MYCOBACTERIUM AVIUM subsp. *PARATUBERCULOSIS* AND PASTEURISATION

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Introduction

Mycobacterium avium **subspecies** ***paratuberculosis*** **(MAP), discovered a hundred years ago, is found worldwide in numerous mammals, ruminants and birds. MAP causes Johne's disease, which leads to death of the animals. Infected animals shed MAP into the environment, where it persists in faeces (up to 10^8 cfu/g), soil and water. In (bovine) herds, animals of different infection stages again spread and transmit MAP through faeces, semen, colostrum and milk. Pasteurisation is the method of choice to reduce the bacteria in drinking milk.**

Materials and Methods

Literature concerning D values of MAP is available (Rowan et al., 2000; Olsen et al., 1985; Spahr & Schafroth, 2001; Keswani & Franck, 1998; IDF, 1999; Sung & Collins, 1998, Griffiths, 2002; Chiodini & Hermon-Taylor, 1993; Pearce et al., 2001; Grant et al., 1996). We compiled the published data by means of MS-Excel in order to visualize the temperature dependent behaviour of MAP and to derive practicable advice for producers of drinking milk.

Results and Discussion

Figs. 1, 2: **MAP growth peaks at 29 - 39°C. Between 4 and 45°C in aerobic conditions, MAP is not eliminated and D value can thus not be defined. From 4 - 25°C, a D value equivalent (lower time limit) must thus be estimated for anaerobic conditions. Growth of MAP is reduced between 45 - 49°C and further heating between 49 to 54°C stops growth. MAP enters D-value behaviour around 53°C. A power law [y = -0.145 log(D)+11.16] can be used to fit to the 54 – 74°C interval, where D values clearly decrease. Between 72 - 90°C, MAP is inactivated, although some authors showed MAP survival or even "resuscitation" (viable MAP was found after 30s at 90°C).** ***Fig 3:*** **MAP's heat resistance is deduced from high probabilities of finding viable MAP in drinking milk even after pasteurisation (40 months culture test).**

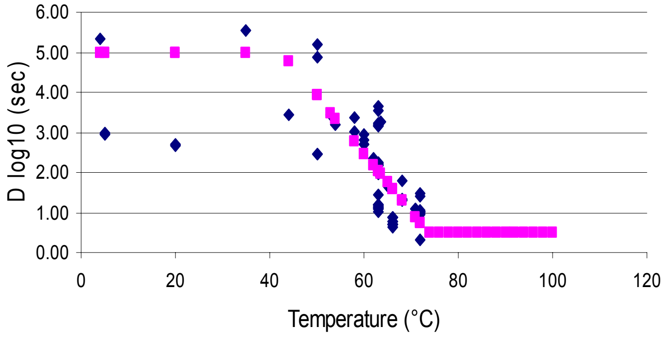

Figure 1: D values as a function of the heating temperature of milk. Values <50°C are lower limits or estimates of D in anaerobic environments. Within the interval of 54-74°C, a linear regression is seen (red spots). The 5 (T<40°C) and 0.5 (T>75°C) horizontal spots represent estimates of D. In both temperature intervals, the behaviour of D is not temperature dependant. Neither cooling nor completely kill MAP.

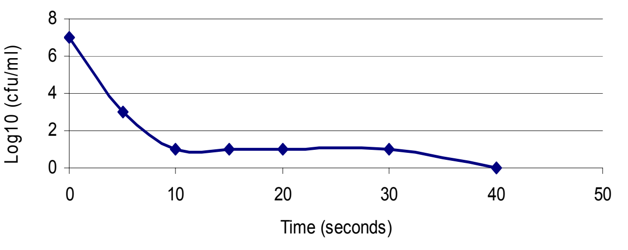

Figure 2: MAP survival during milk pasteurisation at 63°C. The D value only describes the 10 first seconds of pasteurisation (killing). The overwhelming part of time, MAP shows different temperature dependent behaviour (survival; afssa Report of the 5th Workshop, Paris, 24-25 of October, 2002).

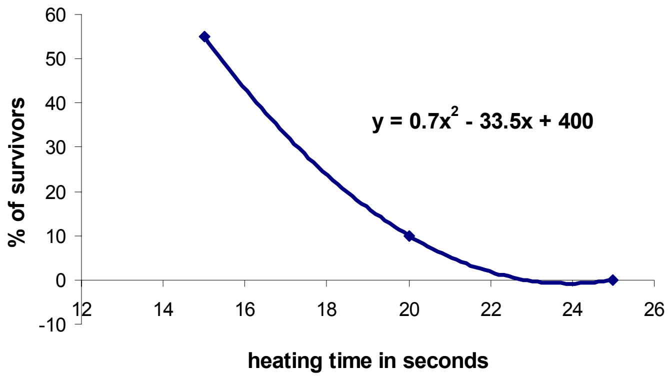

Figure 3: The probability of finding MAP in pasteurised milk decreases with increasing heating time (afssa Report of the 5th Workshop, Paris, 24-25 of October, 2002).

Conclusions

Temperature dependent methods of milk preservation effectively reduce but do not eliminate MAP contamination >10 cfu/ml.

Pasteurisation efficiency against MAP rises applying stringent pasteurisation conditions (temperature, time) in combination with turbulent flow for the disruption of MAP clusters.

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