

Probiotics and prebiotics for the treatment and prevention of eczema

Robert Boyle, Consultant Paediatric Allergist at St Mary's Hospital Paddington and Imperial College London examines whether 'friendly bacteria' can harness the immune system in a positive way to treat or prevent eczema.

Eczema appears to have become more common over recent decades, and some studies suggest that changes in our exposure to microbes in the environment might explain the increase (hygiene hypothesis). Many studies have found that the microbes inhabiting our guts (we each have about 1000 trillion of them) are different in infants with eczema from infants without eczema, and these 'old friends' are an important stimulus to help the immune system develop in early life.

About 15 years ago, Scandinavian researchers developed the idea that giving the right type of microbe might be an effective way to treat or prevent eczema, perhaps by displacing 'bad bugs' from the intestine, or by stimulating the immune system in a helpful way. Either effect can potentially be achieved by:

- Using harmless microbes called **probiotics** – these are usually *Lactobacillus* or *Bifidobacterium* species derived from the dairy industry or from the human intestine.
- Using a substrate that will help certain microbes to flourish in the intestine, called **prebiotics** – these are non-digestible sugars already present naturally in large amounts in human breast milk, probably to help ensure that the right types of microbes flourish in the infant intestine from the start.
- A combination of probiotic and prebiotic, called a **synbiotic**.

One key message from experts in this area is that one probiotic is not the same as another – they all share certain characteristics including low pathogenicity (i.e. low chance of causing an infection) and ability to survive in the human intestine, but sometimes their clinical effects can be quite specific. Some researchers have created 'designer probiotics' through genetic engineering, aiming for very specific effects in the intestine that they believe will help treat certain illnesses.

Probiotics and prebiotics for treating eczema

There have been at least 13 trials of probiotics for treating people who already have eczema, but far fewer trials of prebiotics or synbiotics. Most of the probiotic studies have been in young children under 2, and only a limited range of probiotics have been used – mostly *Lactobacillus* species. In contexts other than eczema, a much wider range of probiotics have been used, including safe strains of *Streptococcus*, *E. coli* and *Bacillus* bacteria, the yeast *Saccharomyces boulardii* and other microbes, but these non-*Lactobacillus* probiotics have mostly not been tested for treating eczema. The eczema treatment trials have largely been unsuccessful, with none of them individually showing probiotics can make eczema better or reduce itching. However it is possible that some untested probiotics or genetically engineered ones may prove to be effective for treating eczema in the future.

Preventing eczema with probiotics and prebiotics

The prevention of eczema and other allergic problems is of particular interest, since we have so few curative treatments for them at the moment and they seem to be getting more and more common. Probiotics are perhaps the most promising single strategy in the field

of eczema prevention at the moment. Probiotics have been tested for preventing eczema in 15 different trials now, using a range of different probiotic bacteria. Again there are far fewer studies of prebiotics or synbiotics. When combined together, the studies suggest that probiotics can reduce the risk of developing eczema by 10–30%. However, each of those 15 trials has used a different probiotic bacterium, or combination, in a different way and this makes it difficult to advise people what to take and when. Some have given probiotics to pregnant women, some to breastfeeding women, some to infants directly and many have used a combination of two or more of these approaches. It seems unlikely that probiotics are doing the same thing when given in all these different ways. Several of the positive studies have used a *Lactobacillus rhamnosus* strain, either alone or in combination – including the only two studies that have shown longer term reduction in eczema prevalence beyond the first 2 years of life. So a *Lactobacillus rhamnosus* probiotic might be the best bet for preventing eczema in the future, but more studies are needed to help understand who should take it and when.

Are there any safety concerns with using probiotics?

One question that is often asked is whether it is safe to give live bacteria to pregnant women and infants. On the current available evidence, we think that they are safe in people without major health problems. However, there have been some reports of probiotics causing low-level infections, particularly in people whose normal immune defences are compromised by illness, and there have not been many studies specifically looking at their safety during early pregnancy. One study in the Netherlands found that probiotic treatment of people with a condition called pancreatitis, resulted in fatal bowel complications. This suggests that probiotics should be avoided in people who are very unwell.

An alternative to taking live bacteria is to use *prebiotics* instead. These non-digestible sugars cannot directly cause infection, but rather they encourage the growth of particular ‘friendly bacteria’ in the intestine and they can also directly stimulate the immune system. Preliminary studies of prebiotics for preventing eczema suggest that they may be effective when added to infant formula. However, prebiotics are naturally present in large quantities in human breast milk, so are only really appropriate for infants where breastfeeding has failed. In fact, while breastfeeding is probably the best way to give prebiotics to your infant, most infant formula available in the UK does already contain prebiotics on the basis that they are safe and make the formula more like breast milk.

How do I find a probiotic?

Probiotics can be sold in liquid, capsule or powder form, and are available in most supermarkets and food shops. They are also added in smaller amounts to live yoghurt. ‘Friendly bacteria’ are naturally present in quite a wide range of foods including yoghurt, unpasteurised cheese, sauerkraut and other fermented foods. To purchase a specific probiotic bacterium, you may need to ask a health food shop or pharmacy to order it in.

What next...

The rapid increase in eczema and other allergic problems such as food allergy and asthma, suggests that modifiable environmental factors are important for their development. We should therefore be able to prevent these problems in some people. At the moment we know a lot about eczema and allergy, but don’t quite know how to prevent it - friendly bacteria look very promising, and our old friends may provide us with a useful treatment before too long.