

**Table 1.** Total *Lactobacillus* count in Colony Forming Units per gram (CFU/g) for samples before and after one hour at 37°C shaking in 1.5N Hydrochloric Acid

Probiotic Acid Stability 1 hour Hydrochloric Acid

Product	Log10 reduction	Log10 Reduction from MAKTreK <sup>®</sup>	Times MAKTreK <sup>®</sup> better by
A	2.35	0.75	7.5X
B	1.6	0.26	2.6X
C	4.47	3.13	1130X
<b>MAK TREK<sup>®</sup></b>	<b>1.34</b>	<b>0</b>	<b>0X</b>
E	2.28	0.94	9.4X
			Average 287X

MAKTrek<sup>®</sup> STABILITY OVER OTHER PROBITOIC PRODUCTS



**Figure 1. Representative examples of capsules in acid after 1 hour.** Beaker on the left contains 0.1N HCl pH 1.5 MAKTreK<sup>®</sup> (MBT) capsules with probiotics after 60 minutes.

Beaker on the right contains negative control capsules with a purported acid stable system which previously failed in this system (data not shown). There is complete degradation of the shells of both the MAKTreK<sup>®</sup> capsules and the control capsules. However, the MAKTreK<sup>®</sup> capsules maintain their shape. Despite the fact that the capsule has been dissolved, capsules create an outer wall that is impenetrable to water and the inside stays dry. To test this, one of the capsules was cut apart and shown in a later image. Here, however, notice the MAKTreK<sup>®</sup> capsules are beginning to change shape as time moves forward. They become elongated and eventually, over time, will dissolve, although for the two hours we looked they did not until the pH was raised.



**Figure 2. Representative example of capsules after one hour after cutting in half. Picture of MAKTrek<sup>®</sup> capsule after one hour in gastric fluid plus pepsin.** While the vegetarian capsule shell dissolves, the remaining bulk forms a secondary “capsule” as can be seen in the image, containing a dry interior. The secondary capsule appears 1-2 mm thick and consists of the polymerized marine complex polysaccharide.

### **Discussion:**

As can be seen, the MAKTrek<sup>®</sup> protected the bacteria to a greater degree than the other systems. In one case, MAKTrek<sup>®</sup> was shown to be 1130 times greater than the “acid stable” system. The average was 287 times as good survivability than the other systems.

What we have seen from these and previous results is that in the simulated stomach acid the out shell of the capsule dissolves. As it does so water penetrates towards, but not completely through, the interior of the capsule and in doing so causes a polymerization of the complex polysaccharide. This forms an impenetrable layer, or “secondary capsule” which then is essentially protected from the stomach acid. This secondary capsule, which contains the probiotics, can then more safely travel to the small intestine where it can continue the process of breaking down and releasing the probiotics.