Probiotics and their Ability to Restore Natural Flora Following Antibiotic Treatment

Subtitle: Informing the patient About the Benefits of Probiotics

Tag Words: Probiotics, Antibiotics

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Summary: Most of us spend our life trying to protect ourselves from the notorious microorganisms we commonly known as bacteria. It is regrettable that bad, disease-causing or pathogenic bacteria have given all types of bacteria a poor reputation, causing the majority of people to be unaware of how vital bacteria really are to our existence. Some of this beneficial bacteria is the microflora that is found in our gut that help with crucial physiological processes like digestion, our immune response etc. One way that people unknowingly diminish essential gut microflora is through the use of antibiotics. In our project we will explore the benefits of the consumption of probiotics as part as one’s daily diet and/or as a supplement to antibiotic treatment.

Video: http://youtu.be/8kirLpoetUY

Not All Bacteria are “Bad” Bacteria (MS)

Most of us go throughout our life trying to protect ourselves from the notorious microorganisms we know as bacteria. It is regrettable that bad, disease-causing or pathogenic bacteria have given all types of bacteria a poor reputation. This has caused the majority of people to be unaware of how vital bacteria really are to our existence and our overall health. Most would be surprised to know that only 10% of bacteria are pathogenic while the remaining 90% are “good” or non-pathogenic bacteria (Isolauri, da Dosta Ribeiro, Gibson, Saavedra, Saalinen, Vanderhoof & Varavithya, 2002). In fact, roughly 10% of the total cells within our body are actually our own while the remaining 90% of cells are actually a type of bacterial cell, many of which are required for essential components for biological processes within our own body’s and are essential for life to occur (McKee & McKee, 2009).

The human body has several ways in which it protects itself from infections. The multiple layers of our skin, protective mucous barriers, our immune system and microflora in our gut are all different systems that our bodies utilize to ward off unwanted bacteria (Fuchs, Issenman Ribeiro, Michail & Sylvester, 2006). The gut microflora are crucial and are made of beneficial types of bacteria that help to digest food, energy conversion, essential for the intake of nutrients and the creation of vitamins (Fuchs et al., 2006). The bacteria that make up our microflora often compete for essential nutrients with foreign and pathogenic bacteria. This competition between natural bacteria and foreign/pathological bacteria help keep us healthy and free of illnesses caused by toxins or other substances the pathogenic bacteria can create. Occasionally, due to multiple causes, such as illness, trauma, damage to protective skin, infections, antibiotic use, the consumption of alcohol, etc., our microflora can get diminished or
decrease, allowing a chance for pathological bacteria to grow into a population size that can be hazardous to our health (Isolauri et al., 2002);

A Broken Healthcare System (MS)

Today our current healthcare system is mainly centered on the illness itself. In developed countries there is a strong emphasis on treating disease caused by bacteria once it has occurred, rather than trying to find ways to avoid and prevent the disease from occurring. In situations when a person’s health comes at risk when their body’s natural defenses and microflora become ineffective in fighting and competing with pathological bacteria, the use of antibiotics has been widely used globally to treat such infections. This method has been used mainly as way to treat an illness or disease from pathological bacteria once it has occurred and does not focus on prevention of the illness or disease in the first place. This style of healthcare has produced an extremely complicated and expensive healthcare system; frustrating medical professionals and patients globally. Currently this systems is not working efficiently and one way to begin to turn it around is to start changing our treatment philosophy to one that is based on prevention and not just treatment.

The Emergence of Antibiotic Resistance (JB)

Antibiotics and similar drugs can be described as antimicrobial agents and have been in use since the 1940s and are used to target bacteria and microbes. When used correctly, their value to patients is enormous, however, with time; the overuse of antibiotics has caused the emergence of antibiotic resistant bacteria, causing certain antibiotics to be ineffective in treating the disease and increasing the chances of health complications (Drug Resistance, 2010). Antibiotic resistant bacteria has become a major issue that has been plaguing our healthcare system and is causing problems globally. Medical professionals and researchers believe that the overuse of antibiotics has contributed the most to the rise in antibiotic resistant bacteria. However, there are many means by which bacteria can become resistant to a certain antibiotics. Such causes of resistance include selective pressures, mutation, gene transfer, societal pressures, inappropriate use, inadequate diagnosis, hospital use and agricultural use (Antimicrobial (Drug) Resistance, 2011). Selective pressures are when in the presence in an antibiotic/antimicrobial drug, bacteria or microbes are either killed off; or if they carry resistant genes, they survive. In these cases, the surviving bacteria/microbes will then have the ability to replicate and become the dominant type throughout the population. While in societal pressures, human behaviors create a form of selective pressure for resistant strains to become the dominant type in the environment.

Bacterial Resistance, How Does it Happen? (JB)

Genetic Variations of bacteria is a major means by which they become resistant to antibiotics over time. Researchers believe that Horizontal Gene Transfer (HGT) is the most common way that inter and intra-species transfer resistant genes (Sohail, 2012); this process involves multiple steps including; conjugation between cells; transformation of DNA or plasmid released from dead cells; and transduction through phase. Of these processes, the most important is the transfer or collection of bacterial plasmids, which are believed to be the carrier for most genes of resistance in a bacterial genome (Sohail, 2012). One plasmid that has been discovered, the IncP-1, has been seemed to be extremely versatile in adoption in many different species, which is why the plasmid is commonly found in our environment and also has been isolated from
various human pathogens (Sohail, 2012). Research by Heuer et al. (2012) examined the plasmid IncP-1ε, a member of the group of plasmids Inc-P1 and isolated it from samples of manure and soil. From their research, a strong positive correlation was seen between antibiotic use and the abundances of the IncP-1ε plasmid in manure and soils. Throughout the experiment the positive correlation increased after the application of a manure-containing the antibiotic sulfadiazine. After 127 days of application, around 50% of the IncP-1ε plasmids that were isolated contained a gene for sulfadiazine resistance (Heuer et al, 2012). However, the most effective part about plasmids for drug resistances is its ability to incorporate multiple genes for resistance and transfer plasmids with these multiple genes. This trait has allowed for the development of multiple-drug resistant bacteria species (Sohail, 2012). This is just one example of how plasmids and gene transfer can contribute to the resistances of bacteria within the environment. While another genetic variation that contributes to resistance occurs through mutation. Mutations occur during replication of the bacteria DNA during reproduction and in some cases, these mutations in the DNA may help the bacteria to become resistant to an antibiotic (Antimicrobial (Drug) Resistance, 2011). Even though these mutations that occur are random, they can still contribute to the rise in antibiotic resistances.

Our Role in Promoting Drug Resistance (JB)

As stated earlier, the main ways humans contribute to antibiotic resistant bacteria, is through the overuse of antibiotics. Within the United States alone, approximately 190 million doses of antibiotics are administered in hospitals daily and approximately more than 133 million courses of antibiotics are prescribed by doctors for non-hospital patients. It is estimated that about 50% of the prescriptions are unnecessary as they may have been prescribed for simple coughs, colds and other viral infections were antibiotics are ineffective in treating (Antibiotic Resistance).

In addition, the overuse of antibiotics occurs within the agriculture industry as well. Antibiotics are used to protect the health of many food animals within the United States and other developed countries as well, but are not used for treatment as the antibiotic is designed for. The Food and Drug Administration (FDA) and the Department of Agriculture (DOA) have found that 80% of the antibacterial drugs sold in the U.S are for agricultural use and also between 83-84% of swine farms, cattle feedlots and sheep farms use animal feed and water enriched with antibiotics (Maleske, 2012). Such use of antibacterial drugs can lead to inconsistent doses overtime, allowing exposed bacteria to develop resistances to the antibiotics over time. Not only does this promote resistance within the animals, but many of the drugs sold for agricultural use is the same antibiotics that are used for human treatment as well (Maleske, 2012). Since this research has been conducted, the FDA and DOA have begun to eliminate policies that allow for nontherapeutic use of medically important antibiotics in animal agriculture (Maleske, 2012). Although these changes in policies is a positive step in preventing new antibiotic resistant bacteria, most of the damage has already been done and will continue to affect us for some time.

Types of Resistance in Society (JB)

There are many different types of antibiotic resistant bacteria that have been addressed globally and many of which cause complications, especially in hospitals and healthcare housing, because of the close and isolated environments. In regards of the CDC, the main bacteria that are causing complications in the United States and elsewhere include. *Acinetobacter* is a group of
bacteria commonly found in soil and water, which all species cause the human disease of *Acinetobacter baumannii*, often occurs in intensive care units and healthcare settings that house very ill patients (Diseases/Pathogens Associated with Antimicrobial Resistance, 2010); *Bacillus anthracis* causes the disease anthrax in humans by releasing a spore into our systems. Resistant strains have been observed in the wild, but there can also be engineered strains to be resistant to antibiotics as well (Diseases/Pathogens Associated with Antimicrobial Resistance, 2010); *Neisseria gonorrhoeae* causes the sexually transmitted disease Gonorrhea and the occurrence of resistant strains has cause complications of reducing the spread of the STD (Diseases/Pathogens Associated with Antimicrobial Resistance, 2010); Group-B *streptococcus* is a resistant strain of strep that causes illness in newborns, elderly and adults with current illness such as diabetes (Diseases/Pathogens Associated with Antimicrobial Resistance, 2010); *Klebsiella pneumonia* is known to cause numerous complications and illnesses such as pneumonia, bloodstream infections, wound/surgical site infections and meningitis. *Klebsiella* bacteria can naturally be found in human intestines and are known not to cause disease as well (Diseases/Pathogens Associated with Antimicrobial Resistance, 2010); Methicillin-resistant *Staphylococcus aureus* (MRSA) is a strain of staph resistant to the antibiotics methicillin and other common antibiotics such as oxacillin, penicillin and amoxicillin, which are widely used to treat staph infections (Diseases/Pathogens Associated with Antimicrobial Resistance, 2010); *Neisseria meningitides* is the leading cause of bacteria that cause meningitis in young children and young adults and during 2007-2008 was the first reported resistance to fluoroquinolone resistance in the United States (Diseases/Pathogens Associated with Antimicrobial Resistance, 2010); *Shigella* is a group of bacteria that cause the infectious disease Shigellosis, which lines the intestines. The Shigella germ is also known to cause diarrhea in humans (Diseases/Pathogens Associated with Antimicrobial Resistance, 2010); *Streptococcus pneumonia* is the leading cause of illness among young children and is the most frequent cause of pneumonia, bacteremia, sinusitis and acute otitis media; *Mycobacterium tuberculosis* is the bacterium that causes tuberculosis (TB) and there have been many cases of multi-drug resistant and extensively drug-resistant TB globally; *Salmonella Typhi* which is known to cause typhoid fever; Vancomycin-resistant *Enterococci* (VRE), which is caused by the bacteria *Enterococci* which is typically found in human intestines, the female genital tract and the environment. On occasion the bacteria can cause infection and is typically treated with vancomycin; and Vancomycin intermediate/Resistant *Staphylococcus aureus* (VISA/VRSA) which is a more serious type of resistant staph infections. However to date, all VISA and VRSA infections have been treated by other FDA approved antibiotics. (Diseases/Pathogens Associated with Antimicrobial Resistance, 2010)

**The CDC’s Involvement and Other Programs (JB)**

Although these resistant forms of bacteria are present, their occurrence has developed due to the misuse and abuse of antibiotics by society, in both human and agricultural use as well. All of these bacteria at one point were susceptible to previously used antibiotics and were easily treated in the past, but today they are extremely harmful to people of all ages and cause serious illnesses and countless deaths each year. In order for the CDC to keep track of resistant bacteria, they using expensive and complicated, inter- and multi-national surveillance systems to collect data on the occurrence of antibiotic resistant bacteria, especially those listed above (CDC Surveillance Systems, 2010). Not only has our overuse of antibiotics caused health complications and deaths, it continues to significantly increase costs of healthcare, contributing hundreds of
millions of dollars to diagnose, treat, observe and research possible new antibiotics and will continue to be a burden on the healthcare system.

In addition to the surveillance, the CDC also provides and sponsors educational campaigns to raise awareness of the risks of antibiotic resistant bacteria, such as the Get Smart campaigns for the community, schools, college campuses and industries, the National MRSA Education Initiative and Hand Hygiene Save Lives program. Other organizations and government programs are becoming involved in the issue of resistance, through educational programs for both patients and providers. An example of one organization is the Alliance on the Prudent Use of Antibiotics (APUA), whose goal is to promote proper antibiotic use by both patients and providers and the prevention of further antibiotic resistance bacteria worldwide. In May 2002, they released a report from their Facts about Antibiotics in Animals and Their Impact on Resistance (FAAIR), to provide scientific evidence for antibiotic use in agriculture and the risk it posed to humans to a policy debate and helped push for legislation change (Alliance for the Prudent Use of Antibiotics).

Despite the CDC’s surveillance systems and other government organizations, it is extremely complicated to accurately predict where and when resistant bacteria will emerge in society. In one study for example, it showed that multiple-antibiotic resistant strains of gram-negative bacteria were found and isolated from a bag of triple-washed, ready to eat spinach. Showing that the consumption of food products containing multiple-antibiotic resistant bacteria may increase the resistant gene pool as well (Walia, Rana, Maue, 2012).

Current Antibiotic Research State (JB)

Despite the emergence of antibiotic resistant bacteria, antibiotic research has been at a standstill since the end of the 20th century. It has now been over 30 years since the pharmaceutical industry has been able to create a new class of antibiotics due to the lack of development of new any novel compounds. This has lead to less innovations and development of new, more effective antibiotics. In fact, all the “new” antibiotics that have been introduced, function in similar ways to older antibiotics (Quinn, 2013). Without the development of “new” antibiotics it will become increasingly difficult to treat illnesses and diseases caused by antibiotic resistant bacteria, creating an obvious need for more research. By promoting similar governmental and economic incentives to pharmaceutical industries to shift their focus back to antibiotic research, a similar approach the United States took during World War II (Quinn, 2013). Unfortunately research is extremely expensive and this approach will only cause an increased financial burden on the healthcare system and governments as well. In addition to its expense, it will take countless hours of research and countless trial and errors. It will be unknown when a new and effective antibiotic will be developed by a pharmaceutical industry and approved by the FDA and similar government organization to be available for general use.

The Introduction of Probiotics (MS)

Elie Metchnikoff, a Russian biologist, first introduced Probiotics in 1960 (Zhang, 2011). Metchnikoff hypothesized that the human gut created harmful chemicals as an unintended consequence of digestion. These chemicals lead to aging, infection and disease. The biologist predicted that eating the ‘acid-producing bacteria’ which eliminate the harmful chemicals, could improve overall health (Zhang, 2011). It has now been confirmed by scientists that particular strains of bacteria in the gut can counteract these toxins, ultimately modifying the
flora in the gut and replacing harmful microbes with useful ones (Zhang, 2011). Recently probiotics have become a popular area of study, inspiring new comprehensive and widespread research among both scientists and healthcare providers about the many possible health benefits they can provide and the types of preventative health styles they can create as well.

Recent studies show probiotics have the potential to benefit their host through more than a few different mechanisms (Fuchs et al., 2006). As mentioned earlier, they modify the microflora in the gut, an antimicrobial effect that occurs by secreting antibacterial substances (Fuchs et al., 2006). The ingested live microorganisms compete with the pathogenic bacteria in the intestines to stop them from adhering to the epithelium (Fuchs et al., 2006). They also compete for nutrients, leaving a limited supply for the pathogens to survive. Not only do the probiotics help to kill the pathogens they can actually reverse some of the consequences of the infected epithelium if the pathogens successfully infect the intestines of the human host. They do this by producing an antitoxin effect (Fuchs et al., 2006). Other mechanisms that probiotics positively affect are found within our immune system. Due to the fact that 70% of our immune system is found within our gastrointestinal system it is no wonder that these microorganisms can also help to bolster our immune responses. Probiotics do this by altering the system itself, control allergic immune cell responses and also reduce cell production in certain cancers (Fuchs et al., 2006). Probiotics have been shown to be advantageous for our urogenital and respiratory mucosa as well. Even more remarkable results have been seen in the lab such as products of probiotics being able to block inflammation and stop the death of epithelial cells. As the name implies, probiotics promote many “pro-life” processes in many of the human body’s physiologic systems.

**Probiotics Role in Digestive and Intestinal Health (MS)**

An area that has been studied thoroughly has been probiotics positive effect on the bowels and intestinal health. It has become common practice for probiotics to be used for the prevention and treatment of diarrhea (Mrukowicz & Szajewska, 2001). The prevention of acute diarrhea with probiotics is encouraging and used to fight against the intestinal pathogens causing the diarrhea (Mrukowicz & Szajewska, 2001). The probiotics modify the composition of colonic microflora and act against enteric pathogens, helping instances of diarrhea (Setty, Guandalini, Mrukowicz & Szajewska, 2006). Scientists are not yet able to say the exact physiological mechanism by which this process works, however, they are able narrow it down to a few possibilities; production of antimicrobial material, competition for nutrients necessary for growth and survival of pathogens, competitive inhibition of adhesion of pathogens, alteration of toxins or toxin receptors, or stimulation of nonspecific and specific immune responses to pathogens (Mrukowicz & Szajewska, 2001).

In a study done by the *Journal of Pediatric Gastroenterology and Nutrition*, probiotics have shown been to be an effective treatment prevent acute infections resulting in diarrhea in infants and young children. This study examined the effect of probiotics on the risk of diarrhea lasting more than three days. The researchers conducted eight trails that included 731 children and they found there was a significantly reduced risk for children who had used probiotics versus the placebo, of diarrhea lasting more than three days (Mrukowicz & Szajewska, 2001). The strain of bacteria that showed the most consistent effect on the reduction in risk of diarrhea lasting more than three days was *Lactobacillus GG* (Mrukowicz & Szajewska, 2001). In the
same study they looked at the effect probiotics had on the duration of diarrhea. The study involved 773 children and demonstrated that probiotics significantly reduced the duration of diarrhea compared with the placebo (Mrukowicz & Szajewska, 2001). Although the *Lactobacillus GG* strain appeared to be the most affected bacterial strain, the researchers who conducted this study recommend future studies to be conducted on other bacterial strains. Another study conducted by Mrukowicz and Szajewska names a few other beneficial effects. They showed the use of probiotics for acute diarrhea in children seemed to reduce duration of diarrhea by 17-30 hours, most helpful for watery diarrhea and viral gastroenteritis, most effective when administered early in the course of the disease and more evident in children in developed countries (Mrukowicz & Szajewska, 2001). This study also named *Lactobacillus GG* as the strain most effective in treating acute diarrhea.

Probiotics can help with other issues in the intestines as well. One example is necrotizing enterocolitis, the death of intestinal tissue and occurs when the lining of the intestinal wall dies and tissue falls off (Barclay, Stenson, Simpson, Weaver & Wilson, 2007). This occurs in around 2/1000 live births and is considered the most common intra-abdominal emergency among newborns and infants (Barclay et al., 2007). Doctors are not sure what the cause of this disorder is yet they do know that a decrease in blood flow to the bowel keeps the bowel from producing mucus that protects the gastrointestinal tract (Barclay et al., 2007). Some are suspicious that bacteria in the intestine may be able to cause such a disorder (Barclay et al., 2007). A study done by the Journal of Pediatric Gastroenterology and Nutrition looks at probiotics as a strategy to prevent necrotizing enterocolitis. This study states it is very likely that probiotics prevent the incidence of this disorder in preterm and very low birth weight infants (Barclay et al., 2007). Not only do the probiotics seem to prevent necrotizing enterocolitis, the overall mortality rate decreased compared to those who were not in the probiotic treated groups. Although they are unsure the exact mechanisms by which the probiotics prevent this disorder they look at the mechanisms previously mentioned when treating diarrhea. Researchers believe that the overall decrease in mortality rate demonstrates the potential of probiotics in areas such as immune stimulation and the reduction of bacterial sepsis rates. This study recommends more research be done on the specific dosing and type of probiotics that would should optimal results (Barclay et al., 2007).

**The Common Cold and Probiotics (MS)**

Probiotics have begun to be studied in areas that go beyond intestinal health and one of these areas is the prevention of cold and flu like symptoms. In a study reported in the Official Journal of the American Academy of Pediatrics, 326 healthy children were evaluated during the winter season for incidences of cold and influenza like symptoms while taking either a placebo, *Lactobacillus acidophilus* or *Lactobacillus acidophilus* in conjunction with *Bifidobacterium animalis* twice daily for 6 months (Leyer, Mohamed, Reifer, Ouwehand & Li, 2008). Those children who were in the *L acidophilus* group had significantly lower incidence and odds of having fever and cough compared to the placebo group (Leyer et al., 2008). However, those subjects who were in the *L acidophilus/B lactis* group had significantly lower odds of having fever, cough, rhinorrhea (mucous fluid in the nasal cavity), or any cold or influenza like symptoms when compared to the placebo group. Those in the placebo group had symptoms for an average duration of 7 days (Leyer et al., 2008). The *L acidophilus* group had symptoms for an average of 4.6 days and the *L acidophilus/B lactis* group had symptoms for 3.5 days (Leyer et
al., 2008). The probiotics were not only able to prevent incidence and odd of flu and cold like symptoms but duration of symptoms as well.

**Autoimmune Issues and Probiotics (MS)**

Probiotics are a growing field of study that is showing promising results. By reducing the incidence of infections there will be a reduction in the reliance on antibiotics (Leyer et al., 2008). Allergies and certain chronic conditions like inflammatory bowel diseases have become more prevalent in recent generations due to our overuse of antibiotics (Leyer et al., 2008). This has created an antimicrobial resistance in many children, lowering their natural immune and disease-fighting responses (Leyer et al., 2008). The use of probiotics will potentially stop the need for treating infection in such a way that has caused these antimicrobial resistances and start preventing them. Not only that, consumption of probiotics does not have the major side effects, that other current antibiotic treatments have. These non-pathogenic living microorganisms are by no means a miracle preventive strategy; however they show great promise when it comes to moving toward a nation focused on preventive healthcare.

**The Different Probiotic Strains (MS)**

Probiotics can contain bacteria and/or yeasts, with each probiotic product being unique in its makeup. Probiotics are identified by the genus, species and strain they contain (Huber, 2012). Each will have variable health benefits depending on the role they play in a person’s gut. Probiotics are still very new to the healthcare world and much more research must be done in order to definitively say if certain genus, species or strains are better for treating certain conditions. However, from previous studies scientists and medical professionals are already seeing that certain probiotics are able to treat particular ailments.

There are 50 species of lactobacilli, all of which are naturally found in one’s digestive, urinary and genital systems and have been used for treating and preventing a wide variety of diseases and conditions for a while (Huber, 2012). Some of the lactobacilli found in foods and supplements are *Lactobacillus acidophilus*, *Lacidophilus DDS-1*, *Lactobacillus blugaricus*, *Lactobacillus rhamnosus* GG, *Lactobacillus plantarum*, *Lactobacillus reuteri*, *Lactobacillus salivarius*, *Lactobacillus casei*, *Lactobacillus johnsonii*, and *Lactobacillus gasseri* (Kovacs, 2012). This genus is commonly found in yogurt and probiotic supplements. Various studies have shown that *Lactobacillus* can help in treating and preventing yeast infections, urinary tract infections, irritable bowel syndrome, antibiotic related diarrhea, travelers diarrhea, diarrhea caused by Clostridium difficile, lactose intolerance, fever blisters, eczema, acne, canker sores and prevention of respiratory infections (Kovacs, 2012).

Some studies have begun to look at individual strains in an attempt to narrow down their possible effects. Children with irritable bowel syndrome were given three billion cells of *Lactobacillus* GG twice a day for eight weeks (Kovacs, 2012). This probiotic regimen was able to reduce the frequency and the severity of abdominal pains (Kovacs, 2012). This same strain was given to children taking antibiotics, a decrease in antibiotic related diarrhea resulted (Kovacs, 2012). When day care children, ages 1 to 6 years, were given milk supplemented with *Lactobacillus* GG, they got fewer and less severe lung infections than those children who were not drinking the milk (Kovacs, 2012). In a study containing 245 people who traveled to 14 different regions in the world, *Lactobacillus* GG reduced the risk of traveler's diarrhea by 47 percent (Kovacs, 2012).
In a research study *Lactobacillus casei*, *Lactobacillus bulgarius*, and *Streptococcus thermophiles* were given two times a day concurrently with a regiment of antibiotics and one week following antibiotic treatment (Huber, 2012). This decreased the risk of diarrhea in adults who were hospitalized (Huber, 2012).

*Lactobacillus gasseri* and *Lactobacillus rhamnosus* vaginal capsules were able to lengthen the time in between bacterial vaginosis infections (Huber, 2012).

Another widespread microbe used in probiotics is bifidobacteria. Thirty different species of bifidobacteria make up 90 percent of a person’s intestinal microflora in the colon (Kovacs, 2012). Some of these species that are commonly used in probiotics are *Bifidobacterium bifidum*, *Bifidobacterium lactis*, *Bifidobacterium longum*, *Bifidobacterium breve*, *Bifidobacterium infantis*, *Bifidobacterium thermophilum*, and *Bifidobacterium pseudolongum* (Kovacs, 2012). Researchers are still looking into conducting more studies to identify specific benefits this organism can offer to a person’s health. Some studies that have already been performed were able to conclude that this organism does indeed have several possible health benefits.

Studies have identified bifidobacteria as a probiotic that can help with IBS, dental cavities, improved blood lipids, and glucose tolerance (Kovacs, 2012). In one recent study, 362 people with IBS were given *Bifidobacterium infantis* 35624 for four consecutive weeks (Kovacs, 2012). All the patients taking part in the study saw improvement of symptoms, such as abdominal pain, bloating, bowel dysfunction, incomplete evacuation, straining, and passage of gas (Kovacs, 2012). Another study looking at cavities in adults in children saw that those taking this probiotic had less frequent incidences of cavities due to the fact that salivary levels of bifidobacteria are associated with dental cavities (Kovacs, 2012). Another strain, *Bifidobacterium lactis* Bb12, has been proven to improve metabolism (Kovacs, 2012). This includes lowered serum LDL- cholesterol in people with type 2 diabetes, increased HDL in adult women, and improved glucose tolerance during pregnancy (Kovacs, 2012).

*Saccharomyces boulardii* is the only probiotic that is a yeast. This probiotic has been proven to be effective in preventing the frequency of *C. difficile*, antibiotic related and traveler's diarrhea (Kovacs, 2012). *S. boulardii* has shown to help reduce the incidence of acne (Kovacs, 2012). The treatment of *Helicobacter pylori* can cause severe side effects, this probiotic has shown to be effective in the reduction of such side effects (Kovacs, 2012).

*Streptococcus thermophilus* is a bacterium that produces a significant amount of the enzyme lactase, whose job it is to break down lactose (Kovacs, 2012). New studies suggest that ingesting this probiotic can help prevent lactose intolerance (Kovacs, 2012).

What Probiotic is Best? (MS)

There are many different kinds of probiotics that are currently on the market and it can be difficult to decide which one is most appropriate for you. While the research and studies mentioned above can help narrow it down, most research as of now just mentions “antibiotics” as a general term and does not narrow it down to what probiotic is best for a particular antibiotic. Many of the antibiotics prescribed today by doctors are what are called “broad spectrum” (Hempel, S, et al., 2012). This means that they have the ability to destroy a wide range of bacteria, good and bad (Hempel, S, et al., 2012). For such antibiotics, one must select a probiotic that has the ability to do just the opposite, replenish a broad range of beneficial bacteria into one’s digestive tract. Two examples of broad-spectrum probiotics are *Lactobacillus* and *Bifidobacterium* (Hempel, S, et al., 2012). Within these genii there are particular species that are better suited to endure the harsh conditions of a person’s gastrointestinal system. Examples of
these hardier species are *L. acidophilus*, *L. rhamnosus* and *L. salivarius* (Hempel, S, et al., 2012). Species such as *L. casei* and *B. longum* are specifically suited to prevent diarrhea associated with antibiotic use (Hempel, S, et al., 2012).

As mentioned earlier, in order to be effective a probiotic must be able to survive the extremely harsh conditions of the intestines, stomach etc. The best way to ensure a probiotic will be able to survive those conditions is to look for a probiotic that is enteric-coated (Hempel, S, et al., 2012). This will make sure the probiotic is not broken down once it reaches the small intestine before the beneficial bacteria can be introduced. More research still needs to be done on what probiotics are best for particular antibiotics.

**How to Incorporate Probiotics into Your Diet (MS)**

Probiotics can be ingested in many forms, and one that has been popular in health conscious communities and that is just beginning to gain popularity within the general population is Kombucha. It is a beverage that usually has some combination of tea, sugar and a SCOBY or a symbiotic colony of bacteria and yeast (Wollan, 2010). Even though this elixir is just starting to gain popularity, it has actually been around for more than 2,000 years (Wollan, 2010). The drink was first introduced when it was given to a Japanese emperor as a healing tonic (Wollan, 2010). It was also found in ancient China where it was known to promote immortality (Wollan, 2010). This health-supportive drink will not work miracles however; it can offer you an alternative to more well-known cultured products, like yogurt and maybe even a few extra benefits as well. With the number of people who are lactose intolerant and/or are practicing the vegan lifestyle quickly growing, this could be a great alternative. Lactic, glucoronic and gluconic acids all can be found within this health drink (Wollan, 2010). Lactic acid plays vital role in digestion, and gluconic acid is known to help heal yeast infections, while glucoronic acid is beneficial for liver detoxification (Wollan, 2010). Due to its ability to bind environmental and metabolic waste products and toxins so they can be excreted through one’s kidneys, it has the ability to boost energy and assist in detoxification (Wollan, 2010). However, it is its probiotic properties that led to our interest in this health concoction. The live microorganisms found in Kombucha support tissue growth, balances intestinal flora and aiding with digestion (Wollan, 2010).

Despite the many possible health benefits offered by Kombucha, there are also more traditional ways one could add probiotics to their diet. The number of probiotic and prebiotic products introduced to the marketplace has increased fivefold from 2004 to 2008 according to Datamonitor’s Product-Launch Analytics (Fleenor, 2010). Dannon launched its Activia probiotic yogurt in 2006 and since then a surge of functional yogurt have come on the market, totally 102 new probiotic yogurt products between 2006 and 2009 (Fleenor, 2010). Frozen yogurt treats have also come on the market as well. Blue Blunny from Le Mars introduced a frozen yogurt granola bar in 2009 (Fleenor, 2010). Thicker greek yogurt products are gaining popularity as well. NAKED, a juice brand has come out with a probiotic juice blend, this too contains dairy (Fleenor, 2010). A juice option that contains no dairy is Good Belly Juice shots, which contain 20 billion active cultures per serving (Fleenor, 2010). Another different option that is not juice and does not contain any dairy is Attune Foods bars (Fleenor, 2010). These are chocolate bars that contain 5 times the amount of probiotics found in regular yogurt, at least 5 billion active cultures (Fleenor, 2010). With the growing popularity of probiotics there are now probiotic supplements that one can take. One such example is Bowtrol, it is a extremely potent
and popular supplement that is on the market (Fleenor, 2010). These gained popularity due to the fact is contains 10 billion cultures that are delivered to the intestines after they survive the acidic environment of the stomach (Fleenor, 2010). There are many probiotic products on today’s market and there seems to be one that can fits everyone's lifestyle. Probiotics work best when combined with a well-balanced diet high in fiber such as whole grains, fruits and vegetables. Hydration is also crucial to digestive health, so make sure your child is drinking plenty of water! Introducing probiotics in combination with changes in diet content, timing, or frequency can help maintain your health.

Some Limitations of Probiotic Use (JB)

Despite the benefits probiotics can have on a person’s health, limitations of their use have also been discovered as well. One major limitation of probiotics is their effectiveness in the presence of antibiotics which was observed in a study done regarding the antimicrobial resistance of 40 Japanese probiotics (30 dairy products and 10 products in tablet form) available in the market without a doctor’s or pharmacist’s supervision (Hammad & Shimamoto, 2010). All the products that were used in the study were observed to contain viable probiotic species (11 species in total) and were tested under several different conditions to replicate the human body prior to antimicrobial exposure. The experiment used 14 antimicrobial agents that are commonly prescribed for routine antibiotic treatments and were exposed to the probiotics by the disc diffusion method. From the results of the study, none of the dairy probiotics showed any level of resistance or carried any inducible resistance genes to the antibiotics. However, this did prove them to be suitable to be administered with the class of antibiotics of macrolides (Hammad & Shimamoto, 2010). However, from the tablet probiotics, only the strains of Enterococcus faecium carrying the msrC gene showed any resistance to the antimicrobial agents (Hammad & Shimamoto, 2010), allowing them to be used with antibiotic treatment, but only if the culture carries the msrC gene. Additional research from Udekwu et al. 2009 from the Hammad and Shimamoto study, also showed that the effectiveness of an antibiotic (such as vancomycin) on its target microbe can decline with the density of bacteria exposed to the antibiotic (Hammad & Shimamoto, 2010). This study helped proposing the idea that probiotic-antibiotic combination therapy in some cases can actually counteract the target goal of the antibiotic (Hammad & Shimamoto, 2010). This study made it clear that the current probiotics from the Japanese market had little benefit to the user when they were exposed to majority of antibiotics, but the study did not eliminate the benefits they can also have on the person’s health.

A Pharmacist's Perspective (JB)

When discussing with various pharmacists in retail locations such as CVS, Walgreens, Rite Aid and Target around Rutgers University, similar trends were seen among them. The first trend was that roughly one-third of the prescriptions received by their pharmacy were for antibiotics of some kind. Many of the pharmacists felt that a fair percentage of the prescriptions were most likely unnecessary but they did not have the power or authority to do anything about it. When speaking to them there was a consensus that, for the most part, antibiotics were being over-prescribed from physicians, but also felt that the patients push for them as well in order to treat their symptoms. They felt that patients, specifically parents, need to “relax” to a degree and not push for antibiotics with every cough their child has they grow. Behaviors and actions such as these, not only contribute to increasing resistance to antibiotics, it does not create any health benefit for the patient as well.
It was also discussed with the pharmacists about the possible use of probiotics by patients. They described that they would only recommend the use of certain probiotics depending on the clinical requirements and information of the antibiotic they were issuing to the patient. However, they felt that they were unaware of any true benefit that they could provide from probiotics than just providing relief for some of the symptoms the antibiotic may cause. Many also said that they were not exposed to enough information throughout their education about the possible health benefits of probiotic use prior, during and after antibiotic treatment.

**Addressing Medical Professions:**

The idea of incorporating probiotics into one’s diet is an easy and inexpensive way for people to take control of their own health and help support a preventive care lifestyle and potentially reducing the need for antibiotics within our society (Chung, Lee, Morrison & Schuster, 2006). There are certain areas in preventative health care that are hard to improve, such as patient compliance issues, adequate behavior, screening for health risks, vaccines, insurances, education etc. These areas are the biggest obstacles in reducing the need for specific treatments such as antibiotic use. However, probiotics is a simple alternative that can be used by both patients and medical professions to promote healthy and safer lifestyles. The key to disseminating this information is to have medical professionals inform their patients and have them educate and help promote preventative lifestyles within society. Thus, our overall goal is to reach out to medical professionals, such as pharmacists and physicians and encouraging them to explore the benefits probiotics can have on their patients and clients. We wrote to the American Medical Association (AMA) through the Journal of American Medical Association (JAMA) and described to them the benefits of probiotics. Hopefully, with the information and research regarding probiotics available, it can help encourage medical professions to further investigate the use of probiotics in the normal and healthy routines of their patients, especially as a follow up to antibiotic use.

Research that has been conducted thus far has indicated that probiotics have positive impact on patients health. They have been seen to decrease chances of infections and illnesses caused by pathological bacteria and may reverse some of the negative effects caused by the harmful bacteria. They can be used to reduce mild illnesses caused by bacteria such as diarrhea, as well used to decrease the symptoms of antibiotics and other treatments. However, more research is still required to be conducted in order to increase their odds of being an alternative and preventative healthcare lifestyle. Hopefully with the information sent to the AMA and JAMA, it will help push for additional research into probiotics, increasing the types of probiotics available for use and to increase the overall benefits of probiotics. The need for medicines and specifically antibiotics will always hold a place in our healthcare and the treatment of illnesses, but the current track and patterns of our systems will only lead to increased expenses, increased amounts of antibiotic resistant bacteria and increased amounts of health complications. Probiotics is a safe, simple and smart choice a person can use today, to effectively increase their health, energy levels, and overall well being without the need of expensive medicines, visiting a doctor or healthcare provider and can potentially reduce their overall need for antibiotics after an illness has occurred.
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**Probiotics Article/Letter to the Editor**
Probiotics, A Healthier You

Written By: Jonathan Bellizio and Margaret Semple

The human body has several ways in which it protects itself from infections. The multiple layers of our skin, protective mucous barriers, our immune system and the community of microflora in our gut are all different systems that our bodies utilize to ward off unwanted bacteria. The gut microflora are crucial and are made of beneficial types of bacteria that help to digest food and make vitamins. The bacteria that make up our microflora also compete with the foreign pathogenic bacteria for nutrients and this competition help keep the pathogenic bacteria in check.

Our bodies are constantly trying to keep these naturally-occurring, beneficial bacteria in balance, however, this isn’t easy. The intestines have an incredibly large surface area due to its role in nutrient absorption. While this large surface area helps to increase nutrient absorption it also makes it very difficult to defend against unwanted bacteria. Occasionally, due to multiple causes like the overuse of antibiotics, over the counter drugs, birth control pills, alcohol, tobacco, consumption of feedlot animals, illnesses, stress, surgery ect., our gut microflora can become diminished or low. This is where probiotics come into play.

Probiotics are used to help maintain the optimal balance of gut flora, out-compete the bad bacteria that may cause harm, and secrete chemicals that can kill off some bad bacteria. Probiotics literally means “for life” and they help the gut microflora grow back as well as help to support other natural bodily functions. Seventy percent of our body's immune cells are found in our gastrointestinal system. Immune cells in our intestinal immune system are constantly on guard, deciding what can enter our body. Probiotics help stimulate and exercise the immune cells by going through a screening process, helping to prepare our immune cells to fight off any bad bacteria.

Probiotics has been seen to help reduce several different diseases, such as inflammatory bowel disease, cancer and promote immune system stimulation. Animal and some human studies have shown an effect of yogurt or lactic acid bacteria on enhancing levels of certain immunoreactive cells such as macrophages and lymphocytes or immunoreactive factors such as cytokines, immunoglobulins and interferons as well. From these studies, it appears that probiotic bacteria are able to enhance both nonspecific and specific immune responses by activating macrophages. Each showing how probiotic cultures in a variety of test systems can stimulate certain cellular and antibody functions of the immune system.

For Inflammatory Bowel Disease, such as ulcerative colitis and Crohn’s disease it has been hypothesized that an intolerance to the normal flora (bacteria) in the gut leads to inflammation and resulting pathology. The role of gut flora in the progression of these diseases
has led some researchers to study the impact certain probiotic bacteria might have on maintaining the state of reduced inflammation that occurs during the diseases' remission stages. Several controlled clinical trials have shown that high levels of certain probiotic strains can extend the disease-free remission period and have shown to improve the clinical outcome in many intestinal disease targets.

In general, cancer is caused by mutation or abnormal activation of genes that control cell growth and division. It has been hypothesized that probiotic cultures might decrease the exposure to chemical carcinogens by detoxifying ingested carcinogens and altering the environment of the intestine. Thereby decreasing populations or metabolic activities of bacteria that may generate carcinogenic compounds. Additional probiotics would be producing metabolic products (such as butyrate) which improve a cell's ability to die when it should die (a process known as apoptosis). As well as producing compounds that inhibit the growth of tumor cells and stimulating the immune system to better defend against cancer cell proliferation.

Besides the evidence showing the benefits can have on diseases, probiotics also have the ability to reduce allergic reactions and reduce or eliminate cold and flu symptoms as well. In a study posted in the Journal of the American Academy of Pediatrics, children who were given probiotic supplementation (symptoms for were seen for 4.6 and 3.5 days) had significantly lower odds of fever, cough, rhinorrhea, or any cold or influenza like symptoms in comparison to the placebo group, which had symptoms for about 7 days.

These are just few of the possible benefits that probiotics can have on an individual's health. It’s not saying that it can treat or completely prevent these diseases or illnesses from occurring, or even eliminating the need for specific treatments, such as antibiotic use, but it is becoming a safe, easy and inexpensive alternative to promote healthier lifestyles in a person’s life.

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Greetings,

This article was written by two graduating Seniors, Jonathan Bellizio and Margaret Semple, at Rutgers University for the colloquium course Ethics In Science. Each group was given the task of addressing a certain issue within society and provided a suitable alternative to help address the issue with the assistance of our professor, Dr. Julie M. Fagan. Our group look into the benefits of probiotics and how they could potentially alleviate the stress and dependence of antibiotics within society; in addition, hopefully helping to prevent the increase of antibiotic resistant bacteria.

In developed countries there is a strong emphasis on treating disease caused by bacteria once it has occurred, rather than trying to find ways to avoid and prevent the disease from occurring. This style of healthcare has produced an extremely complicated and expensive healthcare system; Currently this systems is not working efficiently and one way to begin to turn it around is to start changing our treatment philosophy to one that is based on prevention and not just treatment. Since the end of the 20th century, antibiotic research has been at a standstill, despite the emergence of antibiotic resistant bacteria. It has now been over 30 years since the pharmaceutical industry has been able to created a new class of antibiotics due to the lack of development of new any novel compounds. All the “new” antibiotics that have been introduced, function in similar ways to older antibiotics (Quinn, 2013). Without the development of “new” antibiotics it will become increasingly difficult to treat illnesses and diseases caused by antibiotic resistant bacteria, creating an obvious need for more research. Unfortunately research is extremely expensive and this approach will only cause an increased financial burden on the healthcare system and governments as well. It will be unknown when a new and effective antibiotic will be developed by a pharmaceutical industry and approved by the FDA and similar government organization to be available for general use. The idea of incorporating probiotics into one’s diet is an easy and inexpensive way for people to take control of their own health and help support a preventive care lifestyle and potentially reducing the need for antibiotics within our society (Chung, Lee, Morrison & Schuster, 2006).

Probiotics can contain bacteria and/or yeasts, with each probiotic product being unique in its makeup. Each will have variable health benefits depending on the role they play in a person’s gut. There are 50 species of lactobacilli, all of which are naturally found in one’s digestive, urinary and genital systems and have been used for treating and preventing a wide variety of diseases and conditions for a while (Huber, 2012). Some of the lactobacilli found in foods and supplements are Lactobacillus acidophilus, Lacidophilus DDS-1, Lactobacillus blugaricus, Lactobacillus rhamnosus GG, Lactobacillus plantarium, Lactobacillus reuteri, Lactobacillus salivarius, Lactobacillus casei, Lactobacillus johnsonii, and Lactobacillus gasseri (Kovacs, 2012). This genus is commonly found in yogurt and probiotic supplements. Various studies have shown that Lactobacillus can help in treating and preventing yeast infections, urinary tract infections, irritable bowel syndrome, antibiotic related diarrhea, traveler's diarrhea, diarrhea
caused by Clostridium difficile, lactose intolerance, fever blisters, eczema, acne, canker sores and prevention of respiratory infections (Kovacs, 2012).

Some studies have begun to look at individual strains in an attempt to narrow down their possible effects. Children with irritable bowel syndrome were given three billion cells of Lactobacillus GG twice a day for eight weeks (Kovacs, 2012). This probiotic regiment was able to reduce the frequency and the severity of abdominal pains (Kovacs, 2012). This same strain was given to children taking antibiotics, a decrease in antibiotic related diarrhea resulted (Kovacs, 2012). When day care children, ages 1 to 6 years, were given milk supplemented with Lactobacillus GG, they got fewer and less severe lung infections than those children who were not drinking the milk (Kovacs, 2012). In a study containing 245 people who traveled to 14 different regions in the world, Lactobacillus GG reduced the risk of traveler's diarrhea by 47 percent (Kovacs, 2012).

In a research study Lactobacillus casei, Lactobacillus bulgaricus, and Streptococcus thermophilus were given two times a day concurrently with a regimen of antibiotics and one week following antibiotic treatment (Huber, 2012). This decreased the risk of diarrhea in adults who were hospitalized (Huber, 2012). Lactobacillus gasseri and Lactobacillus rhamnosus vaginal capsules were able to lengthen the time in between bacterial vaginosis infections (Huber, 2012).

Another widespread microbe used in probiotics is bifidobacteria. Thirty different species of bifidobacteria make up 90 percent of a person’s intestinal microflora in the colon (Kovacs, 2012). Some of these species that are commonly used in probiotics are Bifidobacterium bifidum, Bifidobacterium lactis, Bifidobacterium longum, Bifidobacterium breve, Bifidobacterium infantis, Bifidobacterium thermophilum, and Bifidobacterium pseudolongum (Kovacs, 2012). Some studies that have already been performed were able to conclude that this organism does indeed have several possible health benefits. Bifidobacteria has been identified as a probiotic that can help with IBS, dental cavities, improved blood lipids, and glucose tolerance (Kovacs, 2012). In one recent study, 362 people with IBS were given Bifidobacterium infantis 35624 for four consecutive weeks (Kovacs, 2012). All the patients taking part in the study saw improvement of symptoms, such as abdominal pain, bloating, bowel dysfunction, incomplete evacuation, straining, and passage of gas (Kovacs, 2012). Another study looking at cavities in adults in children saw that those taking this probiotic had less frequent incidences of cavities due to the fact that salivary levels of bifidobacteria are associated with dental cavities (Kovacs, 2012). Another strain, Bifidobacterium lactis Bb12, has been proven to improve metabolism (Kovacs, 2012). This includes lowered serum LDL-cholesterol in people with type 2 diabetes, increased HDL in adult women, and improved glucose tolerance during pregnancy (Kovacs, 2012).

Saccharomyces boulardii is the only probiotic that is a yeast. This probiotic has been proven to be effective in preventing the frequency of C. difficile, antibiotic related and traveler's diarrhea (Kovacs, 2012). S. boulardii has shown to help reduce the incidence of acne (Kovacs, 2012). The treatment of Helicobacter pylori can cause severe side effects, this probiotic has shown to be effective in the reduction of such side effects (Kovacs, 2012). Streptococcus thermophilus is a bacterium that produces a significant amount of the enzyme lactase, whose job it is to break down lactose (Kovacs, 2012). New studies suggest that ingesting this probiotic can help prevent lactose intolerance (Kovacs, 2012).

An area that has been studied thoroughly has been probiotics positive effect on the bowels and intestinal health. It has become common practice for probiotics to be used for the
prevention and treatment of diarrhea (Mrukowicz & Szajewska, 2001). The prevention of acute diarrhea with probiotics is encouraging and used to fight against the intestinal pathogens causing the diarrhea (Mrukowicz & Szajewska, 2001). Scientists are not yet able to say the exact physiological mechanism by which this process works, however, they are able narrow it down to a few possibilities; production of antimicrobial material, competition for nutrients necessary for growth and survival of pathogens, competitive inhibition of adhesion of pathogens, alteration of toxins or toxin receptors, or stimulation of nonspecific and specific immune responses to pathogens (Mrukowicz & Szajewska, 2001).

In a study done by the Journal of Pediatric Gastroenterology and Nutrition, probiotics have shown been to be an effective treatment prevent acute infections resulting in diarrhea in infants and young children. The researchers conducted eight trials that included 731 children and they found there was a significantly reduced risk for children who had used probiotics versus the placebo, of diarrhea lasting more than three days (Mrukowicz & Szajewska, 2001). Probiotics can help with other issues in the intestines as well. One example is necrotizing enterocolitis, the death of intestinal tissue and occurs when the lining of the intestinal wall dies and tissue falls off (Barclay, Stenson, Simpson, Weaver & Wilson, 2007). Doctors are not sure what the cause of this disorder is yet they do know that a decrease in blood flow to the bowel keeps the bowel from producing mucus that protects the gastrointestinal tract (Barclay et al., 2007). Some are suspicious that bacteria in the intestine may be able to cause such a disorder (Barclay et al., 2007). A study done by the Journal of Pediatric Gastroenterology and Nutrition looks at probiotics as a strategy to prevent necrotizing enterocolitis. This study states it is very likely that probiotics prevent the incidence of this disorder in preterm and very low birth weight infants (Barclay et al., 2007). Not only do the probiotics seem to prevent necrotizing enterocolitis, the overall mortality rate decreased compared to those who were not in the probiotic treated groups. Researchers believe that the overall decrease in mortality rate demonstrates the potential of probiotics in areas such as immune stimulation and the reduction of bacterial sepsis rates. This study recommends more research be done on the specific dosing and type of probiotics that would should optimal results (Barclay et al., 2007).

Probiotics have begun to be studied in areas that go beyond intestinal health and one of these areas is the prevention of cold and flu like symptoms. In a study reported in the Official Journal of the American Academy of Pediatrics, 326 healthy children were evaluated during the winter season for incidences of cold and influenza like symptoms while taking either a placebo, *Lactobacillus acidophilus* or *Lactobacillus acidophilus* in conjunction with *Bifidobacterium animalis* twice daily for 6 months (Leyer, Mohamed, Reifer, Ouwehand & Li, 2008). Those children who were in the *L acidophilus* group had significantly lower incidence and odds of having fever and cough compared to the placebo group (Leyer et al., 2008). However, those subjects who were in the *L acidophilus/B lactis* group had significantly lower odds of having fever, cough, rhinorrhea (mucus fluid in the nasal cavity), or any cold or influenza like symptoms when compared to the placebo group. Those in the placebo group had symptoms for an average duration of 7 days (Leyer et al., 2008). The *L acidophilus* group had symptoms for an average of 4.6 days and the *L acidophilus/B lactis* group had symptoms for 3.5 days (Leyer et al., 2008). The probiotics were not only able to prevent incidence and odd of flu and cold like symptoms but duration of symptoms as well.

Probiotics are a growing field of study that is showing promising results. By reducing the incidence of infections there will be a reduction in the reliance on antibiotics (Leyer et al., 2008). Allergies and certain chronic conditions like inflammatory bowel diseases have become
more prevalent in recent generations due to our overuse of antibiotics (Leyer et al., 2008). This has created an antimicrobial resistance in many children, lowering their natural immune and disease-fighting responses (Leyer et al., 2008). The use of probiotics will potentially stop the need for treating infection in such a way that has caused these antimicrobial resistances and start preventing them. Not only that, consumption of probiotics does not have the major side effects, that other current antibiotic treatments have. These non-pathogenic living microorganisms are by no means a miracle preventive strategy; however they show great promise when it comes to moving toward a nation focused on preventive healthcare.

Despite the benefits probiotics can have on a person’s health, limitations of their use have also been discovered as well. One major limitation of probiotics is their effectiveness in the presence of antibiotics which was observed in a study done regarding the antimicrobial resistance of 40 Japanese probiotics (30 dairy products and 10 products in tablet form) available in the market without a doctor’s or pharmacist’s supervision (Hammad & Shimamoto, 2010). From the results of the study, none of the dairy probiotics showed any level of resistance or carried any inducible resistance genes to the antibiotics. However, this did prove them to be suitable to be administered with the class of antibiotics of macrolides (Hammad & Shimamoto, 2010). However, from the tablet probiotics, only the strains of Enterococcus faecium carrying the msrC gene showed any resistance to the antimicrobial agents (Hammad & Shimamoto, 2010), allowing them to be used with antibiotic treatment, but only if the culture carries the msrC gene. Additional research from Udekwu et al. 2009 from the Hammad and Shimamoto study, also showed that the effectiveness of an antibiotic (such as vancomycin) on its target microbe can decline with the density of bacteria exposed to the antibiotic (Hammad & Shimamoto, 2010). This study helped proposing the idea that probiotic-antibiotic combination therapy in some cases can actually counteract the target goal of the antibiotic (Hammad & Shimamoto, 2010). This study also made it clear that the current probiotics from the Japanese market had little benefit to the user when they were exposed to majority of antibiotics, but the study did not eliminate the benefits they can also have on the person’s health.

There are certain areas in preventative health care that are hard to improve, such as patient compliance issues, adequate behavior, screening for health risks, vaccines, insurances, education etc. These areas are the biggest obstacles in reducing the need for specific treatments such as antibiotic use. However, probiotics is a simple alternative that can be used by both patients and medical professions to promote healthy and safer lifestyles. Research that has been conducted thus far has indicated that probiotics have positive impact on patients health. They have been seen to decrease chances of infections and illnesses caused by pathological bacteria and may reverse some of the negative effects caused by the harmful bacteria. They can be used to reduce mild illnesses caused by bacteria such as diarrhea, as well used to decrease the symptoms of antibiotics and other treatments. However, more research is still required to be conducted in order to increase their odds of being an alternative and preventative healthcare lifestyle.

With the resources and influence the American Medical Association has over the medical community, we believe that you have the ability to promote the needed research on the topic of probiotic use. But also has the ability to spread and educate medical professions about the benefits and outcomes probiotic use can have on their patients health. With this knowledge medical professions would then be able to educate their patients on health benefits probiotics can have as a preventative health style, as well as a follow up to treatments, such as antibiotic use. The need for medicines and specifically antibiotics will always hold a place in our healthcare and
the treatment of illnesses, but the current track and patterns of our systems will only lead to increased expenses, increased amounts of antibiotic resistant bacteria and increased amounts of health complications.

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