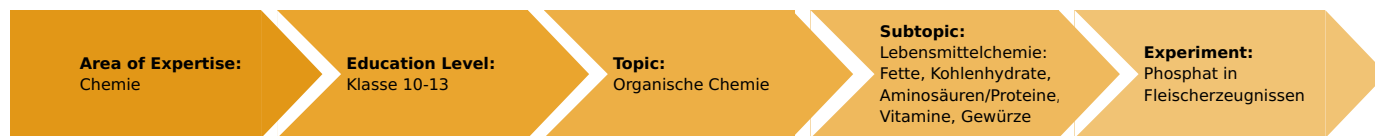


# Phosphate in meat products (Item No.: P7188300)

## Curricular Relevance



### Difficulty



Intermediate

### Preparation Time



10 Minutes

### Execution Time



20 Minutes

### Recommended Group Size



2 Students

### Additional Requirements:

### Experiment Variations:

### Keywords:

food chemistry, tests for phosphate, meat

## Task and equipment

## Information for teachers

## Additional Information

Phosphates play a great role in the production of foods. Phosphates are also present in sausages.

## Notes on content and learning objectives

- Phosphates in meat products can be detected with ammonium molybdate after extraction with water.
- Phosphates are added to scalded sausage mass to increase the water binding capacity and aid mincing.

## Notes on the method

Students can get to know about the different production procedures used in making sausages during a visit to a butcher's shop or a sausage factory.

Point out the diverse uses of phosphates as additives in foods such as processed cheese, baking powder (see the corresponding experiment), cola and condensed milk.

## Fundamentals and remarks

Scalded sausages are made from comminuted meat to which salt and mincing aids such as phosphate, tartrate, lactate, acetate and citrate, as well as water, have been added.

The meat is comminuted in a mincing machine at the lowest possible temperature. The water binding capacity is increased by additives. After mincing, the mass is packed into a covering. It is then subjected to a combined hot smoking/fermentation. The coagulation of the proteins containing water gives a crisp scalded sausage.

## Hints on going deeper

- Prepare a list of meat products which contain phosphates.
- Visit to a butcher's shop or a sausage factory.

## Notes on set-up and procedure

### Preparation:

According to regulations on meat and meat products (in the EU), sausages to which phosphate has been added as a mincing aid must be labelled with the statement "with phosphate". Whether or not a packaged product contains added phosphate can therefore be read from the label.

The following solution should be prepared centrally:

Ammonium molybdate solution:

Dissolve 1.3 g Ammonium heptamolybdate-tetrahydrate in 100 ml of distilled water.

Notes on the students experiment:

Meat has on average a natural content of approx. 200 mg phosphate/100 g. This phosphate is relatively tightly bound to the organic material. On heating with water, almost exclusively added phosphate goes into solution. This added phosphate gives a yellow colouration or a yellow precipitate with ammonium molybdate, according to its concentration.



## Hazard and Precautionary statements

Nitric acid:

- H272: May intensify fire; oxidizer.  
 H290: May be corrosive to metals.  
 H314: Causes severe skin burns and eye damage.  
 P260: Do not breathe dust/fume/gas/mist/vapours/spray.  
 P280: Wear protective gloves/protective clothing/eye protection/face protection.  
 P301+P330+P331: IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.  
 P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do – continue rinsing.  
 P309+P310: IF exposed or you feel unwell: Call a POISON CENTER or doctor/physician.

Trisodium phosphate:

- H314: Causes severe skin burns and eye damage.  
 P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do – continue rinsing.  
 P310: Immediately call a POISON CENTER or doctor/physician.

## Hazards

- Nitric acid is corrosive. Ammonium molybdate causes damage to health when ingested.
- Avoid skin contact with all chemicals.
- Wear protective glasses and protective gloves.

## Waste disposal

Pour the filtrates in the test tubes into the container for heavy metal salt solutions.

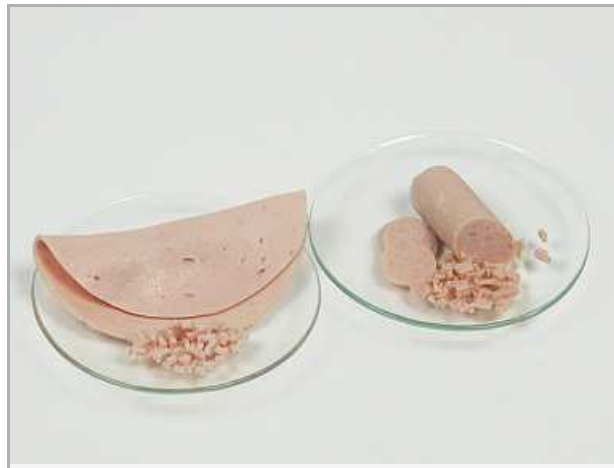
# Phosphate in meat products (Item No.: P7188300)

## Task and equipment

### Task

#### How can the addition of phosphate to meat products be detected?

Detect phosphates in various sausages.



### Equipment



Position No.	Material	Order No.	Quantity
1	Support base, variable	02001-00	1
2	Support rod, stainless steel, l=370 mm, d=10 mm	02059-00	1
3	Boss head	02043-00	1
4	Universal clamp	37715-00	1
5	Ring with boss head, i. d. = 10 cm	37701-01	1
6	Wire gauze with ceramic, 160 x 160 mm	33287-01	1
7	Glass beaker DURAN®, short, 250 ml	36013-00	1
8	Glass beaker DURAN®, short, 400 ml	36014-00	1
9	Erlenmeyer flask, narrow n., 100 ml	36118-00	1
10	Test tube rack for 12 tubes, holes d= 22 mm, wood	37686-10	1
11	Test tube, 180x18 mm, 100 pcs	37658-10	(3)
12	Test tube holder, up to d 22mm	38823-00	1
13	Test tube brush w. wool tip, d25mm	38762-00	1
14	Wash bottle, 250 ml, plastic	33930-00	1
15	Filter funnel, d = 75 mm, PP	46895-00	2
16	Pipette with rubber bulb	64701-00	2
17	Knife, stainless	33476-00	1
18	Spoon, special steel	33398-00	1
19	Labor pencil, waterproof	38711-00	1
20	Protecting glasses, clear glass	39316-00	1
21	Rubber gloves, size S (7)	39325-00	1
	Butane burner f. cartridge 270+470	47536-00	1
	Butane cartridge CV 300 Plus, 240 g	47538-01	1
	Ammonium molybdate 50 g	30025-05	1
	Trisodium phosphate 12-hydr. 250 g	30164-25	1
	Nitric acid 1,40 g/ml, 65%, 500 ml	30213-50	1
	Water, distilled 5 l	31246-81	1
	Circular filter, d 125 mm, 100 pcs	32977-05	2
	Boiling beads, 200 g	36937-20	1
Additional material			
	Sausage (scalded sausage, for heating in boiling water), with phosphate		
	Sausage (scalded sausage, for heating in boiling water), without phosphate		

## Set-up and procedure

### Set-up

### Hazards

- Nitric acid is corrosive. Ammonium molybdate causes damage to health when ingested.
- Avoid skin contact with all chemicals.
- Wear protective glasses and protective gloves.



### Setup

Number three test tubes from 1 to 3 and stand them next to each other in the test tube rack (Fig. 1).



Fig. 1

Assemble the stand as shown in figures 2 to 6. Fasten the support ring to the support rod and place the wire gauze on it. Adjust the height of the support ring so that the flame of the burner just reaches the wire gauze.



Fig. 2



Fig. 3



Fig. 4



Fig. 5



Fig. 6

Half-fill a 400 ml beaker with water and add a few boiling stones (Fig. 7). Heat it to boiling, then put it aside. Extinguish the bunsen burner flame!

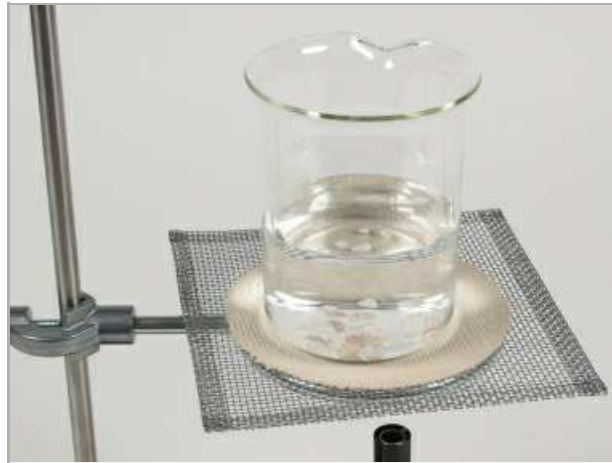


Fig. 7

## Procedure

Chop up a piece of sausage (without phosphate) with a knife on a board. Transfer three heaped spatula tips of the chopped up sausage to a 250 ml glass beaker (Fig. 8).



Fig. 8

Chop up a piece of sausage with phosphate in the same way. Transfer three heaped spatula tips of it to a 100 ml Erlenmeyer flask (Fig. 9).



Fig. 9

Put a few boiling stones and approx. 20 ml distilled water in the beaker and the flask.

Heat the beaker and the Erlenmeyer flask to boiling, one after the other (Fig. 10). Filter a part of the hot solution from the glass

beaker through a fluted filter into test tube 1 (Fig. 11) to a height of 4 cm. Filter the same amount of solution from the Erlenmeyer flask through a fluted filter into test tube 2.



Fig. 10

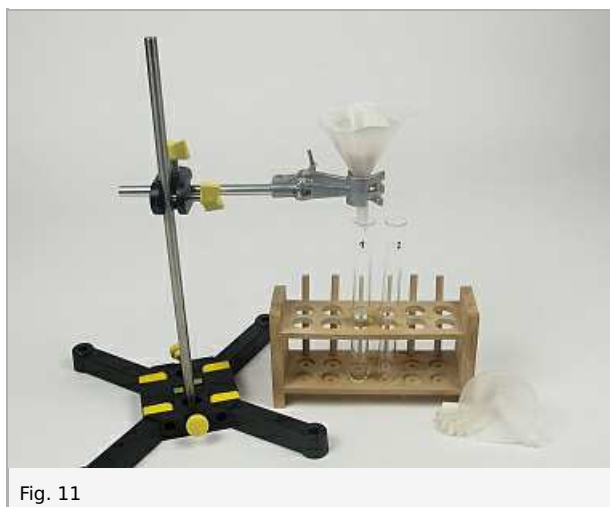


Fig. 11

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Put a spatula tip of sodium phosphate in test tube 3. Dissolve the salt in a little distilled water.

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Pipette 5 drops of nitric acid into each of the three test tubes. Add ammonium molybdate solution to the three test tubes to a height of approx. 6 cm in each.

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Heat the test tubes in the prepared hot water bath for a few minutes.

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## Waste disposal

Pour the filtrates in the test tubes into the container for heavy metal salt solutions.



## Report: Phosphate in meat products

### Result - Observations

Note your observations.

- a) Test tube 1
- b) Test tube 2
- c) Test tube 3

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### Evaluation - Question 1

Draw conclusions from your observations.

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### Evaluation - Question 2

In the making of sausages, they are separated into three types, according to whether they are to be eaten fresh, after frying or after heating in boiling water.

Name sorts of sausages and write them down in the correct group.

- a) Sausages for eating cold
- b) Sausage for frying
- c) Sausage for heating in boiling water

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### Evaluation - Question 3

Complete the following statements:

- 1. Sausages for heating in hot water partly contain ..... The added phosphate can be detected with .....
- 2. Phosphates are added to sausages to be heated in boiling water to increase the ..... and the ..... of proteins.