Are You Pitching Enough Yeast?

Yeast is arguably one of the most important ingredients in the making of beer, yet it is also often the most overlooked ingredient in terms of correct quantities needed for optimal fermentation.

Yeast should be treated with the same respect as hops and grains; as such, it should be carefully controlled to ensure the quality and consistency of a particular recipe.

According to Wyeast Laboratories, under-pitching yeast can lead to "excess levels of diacetyl, an increase in higher/fusel alcohol formation, an increase in ester formation, an increase in volatile sulfur compounds, high terminal gravities, stuck fermentations, and increased risk of infection".

Pitching the correct amount of yeast reduces the lag time before active fermentation begins, helps promote complete attenuation, reduces the risk of infection and improves the overall quality of the beer.

The chart below lists the number of yeast cells needed for 5 gallons of wort at various specific gravities.

Ale	**Specific Gravity**								
[5 gallons]	1.030	1.040	1.050	1.060	1.070	1.080	1.090	1.100	1.110
Yeast Cells Needed [billions]	107	141	175	209	242	274	306	337	367

Lager	**Specific Gravity**								
[5 gallons]	1.030	1.040	1.050	1.060	1.070	1.080	1.090	1.100	1.110
Yeast Cells Needed [billions]	214	283	351	418	484	548	612	647	735

There are two ways of achieving an optimal pitching rate:

1) Acquire more yeast, or 2) Grow more yeast, using a yeast starter.

A yeast starter is simply a small volume of wort which the yeast are pitched into and allowed to ferment out.

The amount of yeast produced by a starter is dependent upon inoculation rate and type of aeration used.

Inoculated with 100 billion cells	**Volume of Starter [Liters]**						
	1.0	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**	**4**
No Aeration	151	182	208	231	251	269	286
Intermittent Shaking	197	237	271	300	326	350	438
Stir Plate	246	297	339	375	408	438	465

Total yeast cells after fermentation* [billions]

*Final cell counts are estimates and can vary depending on strain of yeast, all data taken from www.YeastCalc.com