By Raymond Julien

A wide range of organisms including different species of algae, yeasts, and various species of bacteria are used in probiotics.It is known that probiotic bacteria can compete with and exclude disease-producing bacteria in the intestine, ie, probiotic bacteria actively prevent the colonization of potential disease-producing bacteria in the intestines by the production of lactic acid and by competing with the disease-producers for attachment sites in the intestines. As well, they may well stimulate immunity in the bird or animal; they may stimulate appetite and improve nutrition by the production of vitamins, by detoxifying compounds in the diet, and by the breakdown of indigestible components. There is more and more accumulating evidence that probiotics are effective in inhibiting a wide range of disease-producing bacteria and even some viruses in certain species of animals. Although probiotics may not cover all situations, they are nevertheless a more positive approach to controlling disease, compared with the overuse and misuse of antibiotics in the sport.

For those interested in competing in futurities, whether they are one-loft or multi-loft events, it is a good idea to get your birds on a good probiotic several days a week (mine are on a probiotic almost every day of the year), or a probiotic + apple cider vinegar well ahead of the breeding season and continue it in your YBs prior to shipping. Those receiving these YBs should also have them on a probiotic for the duration of the summer and into the racing season, much as Dr Karl Frank does with the Alberta Classic and Andrew Skrobot with the Le Tour races. (As an aside, several years ago, I used and began recommending plain yogurt to supply probiotic bacteria to pigeons. Later on, I read that the bacteria in yogurt did not colonize the digestive tract of pigeons very well, and that an avian source of probiotic bacteria was much better. However, in a very recent book from Europe, the author, a veterinarian, recommends the use of yogurt in addition to other sources of probiotic bacteria, to try to cover a number of situations that might occur in pigeons. So maybe yogurt is back in favor and could also be added to the drinkers or feed, at much reduced cost compared with the commercial probiotics.) I was asked this question by a veterinary colleague who uses a popular probiotic and races pigeons himself: `If you had your birds on a probiotic and an outbreak of disease such as paratyphoid or E. coli occurred, would you continue to rely on the probiotic alone, or would you intervene and treat the condition with an appropriate antibiotic?' My reply was that I would temporarily discontinue the probiotic, then treat with an antibiotic until the condition was eliminated, and then return to using a probiotic for the future.

Prebiotics

Prebiotics refer to a group of natural sugars such as oligosaccharides (`oligo' = little, scant or few; `saccharide' means sugar) that are resistant to digestion by the host animal or bird but are used exclusively by specific probiotic organisms, allowing them to compete with and thereby exclude disease-producing organisms in the intestines. Thus, prebiotics are nutrients for probiotic organisms. This may be another role for sugars such as glucose or fructose, in addition to the quick source of energy they provide for the birds themselves. One commercial product available for pigeons in North America contains mannanoligosacchari des; I note that Dr Frank uses a fructo-oligosacchar ide in birds in the Alberta Classic.

Immunostimulants

Immunostimulants are chemical compounds that aid in bolstering the immune system by activating white blood cells, and thereby may render animals and birds more resistant to infections by a variety of infectious agents. Included among these compounds are: vitamins, trace minerals, fatty acids, glucans, yeasts, and others such as lactoferrin (see `Whey'), chitin (which makes up the hard outer skeleton of creatures like lobsters and crabs), levamisole, probiotics, Spirulina, etc.. Vaccination is likely the best-known method of specific immunostimulation. It seems that the most promising and potent immunostimulants are the beta glucans, because they have a well-defined chemical structure and mode of action on the immune system. In addition, these compounds are non-toxic universal `alarm signals' that activate the immune system by the same basic mechanism in all groups of animals from the simplest invertebrates to humans. The beta glucans occur naturally in the bran of grasses such as common cereals used routinely in the loft. The bran of barley contains 7%, oats 5%, rye grain 2% and wheat, 1% beta glucans. Note that these levels are in the bran, not in the hull that can be removed with your fingers.

However, the richest concentrated source of beta glucans is found in the cell walls of common baker's or brewer's yeast (Saccharomyces cervisiae). Since fanciers have used brewer's yeast for decades, there is really no need to buy the much more expensive commercial sources of beta glucans. Regardless of the source, however, all beta-glucans are carbohydrates formed by a string of glucose units. When taken orally, they are then absorbed into the body through the intestines.

The beta glucans bind specifically to a receptor site on the surface of certain inflammatory cells (defensive cells) called macrophages (macro = large; phage = to eat; hence, macrophages are large cells that engulf, destroy and digest foreign material such as bacteria). These inflammatory cells play an essential and pivotal role in initiating and maintaining the immune response.

From an evolutionary point of view, macrophages are the oldest and most consistently preserved immune-competent cells known. In order to function in an immune capacity, macrophages must pass through a stage of activation that involves certain physical changes but also, most importantly, an entire sequence of metabolic or internal chemical changes. Activation can be initiated by a variety of different stimuli, such as endotoxins, bacteria, viruses, or chemicals. Beta glucans are not only effective orally, they are also completely nontoxic and safe, but are one of the most potent stimulators of the immune response known.

The receptor site for beta glucans on macrophages has been retained during evolution and is found in all animal groups from invertebrates to humans. There is now evidence to show that, from an evolutionary point of view, glucan is the most widely and most commonly observed macrophage activator in nature. When the receptor site is engaged by beta glucans, these inflammatory cells become more active in engulfing, killing and digesting bacteria, and at the same time, they secrete signal substances that stimulate the formation of new white blood cells.

In animals that have specific immune mechanisms (fish and animals higher on the evolutionary scale), in addition to non-specific defences, the activated inflammatory cells produce substances called cytokines that, in turn, also activate antibody-producing white blood cells. For this reason, beta glucans enhance the efficacy of vaccines. Because of the basic mode of action of beta glucans, products in this category affect a number of

different biological processes, including not only resistance to disease, but also growth, wound healing, repair of cells damaged by ultraviolet light, skin care, arthritis, etc.. Beta glucans are active not only when injected, but also when administered in the feed. (As an aside, it is interesting that for humans, t he U.S. Food and Drug Administration has ruled that cereal companies can make the claim that their products help to reduce the risk of heart disease in humans—but with certain stipulations. A serving must contain at least ¾ of a gram (a gram is about 1/30 th of an ounce) of beta glucan; the product must be used as part of a low-saturated- fat, low-cholesterol diet; and it has to contain no more than 3 grams of fat and no more than 1 gram of saturated fat. Many oatmeal and oat bran cereals and other products now meet the beta glucan and other qualifications as heart disease preventers. Clinical trials have even shown that the higher the beta-glucan content of the oat cereal (hot or cold), the greater the cholesterol- lowering effect. However, there is still only limited evidence that beta-glucans taken in pill form can have this cholesterol-lowering effect.)

Levamisole

This is a common wormer (Tramisol, Levasole, Ripercol, etc.) that in a dosage of 50 mg for 4 litres of water seems to have a useful effect in stimulating the immune system.

Vitamins, Minerals

Vitamins A, C, E and the trace mineral selenium are very important in the development and maintenance of the immune system. The use of a water-soluble multi-vitamin mix once or twice a week, plus a wide-ranging mineral mix containing selenium can supply these nutrients. A good livestock pellet is also a good source of these nutrients. Be aware that vitamins are powerful substances and a little goes a long way. A pelleted feed is also a good source of both vitamins and minerals. An inexpensive multi-vitamin product that is readily available in Canada is Polytonine A Complex. I would not recommend the Polytonine A Super Booster product because of the antibiotics it contains. Not too many organisms are sensitive to the penicillin-streptom ycin present in low concentration.

Vitamin preparations for birds don't often contain vitamin C (also called ascorbic acid) since most birds, except for some species of aviary finches, produce it in their kidneys. So during periods of stress (breeding, racing) you can add vitamin C crystals to the drinkers. Extra vitamin C appears to be especially useful in dealing with heat stress, and can be used ahead of races that occur during the hottest months of the year. In a study in chickens, the use of vitamin C was found to be highly useful in dealing with stress, and improving resistance to respiratory and E. coli infections.

Like vitamins A and E and the trace mineral selenium, vitamin C is closely involved with the immune system, so birds can be placed on a multi-vitamin mix plus extra vitamin C in the drinkers prior to and following vaccination or during an outbreak of disease. Use a teaspoon of vitamin C crystals per 4 litres of water.

Not only grit and oyster shell, but also a wide-ranging mineral mix containing the trace mineral selenium at officially approved levels - plus salt - should be available to the birds throughout the year. However, I find that many mineral preparations for livestock contain such high levels of salt (20-25% salt) that birds will avoid eating sufficient amounts of the mineral. My solution: I buy one bag of mineral that contains salt and another bag of salt-free mineral, both containing selenium. I mix one can of the salt/mineral mix with 5 or 6 cans of salt-fee mineral. This effectively lowers the salt content and encourages the birds to eat the mineral. Also, because antibodies that develop in response to vaccination

or exposure to a disease are composed of protein, young birds in particular should be on a ration of about 18% protein to ensure that they have a wide ranging supply of the essential and nonessential amino acids that make up proteins and thus, antibodies.

Dimethylglycine (DMG). (Also called vitamin B 15, and pangamic acid)

* DMG can increase oxygen utilization and thereby decrease lactic acid levels in animals under extreme stress.
* lactic acid values following training were significantly lower in DMG-treated horses than in untreated horses.
* in human research, it was found that DMG produced a 27.6% increase in the time it took trained athletes to become exhausted, compared with the use of a placebo (an inactive substance used to compare the effects of a substance being tested).
* DMG has been shown to enhance the immune response both by antibody production and generation of lymphocytes, a kind of white blood cell.
* DMG has been found to increase resistance to respiratory disease, enhanced athletic ability, reduced shipping stress, and general reduction of stress.
* In athletics, DMG has been found to improve performance, stamina, cardiovascular function, oxygen utilization, recovery of muscle, reduced buildup of lactic acid, improved resistance to disease, increased calmness and more settled disposition, and increased production of ATP.

Dosage for pigeons – no more than 2 level teaspoons of the pure product (not a product cut with glucose, etc.) for 4 liters of water.

Whey

Whey is the thin serum of milk that remains after the curd and cream have been removed, and is one of two major proteins found in milk (the other is casein). Whey is actually a very complex protein made up of many smaller protein subfractions called peptides. Many of these subfractions are found in very small amounts in cows' milk, usually at less than 1%. For example, one of the subfractions is lactoferrin which makes up approximately 0.5% - 1% or less of whey protein derived from cows' milk (whereas human milk may contain up to 15% lactoferrin) . The importance of lactoferrin is that it appears to be the subfraction of whey that has anti-viral, anti-microbial and immune modifying/enhancing effects.

Whey also contains a high level of the milk sugar lactose. The importance of lactose in pigeons is that it is a nutrient for a number of bacteria that make up probiotics, and aids in their production of lactic acid. Because a number of disease-producing bacteria such as Salmonella spp. (paratyphoid) prefer to exist in an alkaline environment in the intestines, the production of lactic acid by probiotics shifts conditions in the intestine to the acid side of normal and can drop the numbers of paratyphoid organisms by as much as 97% and more. Just as importantly, paratyphoid bacteria are unable to use lactose as a nutrient in their life processes, so the use of lactose in outbreaks of paratyphoid may be very useful to probiotic bacteria in their production of lactic acid.

However, when dealing with Young Bird Sickness (adenovirus + E. coli [?] + circovirus [?]) in which E. coli may be involved, I would not recommend the use of whey, simply because E. coli organisms actually use lactose in their life processes. In my view, it is important to avoid the use of whey if E. coli is suspected to be a part of Young Bird Sickness. To me, there is just no point in supplying food for a bacterial organism that may well be part of a major disease problem.

Apple Cider Vinegar

As an aid in shifting the normal alkalinity of the intestines to the acid side, apple cider vinegar (ACV) can be another help in reducing numbers of paratyphoid, E. coli and other potential disease-producing bacteria in the intestines. Some fanciers use a probiotic every other day and on the altenative days, ACV throughout the week.

The acidic taste of ACV often causes birds to back away from the drinkers, especially in the beginning stages of its use. At time such as this, I would not use it on shipping day, to insure that birds drink an adequate amount of water. However, I am told that once birds become used to it, there is no problem adding ACV to the drinkers on shipping day. Half an ounce to one ounce per gallon of water should be fine.

A general word of caution in the use of immune stimulants: It seems to me that there have to be limits to the amount of stimulation the immune system can handle before it collapses under the strain of attempting to respond to multiple stimulating products. For this reason, I'd suggest limiting the number of immune stimulants to only a few to avoid exhausting the system.

Other Products Used in the Loft

Carnitine

The main function of carnitine in muscle is to transport fat (in the form of fatty acids) into structures called mitochondria where it is metabolized (broken down) to carbon dioxide and water. During the production of carbon dioxide and water, a major energy-producing compound known as adenosine triphosphate (ATP), is produced. ATP provides the energy to allow the wings to beat on the average of 5 beats per second for the duration of the training toss or race, whether the distance flown is 50 or 500 miles or more. Since fat is the major fuel for sustained flight, it is highly important that it is transported efficiently into the mitochondria in muscle for the production of energy. Carnitine also appears to be useful in decreasing the rise in heat production during flight.

The best form of carnitine is L-carnitine – DON'T buy D-carnitine or combinations of D and L-carnitine! ! D-carnitine can be dangerous to use.

It appears that carnitine supplementation is beneficial in maintaining normal aerobic metabolism and in decreasing destruction of muscle during prolonged flight (studies at the University of Ghent, Belgium). Such supplementation in pigeons also improves the efficiency of the utilization of fat during heavy exercise.

Also in breeders, it was found that L-carnitine supplemented pigeons grew at a faster rate than those not supplemented. As well, the speed of growth rose from the first to the third round of youngsters.

Dosage : 90-100 mg per bird per day. For racing birds, Dr Warren Shetrone of California recommends 100 mg L-carnitine per bird Monday to Wednesday starting 3 weeks ahead of the first race + supplementation with vitamin C, iron, amino acids, niacin (a B vitamin) and magnesium. For breeders, he recommends the use of 100 mg L-carnitine per bird starting 3 weeks before pairing and throughout the breeding season.

Electrolytes

__`Electrolyte' is a medical/scientific term for various salts in the body. The term `electrolyte' means that these chemicals are electrically- charged and move to either the negative (cathode) or positive (anode) pole:

The major electrolytes are as follows:

* sodium (Na +)

* potassium (K +)
* chloride (Cl -)

* calcium (Ca 2+)
* magnesium (Mg 2+)
* bicarbonate (HCO 3 -)
* phosphate (PO 4 2-)
* sulfate(SO 4 2-)

Electrolytes are important because they are chemicals that cells, especially nerve, heart, and body muscle use to maintain voltages across their cell membranes and to carry electrical impulses (nerve impulses, muscle contractions) across themselves and to other cells. Kidneys work to keep the electrolyte concentrations in the blood at a constant level despite changes in the body.

As an example, when humans exercise heavily, they lose electrolytes, particularly sodium and potassium, in sweat. These electrolytes must be replaced to keep the electrolyte concentrations of the body fluids constant. So, many sports drinks have sodium chloride or potassium chloride added to them. They also have sugar and flavorings to provide the body with extra energy and to make the drink taste better.

The use of electrolytes is a controversial subject in pigeon racing. In my opinion, if birds have daily access to a good wide-ranging mineral mix (that includes the trace mineral selenium) and an adequate diet, there should be no need for electrolytes in the days prior to a race. Such use of electrolytes could induce unwanted thirst.

A number of veterinarians including Drs David Marx, John Kazmierczak and Nik Weber (USA), Dr Frank Harper (UK), Dr Pascal Lennault (Belgium) and Dr Wim Peters of South Africa believe there is no need at all for electrolytes for healthy racing birds. As one example, this is Dr Peters's reasoning, used with his permission, quote: "Electrolytes are often included in a vitamin preparation. I do not think that their use in pigeons is necessary as a matter of fact I believe that they could be harmful, particularly to the dehydrated pigeon returning home from a long race on a hot day. Imagine this scenario: it's a hot day and the race is from 800 km (500 miles). A bird makes it back just before dark. What has happened to it during the day? Flying requires muscular activity which rapidly builds up heat, particularly with high (environmental) temperatures. The bird must dispose of this heat, otherwise it will be unable to continue. Too much heat will kill it! The only way to rid itself of enough heat is via respiration. (Some is lost through the legs and skin but the eventual effect is the same). Respiration causes water loss from the mouth and respiratory system. Note well: water only, no salts. Increased respiration causes increased water loss. The pigeon becomes dehydrated from all this loss but manages to reach home. We now have a flown out and dehydrated pigeon and wish to restore its physiological equilibrium as quickly as possible. Water was lost from the system (from blood and body tissues) but the salts (electrolytes) are more or less unchanged - in other words the concentration of electrolytes is higher than normal (because of the loss of water).

Giving more electrolytes now would worsen the condition. What is needed is plain water – as soon as possible. Warm it up, by all means, but do not add electrolytes. The usual feed can be given. But I prefer pellets, as they are semi-cooked, turn into mash after intake which means that they do not first have to be ground to pulp, have a large surface area exposed to the digestive enzymes and are pretty much balanced in their proteins,

carbohydrates, fats, vitamins and minerals. All this means they provide a rapid supply of essential food stuffs with which to build up the pigeon as quickly as possible. The electrolytes that the pigeon did lose via its kidneys and bowels are easily replaced by the salts normally contained in a balanced diet. It does not need extra replenishment.

I am fully aware of the controversial opinions held by various people, drug firms and organizations with respect to electrolyte supplementation of racing pigeons. There have been, as far as I'm aware, unfortunately no adequate studies done on the necessity of their inclusion in the diet of actively racing pigeons. The often-quoted work done in Belgium by the University of Ghent, came to the conclusion that electrolyte replenishment was not necessary in the diet of post-race pigeons. But their work measured the pH of the birds' blood before and after a race and the speed with which pH (a measure of the acidity or alkalinity in the blood) equilibrium was restored both in the pigeons that received post-race electrolytes and those that did not. (They found that there was no difference between the two groups). It's not quite same as measuring the levels of the various blood electrolytes. The study of whether electrolyte levels alter after prolonged exercise and how quickly they can return to normal would be a valuable undertaking and put to an end the often-disputed question of electrolyte supplementation.

Pigeon racing should be a relaxing pastime. The competition in most countries has however become so fierce and the lure of big money for important winners so enticing that every effort is made to ensure success. Commerce has spotted this hunger for winning and has responded by producing hundreds of remedies, pills and potions. To say that the huge array of preparations is confusing to the fancier, would be putting it mildly. To purchase these is not necessary for success and success is most definitely not guaranteed if these preparations are given. The right (read good!) pigeons, effective management, an efficient loft and lots of roadwork, as well tenaciously sticking to the guiding principle of KISS – Keep It Simple Sam – will see the desired results. I wish you luck." Unquote.

(The comment about using warm drinking water for returning birds has been questioned by several veterinarians – most believe that returning birds should receive cool water rather than warm water.)

In birds with prolonged diarrhea, electrolyte powders or solutions could be useful in replacing the various electrolytes that are lost with the excess fluids passed as droppings. When mixed according to package directions, the concentration of these solutions is very close to their normal levels in the bloodstream – hence it is very important to mix them correctly.

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A suggested 18% protein ration can be mixed as follows: 30-35 parts peas and other legumes, 25 parts corn, 10-15 parts pellets (such as Milk Plus [28% protein] produced by Cargill, or an 17-18% unmedicated broiler finisher), with the balance made up of wheat, safflower, barley, etc. for a total of 100 parts.