19 Cornwall Terrace London NW1 4QP
[t] 020 7486 7244
[f] 020 7487 4734
[e] info@dia-ltd.org.uk
[w] www.dia-ltd.org.uk

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# Heat Resistant Phosphatase

## Introduction

Very occasionally there may be failures of the phosphatase test in pasteurised milk where there is no evidence of any failure in the pasteurisation process or recontamination with raw milk. These failures are usually associated with the presence of heat resistant phosphatase (HRP) of microbial origin.

All raw cows' milk contains phosphatase which is inactivated by effective pasteurisation. This is the basis of the legal phosphatase test, used to demonstrate that the pasteurisation has been effective.

In the rare instances where HRP is also present, despite the fact that the milk has been correctly pasteurised, the milk may fail the phosphatase test.

## Distinguishing Between Heat Resistant Phosphatase and Processing Failure

The phosphatase test is an important test for confirming that milk has been correctly pasteurised, and has not been re-contaminated with raw milk.

Any failure of the phosphatase test must be regarded as being potentially serious, and be investigated immediately. The most likely cause of a phosphatase failure is a process failure, which could have serious public health consequences. To ensure this is not the case process records and temperature charts need to be thoroughly investigated.

If investigations indicate that the process is not at fault, this can be confirmed by giving milk, which has been pasteurised on the plant, a laboratory pasteurisation. If, following laboratory pasteurisation, the milk continues to fail the phosphatase test this indicates that HRP is the cause of the phosphatase failure.

If laboratory pasteurisation of milk pasteurised on the plant results in the milk becoming phosphatase negative this normally indicates a process fault. Very occasionally, however, there may not be a process fault and it is the cumulative effect of the two pasteurisations which inactivates the HRP resulting in the milk becoming phosphatase negative This situation can be resolved by laboratory pasteurisation of the raw milk (if available).

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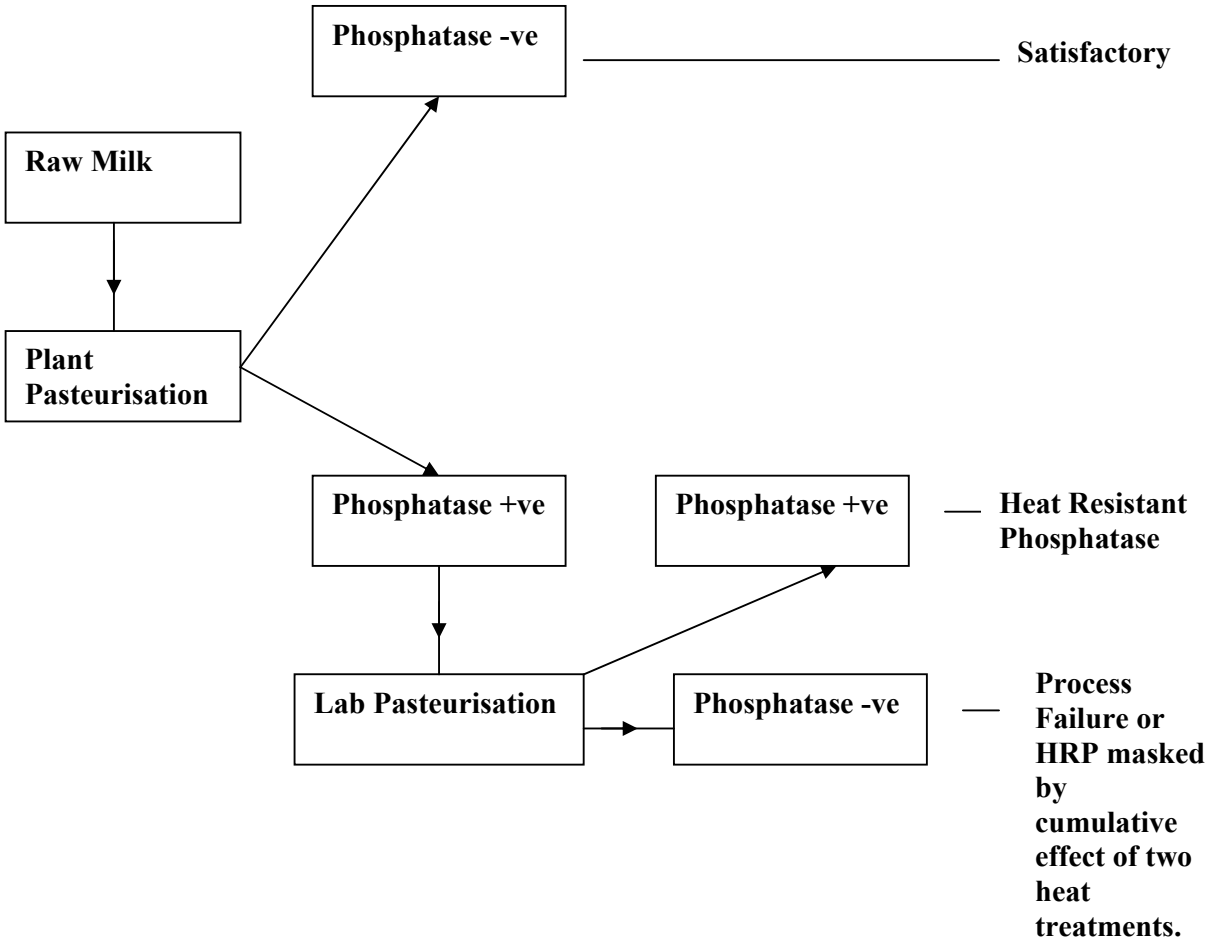
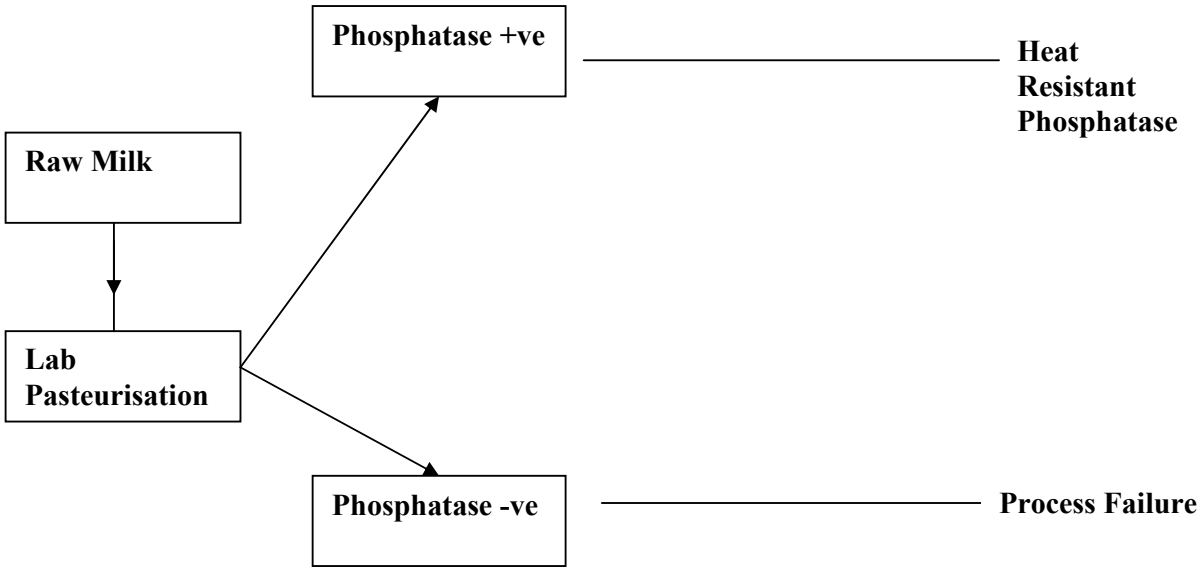
Schematically, this can be shown below with a) giving the situation of laboratory pasteurisation of milk pasteurised on the plant and b) that of laboratory pasteurisation of raw milk.

**a) Laboratory pasteurisation of milk pasteurised on the plant**




**b) Laboratory pasteurisation of raw milk**

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## Sources of Heat Resistant Phosphatase

Heat resistant phosphatase (HRP) has been found to arise from psychotrophic organisms in the milk supply (Knight and Fryer (1989) and Bruce and Drysdale (1999)).

The presence of such bacteria is usually associated with poor hygiene at milking, together with poor temperature control of the milk and extended storage times.

Detection of the problem supplies can be difficult and lengthy on account of the sporadic nature of the occurrence of HRP, and the fact that the bacteria responsible do not grow at standard plating conditions of 30ºC or 37ºC.

## Legal Requirements

Part III of Schedule 4 of the Dairy Products (Hygiene) Regulations 1995, as amended requires that pasteurised milk shall show a negative reaction to the phosphatase test.

As described above, the intention behind this requirement is to cover the normal situation when HRP is not present. Under these circumstances a negative reaction to the phosphatase test demonstrates that the milk has been correctly pasteurised, and not re-contaminated by raw milk.

## Action To Be Taken By Dairies

Dairies experiencing phosphatase failures should initially assume a process fault. Only when investigations indicate this is not the case, and laboratory pasteurisation confirms the presence of HRP, should it be concluded that the failures are due to HRP. Under these circumstances the local EHO can be briefed using this note.

Investigations should also be carried out to identify the milk supplies which are the source of the problem, and advice given to the producers in order to allow the problem to be corrected.

## References

Knight, A. H. and Fryer, S. M., Journal of the Society of Dairy Technology 42, 3 (1989).
Letter from Scottish Office to Enforcement Officers, October (1986).
Bruce, J. and Drysdale, E. M. Dairy Analysis Seminar, Oxford (1999) (to be published).

**Dr E S Komorowski**
**Technical Director**