The image shows two slices of cheese, likely Swiss cheese, placed on a plate with a blue and white checkered border. The slice on the left is a pale yellow color and shows several irregular brown spots, which are likely mold or other defects. The slice on the right is a lighter, off-white color and shows a more pronounced, irregular brown stain, possibly indicating a different type of defect or mold growth. The text "Defects in cheese, causes and preventive measures" is overlaid in the center of the image in a white, serif font with a black outline.

**Defects in cheese, causes and preventive measures**



- ❑ Cheese is product of fermentation and its characteristics of flavor, body and texture, color and curing qualities are influenced by quality of milk, techniques of manufacture, temperature of curing and length of curing time.
- ❑ Develop defects during deviation in selection of quality of milk, method of manufacture and curing.

Defects in cheese can be related to the following aspects

Flavor	Body & Texture	Color and Finish
<ul style="list-style-type: none"> <li>i. Acid</li> <li>ii. Bitter</li> <li>iii. Cowy</li> <li>iv. Feed</li> <li>v. Fermented</li> <li>vi. Fruity</li> <li>vii. Mouldy</li> <li>viii. Rancid</li> <li>ix. Unclean</li> <li>x. Weedy</li> <li>xi. Yeasty</li> </ul>	<p><b>a)Body</b></p> <ul style="list-style-type: none"> <li>i. Corky body</li> <li>ii. Crumbly body</li> <li>iii. Curdy body</li> <li>iv. Dry body</li> <li>v. Mealy body</li> <li>vi. Pasty</li> <li>vii. Sandy</li> <li>viii. Short</li> <li>ix. Sticky</li> <li>x. Weak</li> </ul> <p><b>b)Texture</b></p> <ul style="list-style-type: none"> <li>i. Casein texture</li> <li>ii. Yeasty texture</li> <li>iii. Mechanical openness in texture</li> </ul>	<ul style="list-style-type: none"> <li>i. Acid cut</li> <li>ii. Black discoloration</li> <li>iii. Bleached discoloration</li> <li>iv. Mottled cheese</li> <li>v. Rusty spots</li> <li>vi. Seamy color</li> <li>vii. Waxy color</li> <li>viii. White specks</li> </ul>

## Defects related to moisture content

Moisture has an influence on **flavor, body or consistency, texture or openness and color** because it is directly related to composition and physical qualities of cheese. Moisture is indirectly related with lactose and some milk salts in solution.

Microorganisms change lactose to lactic acid. Lactic acid formation is necessary for proper cheese making and ripening; excessive make cheese taste sour while; inadequate amount may delay ripening or may actually encourage abnormal fermentations of undesirable type.

**1. Excessive moisture:** Cheese with excessive moisture are as follow:

- ❖ Flavor may be sour or acid or merely slightly acid when fresh, and lacking in cheese flavor and sour when aged.
- ❖ Body may be weak or soft when fresh, and sticky and pasty when aged.
- ❖ Texture may be open if acid development during the making operation is inadequate.
- ❖ Color may be higher.

## **Causes:**

- **An unusually high fat content in milk fat delays firming.**
- **Lack of acid development during making.**
- **Insufficient heating or heating too rapidly.**
- **Incomplete removal or elimination of whey.**

## **Prevention:**

- **Not necessary to apply all measures of control indicated.**
- **Corrections may be selected by scrutinizing the manufacturing records.**

## **2. Effects of insufficient moisture:**

- ❖ **Flavor - mild or lacking. May be slightly acid if lack of moisture was caused by excessive acid during making. Cheese flavor develops slowly.**
- ❖ **Body- firm, hard or corky and sometimes crumbly and mealy. Loss of curdy characteristics during ripening is extremely slow.**
- ❖ **Texture - usually close and solid but may show mechanical openness where curd particles failed to knit together properly during pressing.**
- ❖ **Color - sometimes deeper in shade and rind formation is frequently darker in color than rest of cheese.**
- ❖ **Finish - may show defective knitting together of curd particles.**

## **Causes:**

- **Maximum acid development throughout making process.**
- **Use of excessive amounts of rennet or  $\text{CaCl}_2$**
- **Fine cutting or breaking of the curd.**
- **Heating and holding temperature high.**
- **Excessive stirring of the curd while the whey is being removed and immediately after dipping.**
- **Lack of piling during cheddaring operation.**
- **Addition of too much salt.**
- **Holding the cheese in a warm drying room long before paraffining.**



## Prevention

### At salting:

- Steps may be taken to reduce acid development, ripening period and amount of starter, besides adding rennet sooner.
- Amount of rennet should be reduced, use of calcium chloride should be avoided, firm cut should be developed at cutting and coarser knives may be used for cutting curd.

### At heating:

- The temperature may be decreased. If the temperature used approx. 36°C, then acid development may be stimulated.

## **At dipping:**

- **Minimum amount of acid recommended for normal making operation should be developed.**
- **Curd should be settled 30 min before dipping and it should not be stirred at any time.**
- **As curd settles under whey, it should be pushed towards the side of vat to form layers approx. 25 cm deep.**
- **Whey should be removed early and before curd develops extreme firmness, this measure of control is most commonly used. Layers of curd should be cut into blocks 25 cm wide and piling should be sooner. It should be piled 4 or 5 high before milling.**
- **Allow curd to cool during cheddaring.**

## **At milling:**

- **Use minimum acid development consistent with recommended making procedure.**
- **Cool the curd promptly after milling by stirring and rinsing highly with water at 15-21 C.**
- **Salt the curd promptly and use minimum amount indicated for normal cheese.**
- **After pressing, remove cheese to cool room and paraffin it as soon as rind is properly dried.**

## **Defects related to acid content**

**Presence of too much or too little acidity in Cheddar cheese is associated with certain defects.**

**Excessive acidity is found in cheese that contains more than normal amounts of moisture because such cheese contains more than normal amounts of lactose. Excessive acid development during the making process can also produce acid defects in the finished cheese even when the moisture content of the product is normal or perhaps less than normal.**

## **1. Effects of excessive acidity:**

- ❖ **Flavor** – acid or sour. Bitterness is sometimes associated with too much acid development during making. True cheese flavor is lacking or slows in development.
- ❖ **Body** – firm, dry, crumbly, short and mealy when moisture content is low; it may be soft, pasty, sticky, and short when moisture content is high.
- ❖ **Texture** – usually close although in extreme instances the curd particles may be so poorly knitted together that numerous mechanical openings will be formed.
- ❖ **Color** – bleached or acid cut and sometimes mottled.
- ❖ **pH** – usually  $<5.05$  when cheese is 3-4 days old.

## **Causes:**

- **Too much moisture in cheese**
- **High acid initial milk**
- **Use of too much starter**
- **Prolonged ripening period**
- **Too much acid development before adding rennet**
- **Too much acid development at other steps**

## **2. Effects of lack of acidity:**

- ❖ **Flavor** - mild when fresh and fermented, fruity or lacking when aged. True cheese flavor develops slowly, if at all.
- ❖ **Body** - corky, pasty, sticky or weak. Cheese remains curdy for long time in curing.
- ❖ **Texture** - open, with large mechanical holes. Cheese with insufficient acidity may also show effects of uncontrolled fermentations of gas producing yeasts or bacteria.
- ❖ **pH** - usually  $>5.3$  when cheese is approx. 4 days old.

## Causes:

- **Failure of starter** - due to inactive starter, improper handling of starter, unfavorable conditions for starter activity or bacteriophage.
- **Abnormal milk** - unfavorable manufacturing methods, unnecessary amount of  $\text{CaCl}_2$ .
- **At Milling** - Delay milling until whey draining from curd shows at least 0.3% acid. Hot iron test should be nearly 3/8" long and pH of curd should not be >5.6.

If acidity of whey after 2 h of dipping does not exceed 0.25%, probably starter is faulty or that it is contaminated with bacteriophage. If contaminated with phage, prolong Cheddaring operations for 4-5 h do not help acid development. Holding curd in pack for 12 h or longer sometimes permits acid development in curd affected with phage. Curd must be kept at 29°C during this period.



# **Defective Flavours**

## **Acid flavor:**

- **This results from development of too much acid at any stage of cheese making or curing.**
- **It may occur from high acid milk as received, ripening too long before setting, too much starter, improper cutting, cooking too fast or other factors which may interfere with proper expulsion of whey from curd, or otherwise developing acid faster and higher than normal.**
- **Low salt content of cheese may also a contributing factor.**

## **Bitter flavor:**

- **Associated with inferior milk and poor starter, with excessive moisture and high acidity in cheese and using too much rennet and unclean utensils.**
- **Relatively higher temperature and use of *Leuconostoc* sp. as starter cause the defect.**
- **Unclean conditions e.g. rust spots, open seams, milk stones in cans and utensils may cause this defect.**
- **Conditions associated directly with manufacturing operations may also be responsible e.g. excess acid, excess moisture, lack of salt, and high curing temperature.**

## **Fermented flavor:**

- **Characteristics of odor of fermented whey and possess qualities of combined odors of alcohol, acetic acid and propionic acid.**
- **They may appear in cheese soon after it is made, but they usually develop after cheese is two weeks old. Caused by yeasts or bacteria. These organisms may get into milk in farms by contact with unclean and non-sterile surfaces of utensils, milking machines, and milk cans.**
- **Can be prevented by utmost precaution in plant sanitation, clean and active starter and ripening at 7°C or below.**

## **Fruity flavor:**

- Described as pineapple, raspberry or pear-like flavor in cheese.
- Compounds responsible for defect are esters, certain acetaldehydes and ketones and some alcohols.

## **Moldy flavour:**

- Associated with curing conditions.
- Caused by growth of mold in or on cheese. Mold will grow in Cheddar cheese only when O<sub>2</sub> gains entry through openings in the rind or through openings or cracks inside cheese which connect with trier holes or other defects in rind.
- Mold grows slowly on cheese held at low temperature and under dry conditions; grows rapidly at high temperature and humidity; grows most luxuriantly on non-paraffined cheese.
- **Prevention** – Proper paraffining, close texture, sound rind, curing at 7°C and relative humidity below 75% minimize the defect.

## **Rancid flavor:**

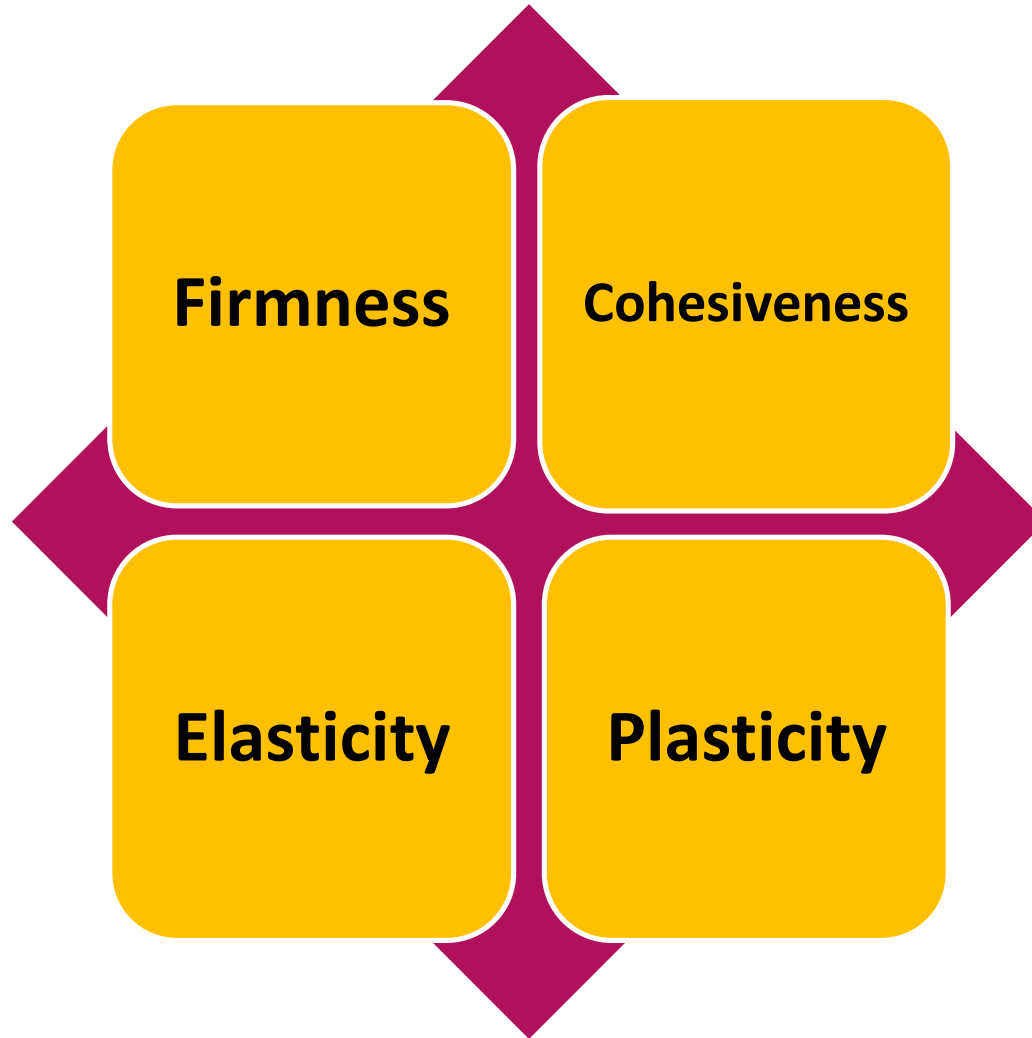
- **Flavor characteristic of the odor of butyric acid. It is believed to be present in all normal Cheddar.**
- **This flavor may come from the milk itself.**

## **Unclean flavour:**

- **Flavors that are foreign to milk and cheese but which can not be identified usually described “unclean”.**
- **Unclean flavors are often attributed to the development of undesirable microorganisms in the milk, curd or cheese.**

# Defects related to body

Physical properties of consistency



## Physical characteristics of cheese are sometimes called rheological properties

- ❖ **Firmness** is the property of the cheese which causes it to resist deformation or distortion under pressure.
- ❖ **Cohesiveness** is the characteristics of cheese that causes it to stick together.
- ❖ **Elasticity** is the capability of cheese to recover its size and shape after deformation.
- ❖ **Plasticity** is the quality of cheese which enables it to be deformed under pressure without rupture.

**Normal plug of ripened Cheddar cheese shows smooth, uniform surface, solid and firm, does not crumble when cut or pressed. It bends before breaking and when rubbed between thumb and fingers, it feels smooth and waxy like cold butter.**



**Common body defects are**



## **Corky:**

- **Cheese with firm, hard, tough and somewhat elastic consistency is called corky. Such cheese is difficult to crush with fingers, but when enough pressure is applied it breaks apart in woody manner.**
- **Corky body may be apparent as very firm curd at time of draining; the characteristics usually appear before salting.**
- **Causes – Low fat content, lack of acid development, over-heating during cooking, lack of moisture and excessive salt content.**

## **Crumbly:**

- **This defect is characterized by the falling apart of cheese when sliced, by difficulty in removing a full plug and by the breaking of the cheese into pieces that crumble when crushed between thumb and fingers.**
- **Lack of cohesion is apparent through whole cheese.**
- **Defect rarely appears during making operations, although first stage of crumbly body may be evident when excessive acid curd fails to mat properly during cheddaring.**
- **Defect is usually apparent in fresh cheese within week after making; persists throughout life of cheese.**
- **Develops in aged cheese and is not regarded as defect, if cheese is sweet in flavor. This crumbly body is caused by ripening changes in foods and by loss of moisture.**

# Curdy:

- Natural in fresh cheese and regarded as defect only when it persists beyond about 30 days.
- Curdy cheese, when broken apart, reveals size and shape of original curd particles after salting.
- When pressed between fingers it feels elastic, firm and somewhat like particles of curd at time of salting.

**causes**

- Low moisture content which delays curing.
- Lack of proper acid development
- Lack of proper cheddaring in vat before milling
- Addition of excessive amount of salt
- Low temperature storage.

## **Mealy:**

- **Appears when cheese is crushed and rubbed between thumb and fingers, structure of curd looks and feels rough, the characteristic is the opposite of waxy, smoothness desired in normal cheese.**
- **Mealy body can be most readily detected after curdy characteristics of cheese have fully disappeared; it is actually apparent during first week of curing but is not so easily discovered.**
- **Cause - Excessive acidity, regarded as stage of disintegration of crumbly cheese.**

## **Pasty:**

- **This defect is soft in consistency, when pressed and rubbed between fingers, it quickly becomes sticky and clings to fingers.**
- **Pasty body in cheese becomes apparent as soon as curdy characteristics disappear. The defect is caused by excessive moisture.**



## Defects related to texture

Open texture is most common defect in cheese. It may be due to the formation of gas or mechanical faults.

Contamination of cheese with gas producing bacteria and yeasts

Lack of acidity

Moisture content

Free whey trapped in curd

Lack of sufficient pressure during pressing of cheese

**CAUSE**

**Defect can be controlled by eliminating source of contamination, using pure culture and pasteurizing the milk efficiently. Acidity of 0.16% LA at draining, piling high, milling at acidity 0.60% LA, delayed salting; washing curd with water at 30°C and curing below 10°C helps in controlling defect.**

# Colour Defects in Cheese

Color defects	Causes
Acid cut	Excessive amount of acidity
Black discoloration	Presence of minute traces of lead coming from paint
Bleached color	Reducing action of organisms like <i>Bacillus subtilis</i> , <i>B. fluorscens</i> , etc.
Mottled color	Mixing of curd from two vats, lumpy starter, uneven development of acidity and moisture, adding starter after color, improper salting.
Rusty spots	Presence of anaerobic lactic organisms, moisture, lactose.