absorption of fructose. However, if fructose is present, i too will be absorbed from the intestine of birds and transported to the liver where it is metabolised (utilised) rapidly. It is significant that the liver of birds is able to metabolise fructose very rapidly and efficiently, even if there are also high levels of glucose present as well. The rapid and efficient metabolism of fructose by birds is not hindered by simultaneously high levels of glucose as it seems to be in mammals.

Another key fact about fructose is that in birds, fat production from the metabolism of fructose exceeds that of all other carbohydrates collectively! Another highly significant point for us as pigeon flyers is that in birds, **the metabolism of fructose and its conversion to fat receive very high metabolic priority** - a key fact! This information offers another practical clue to the process of fuelling pigeons for racing-ie, use fructose to build necessary fat reserves, especially for the tougher distance events!

It seems to me that the use of fructose could be a major factor in rapidly rebuilding fat reserves in a pigeon as it races, say in a widowhood situaflon, for several weeks in a row. Maybe the problem of "picky appetite" and the concurrent need to rebuild fat reserves in widowers might be solved very nicely through the use **of fructose or honey** in drinking water. A racing widow/widower may have a capricious appetite at times, but the more dependable need for a drink of water, to which fructose can be added for a day or two, for example, might provide a partial answer for those birds with the touchy appetites.

Fructose could also be valuable in rapidly rebuilding fat reserves in exhausted birds when they return from a gruelling race, looking like shadows of the birds entered originally in the race. It seems to me that, in looking at these facts, it becomes evident that feeding high levels of carbohydrates in **general, and that** feeding simple sugars such as glucose and fructose specifically, could be highly valuable in rapidly building fat reserves in racing birds, virtually when we want them!!

Now, some general points about nutrition, plus some odds and ends:

We are told that breeding pigeons can do well on a diet containing 13-15% protein. One group of investigators found that when pigeons were offered cereals and peas free choice, the mixture chosen by the birds corresponded to a protein intake of 12.5-13%. However, these investigators also found that a ration containing 18% protein, obtained by adding soybeans or fish meal to the diet -- which add highquality protein -- resulted in optimum hatchability, growth and development of youngsters. They also found that levels of protein higher than 18% did not result in further improvement in growth and weight gains of youngsters. These findings indicated that a ration containing upwards of 18% protein, but not higher, should be ideal for breeding and rearing.

To achieve a ration of 18% protein means adding higher amounts of peas or beans to the diet. In my own situation, 1 use a ration of 25% peas (a mixture of green, white and maple peas, but only 5-10% maple peas because of their content of high levels of substances that interfere with the metabolism of protein). As well, 1 add 10-15% of a 28% protein pellet obtained locally, plus wheat, maize and safflower, all of which results in a ration of 17-18% protein. 1 find this ration to be ideal for breeding and rearing.

To be certain that the systems of both cocks and hens are nutritionally prepared for the breeding season, a change from the bland winter diet to a ration higher in protein needs to take place well in advance of the breeding season. Sheep breeders use a similar approach and apply the term "flushing" to indicate feeding a higher level of quality feed prior to the breeding season. According to one university poultry nutritionist 1 contacted, this dietary change in pigeons should be made about four weeks prior to pairing the birds. *To be continued in next month's "Journal"*