Conference abstract PMS25

Impact of Different Drying Processes on the Cellular Activity of *Enterococcus faecium* M74

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Sci Pharm. 2010; 78: 652 doi:10.3797/scipharm.cespt.8.PMS25

An essential step for the development of probiotic products is the stabilisation (drying) of the microorganisms. The aim of this study was to compare the efficiency of drying cells by lyophilisation, a classical method for cell stabilisation [1], with fluid bed technology, which is an approved method for gentle drying as well as for mixing, granulation and coating processes [2]. For this purpose the probiotic microorganism *Enterococcus faecium* M74 was dried by lyophilisation as well as by fluid bed drying. A further aim was to investigate the protective impact of excipients in different concentrations on microorganisms during the drying processes.

Both methods were studied regarding their effect on the culturability and the cellular activity of *E. faecium* M74. The culturability was determined by spreading the rehydrated cells onto kanamycin esculin azide agar plates and calculating the number of colony forming units (CFU). In order to investigate the cell membrane damage, the esterase activity, and the change in superoxide production of cells, the rehydrated cells were stained with the fluorescent dyes propidium iodide (PI), fluorescein diacetate (FDA), and dihydrorhodamine 123 (DHR 123), respectively, and measured with fluorimetry.

The addition of 50% skim milk, based on the wet mass of cells, had the best protective impact on *E. faecium* M74 during lyophilisation, whereas the best results for fluid bed drying were obtained by adding 100% skim milk. Remarkably, adding 50% or 100% skim milk were the only settings which significantly protected the cells during lyophilisation, contrary to the results of fluid bed drying, where nearly all of the used excipients had a significant protective impact on the cell culturability and the cellular activity of *E. faecium* M74. Furthermore the investigations showed that fluid bed drying is a capable method for the stabilisation of microorganisms. However, the selection of suitable protectants is important for the reliable application of both methods for drying probiotic microorganisms.

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[2] Morgen CA, Hermann N, White PA, Vesey G. Preservation of micro-organisms by drying: A review. J Microbiol Methods. 2006; 66: 183–193. doi:10.1016/j.mimet.2006.02.017