Probiotics – Application Guide

Clinical Context

Patients use probiotics all the time. We think of this, broadly speaking, as a good thing. But what are the details? How should we be instructing our patients in the use of probiotics, to maximize their effectiveness? It's common to suggest that probiotics be taken daily, in one-or-two capsule doses, often with other supplements. This substantially reduces colonization of the intestine. Let's look at a more effective approach.

Quorum Sensing Governs Implantation

Probiotic bacteria, like any bacteria, can be sessile (floating along in the stream) or colony forming. The key thing to consider for probiotic bacteria is how to get them to shift into the morphology in which they'll implant into the wall of the intestinal lumen. Otherwise, they'll stay sessile and float out the other end. The shift we want is determined by quorum sensing (QS). QS is the method bacteria use to sense the presence of other members of their specific bacterial strain.

Each bacterium secretes a unique chemical signal, called a quormone, and also "listens" for the same quormone signal. This is like walking into a room and saying, "Hello." If you hear a much stronger sound than just your own voice, you know there are more of you there; enough to form a colony. You stop wandering around and get to work. So, if the members of a single bacterial strain all detect a high quormone concentration of the specific quormone for their own specific bacterial strain, they will shift into their colony-forming morphology and start colonizing the intestine. Our goal is to promote successful QS, so colonization can occur, with the probiotics forming their own biofilm based colony.

Too Many Strains in the Pill = QS Failure

Remember that each strain-specific organism has its own special quormone. It's not going to respond to the quormones secreted by other bacterial strains. Now the question is, when a patient takes a pill, are there enough bacteria of a specific strain to get the quormone level for that strain high enough for QS to occur? The more different bacterial strains there are in the pill, the less there is of each one, and the less likely it is that QS will occur for any of the bacterial strains included in the probiotic pill. So, give probiotics with fewer strains. I try to stay with five or six strains max.

Concentrate Doses

Determine how many probiotic capsules you want the patient to take in a week. Let's say you would normally give the patient two probiotic capsules per day. That's 14 capsules in a week. Divide that in half and have the patient take half of the total, twice per week, all together. This concentrates the QS capacity of the bacterial strains you're giving, which increases the likelihood that the probiotics will colonize the intestine, which is the goal. You can start with smaller doses and work up to the higher concentrations, to be sure the patient can tolerate it.

Quorum Sensing Inhibition By Food and Supplements

Foods like garlic and onions and supplements like quercetin and others are potent QS inhibitors. When you give probiotics with quercetin, the quercetin shuts down QS, so implantation of your probiotics is substantially reduced. In a patient with dysbiosis, quercetin can help to inhibit QS of unfavorable organisms. But when you're trying to get probiotics to implant, substances like quercetin or garlic can really get in the way of success.

Consider giving patients their twice a week bolus doses of probiotics at least two hours away from food and supplements. If the patient does intermittent fasting, so they're not eating until lunch, or maybe they have an early dinner, you can ask them to take the probiotics in the zone where there isn't any food. Or they can take them two hours after the end of dinner.

T Cell Polarizing Effects of Probiotics

Probiotic bacteria have known T cell polarizing influences. Some examples are as follows:
Th1: L acidophilus, L casei, L johnsoni, L gasseri, L plantarum, L lactis
Th2: L reuteri, B infantis, B bifidum, B longum
Th17: L rhamnosus GG, L rhamnosus Lac23a, B bifidum DSM20239, B bifidum LMG13195

In choosing a probiotic, consider what influence you want it to have on the intestinal immune environment. A mix of influences might be fine but know what themes you want to emphasize. For example, the normal immune response to fungal infection is a Th17 response. But chronically ill patients sometimes have chronic candida albicans infections that are keeping them locked into a Th17 dominance pattern, as the Th17 response grinds away at the candida, but without success. If the candida could be cleared, the Th17 response would no longer be evoked in response. So, it can be very important to get rid of candida infections. Now you have a choice to make about whether you're going to use L rhamnosus GG to support the Th17 response, in support of clearance of the candida infection. You might consider using it short term, in support of an overall anti-fungal strategy, while doing repeat measurements of neutrophil percentages and hsCRP, to make sure you're not ramping the patient's systemic Th17 response. But that strategy is not without risk and could flare the patient's autoimmune disease. Keep in mind also that the polarizing effect of a probiotic strain itself might not be as powerful as the polarizing influence of a dysregulated microbiome overall, which is likely to drive Th2/Th17 co-dominance.

Using Probiotics with Anti-Pathogenic Strategies

Probiotics influence T cell polarization by stimulating toll like receptors (TLR's) on macrophages and dendritic cells, which are antigen presenting cells (APC's). The TLR stimulation determines what the APC will tell the naïve T cell to turn into. So, probiotics determine T cell polarization by influencing what the APC's tell the T cells. The key thing is that probiotic stimulation of TLR's happens whether the probiotic is alive or not. You'll still get TLR stimulation from the debris of dead probiotics, so you can give patients probiotics while you're implementing a program to address dysbiosis, as a way to influence intestinal T cell polarization. I often give lactobacillus acidophilus to promote Th1 while addressing dysbiosis, to keep the patient from shifting into Th2 dominance in response to the inevitable GI epithelial inflammation that comes with addressing dysbiosis.