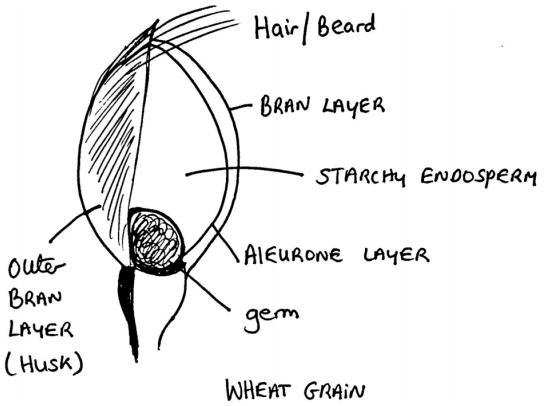
CEREALS

A : STRUCTURE OF A WHEAT GRAIN



1 : HUSK – BRAN LAYER (13%)

- Mainly Cellulose.
- High in Niacin.
- Calcium, Iron + Phosphorous present.

2 : ENDOSPERM (85%)

- High in Starch.
- Gluten present.
- Vitamin B.

3 : GERM (2%)

- Only part of grain with lipid, Vit E present.

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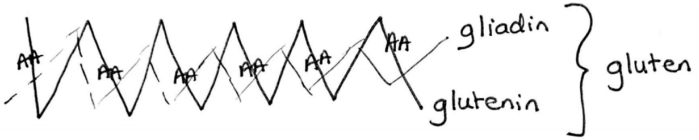
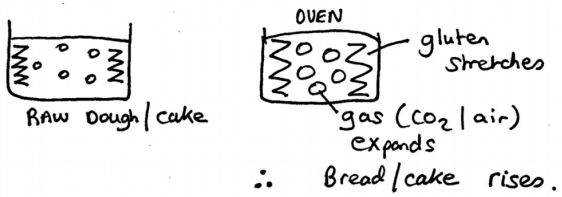
B : GLUTEN/ROLE IN BAKING

- Gluten is a fibrous protein in wheat, oats, rye.
- It has a 3D Shape/Zig-Zag structure.



- It is made up of two polypeptide chains **glutenin** and **gliadin**.
- When moistened gluten forms a sticky elastic dough which stretches as gases (air + CO_2) expand in the oven during baking.



- **Strong Flour** (BAKER'S FLOUR) contains 12% gluten (used in yeast dough)

C : EXTRACTION RATE

- % of grain that remains in flour after processing.
- **Wholemeal Flour** ER 100% (ie) : the whole grain is present in the flour.
- **White Flour** ER 73% (ie) : <u>most</u> of the endosperm is used in this flour.

D : EXTRACTION RATE

- The gluten content of flour is greatly influenced by the climate that the wheat is grown in.
- **Spring Wheat** : In Canada/Russia, wheat is set in Spring and harvested in Autumn, quick growth therefore wheat has a higher gluten percentage (12%)
    - Used for strong flour.
- **Winter Wheat** : In Ireland, wheat grows over the winter months, grows slowly therefore wheat has a lower gluten percentage (9%)
    - Used for plain household flour.

REVISE : Coeliac Disease ("Special Diets"), Nutritive/Dietetic Value (Nutritive Value of Foods sheet)

DIETETIC VALUE : Energy (Starch), Coeliacs (avoid Wheat Flour), Cellulose (Brown Flour) – Peristalsis.

E : EFFECTS OF COOKING/HEAT

- **Dextrinisation** : browning of bread dough.
- **Moist Heat** : gelatinisation (Roux Sauce)
- Starch becomes more digestible.
- B Vitamins are destroyed (especially Thiamin B1)
- **NB** - **Dry Heat** : starch grains swell and burst absorbing butter as it melts (pastry)

F : CLASSIFY FLOUR (IE) TYPES OF FLOUR

1 : WHITE FLOUR

- 73% ER.
- Fortified with Calcium.
- Mainly Endosperm.
- No fat present therefore longer shelf life.
- High in starch, low in fibre.
- **APPLICATION** : Roux Sauce, Sponge Cake, Batters.

2 : WHOLEMEAL FLOUR

- 100% ER.
- Whole grain, crushed.
- High in fibre, high in Vitamin B.
- **APPLICATION** : Wholemeal Bread, Wholemeal Scones.

3 : STRONG FLOUR

- High gluten content (12%)
- Elastic dough.
- **APPLICATION** : Yeast Bread, Pizza.

4 : GLUTEN FREE FLOUR

- Suitable for Coeliacs.
    - (a) Starch is washed out.
    - (b) Liquid is dried.
    - (c) Soya flour often added.
- **APPLICATION** : Gluten Free Bread, Pastry.

5 : SELF RAISING FLOUR

NB : MILLING OF WHEAT

(FOOD THAT HAS BEEN EXTENSIVELY PROCESSED)

1 : CLEANING THE GRAIN

- Dirt, stones etc. are removed.
- The grain is washed and dried.

2 : CONDITIONING

- The grain is given the correct amount of moisture.

3 : GRIST

- Various types of wheat are blended to get the correct 'blend'

4 : BREAK ROLLING

- Wheat grains are passed through metal rollers, the grains are split open (wholemeal flour at this stage)

5 : SIEVING

- Brand and germ are separated from endosperm.
- Flour is sieved numerous times to give correct texture.

6 : AIR CLASSIFYING

- Air is blown through flour to remove any lumps and add lightness to the flour.

7 : ADDITIVES

- White flour is bleached with E928 (Benzoyl Peroxide), Calcium is added (Calcium Carbonate), Vit B1, Niacin, Iron are added.

NUTRITIVE VALUE OF WHEAT

PROTEIN

- 12% of the wheat grain.
- It is Low Biological Protein (LBV %)
- The main protein in flour is the fibrous protein gluten. Wheat is low in Lycine.

LIPIDS

- The only part of the wheat grain that contains lipids is the wheat germ, mainly unsaturated fatty acids.

CARBOHYDRATE

- 74% (Starch 65%, Fibre 9%)
- Unprocessed cereals have a higher amount of fibre than processed cereals.

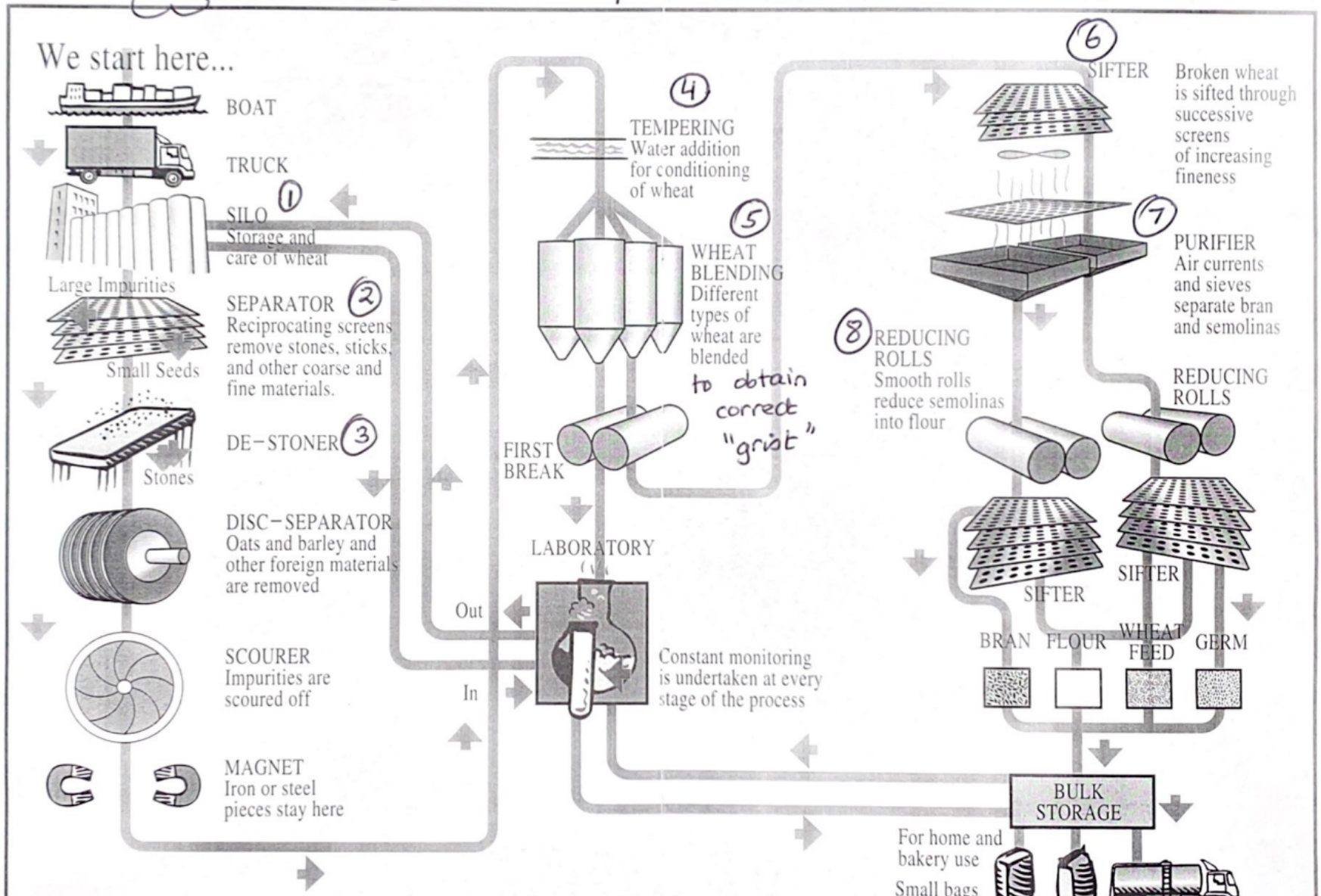
MINERALS

- Wheat contains Calcium, Phosphorous and Iron.

VITAMINS

- Cereals are an excellent source of B Vitamins (eg) : Vitamin B1 (Thiamin), B2 (Riboflavin) and Niacin.
- Wheatgerm contains Vitamin E (fat soluble vitamin)
- Cereals lack Vitamin C.

NB FOOD EXTENSIVELY PROCESSED = MILLING WHEAT TO FLOUR



THE MILLING OF WHEAT

8

9

Source ODLUMS FLOUR MILLS.

DIETETIC VALUE OF CEREALS

COELIAC DISEASE

- Many Irish people have an intolerance to the protein in wheat (gluten) also found to a lesser extend in oats, rye and barley. Instead of these grains they should eat rice, gluten free flour, cakes etc. to avoid damage to the villi of the small intestine.

ENERGY

- Cereals are an excellent source of starch which provides people with a source of energy, whole cereals contain B Vitamins which act as co-enzymes to help release the energy from carbohydrates (starch) more efficiently.

PERISTALSIS

- Whole cereals have an outer bran layer which is a NSP (Non Starch Polysaccharide). This is a source of fibre that can stimulate peristalsis and help prevent constipation.

LACK OF VITAMIN C

- Serve cereals with foods that are rich in Vitamin C to compensate for the lack of Vitamin C (eg) : Savoury rice (boiled rice, peas, sweetcorn) **or** serve a glass of pomegranate juice (orange juice with breakfast cereal.

AVOID TOO MANY CEREALS

- Avoid too many cereals in the diet as they are a source of starch. Excess starch can be converted to adipose tissue and a person may gain weight.

OTHER CEREALS

BARLEY

- Used in the production of alcohol and vinegar.
- Pearl Barley (bran & germ removed) is used to thicken soups.
- Grown in Ireland.

MAIZE

- 100% starch.
- Corn on the cob.
- Cornflakes.
- Popcorn.
- Cornflour.
- Corn Oil (Mazola)

RYE

- Grown in North East Europe / harsh weather.
- Rye bread.
- Crispbreads (Ryvita)
- Grown in poor soil.

OATS

- Very nourishing.
- Higher protein/mineral content than wheat.
- Not used in breadmaking.
- Rolled oats used for porridge, biscuits (flapjacks, Hob Nobs)

BROWN RICE

- Outer bran layer remains.
- Takes longer to cook.
- High in fibre and iron.

RICE

1 : WHITE RICE

- Short grain, plump, tender and sticky when cooked.
- Used in sweet dishes (eg) : rice pudding.

2 : LONG GRAIN RICE

- Light, fluffy rice when cooked.
- Used in savoury dishes.

3 : BASMATI RICE

- Indian rice, excellent flavour and texture.
- Used in savoury dishes.
- Considered to be the best rice.
- It must be rinsed before use to stop it sticking during cooking.

4 : EASI-COOK RICE

- Steam treated.
- Cooks quickly.
- 'Boil in the bag'

5 : INSTANT RICE

- Long grain rice that has been cooked and dehydrated.
- Cooks very quickly when reconstituted.

COOKING RICE

- Cook in boiling salted water.
- 50g portion per person.
- Stir rice while cooking to stop it sticking to the base of the saucepan.
- Simmer white rice (12 minutes)
- Simmer brown rice (30-40 minutes)
- Cook 'al dente'!
- Cook just before storing.

STORAGE OF CEREALS

- Cereals are stored easily as they have a low moisture content, therefore they do not attract mould growth.
- Wholemeal cereals have a shorter shelf life as the germ is present.
- Store cereals in a cool, dry, well ventilated area.

COUSCOUS **(112KCAL PER 100G)**

- Coarsely ground wheat (semolina) is moistened and tossed with fine wheat flour until it forms little round balls.
- It is one of the staple foods of the Maghrib (Western North Africa)
- Just pour boiling water or stock over couscous, let it sit in a bowl (cling film)

QUINOA

- Is a grain like crop derived from South America.
- It is cultivated as a food source for its edible starchy seeds (strictly speaking, it is a seed but commonly referred to as a grain)

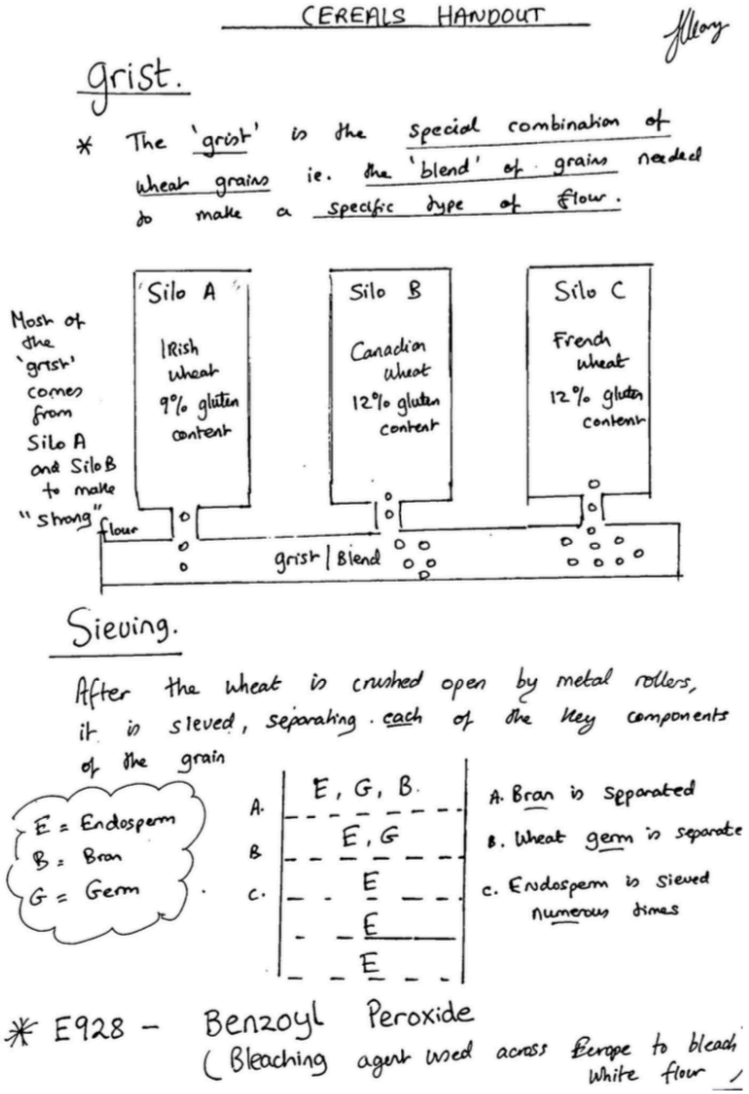
- Quinoa has all essential amino acids so perfect for vegetarians but particularly vegans (complete protein food)
- Gluten free.
- Cholesterol free.
- Almost always organic.
- It is believed to have been a staple food for thousands of years in the Andes region of South America, therefore it is an ancient grain (ie) : it is cultivated now the same way it was millennia ago.
- Takes 10 to 15 minutes to cook.

PASTA

- Italy and China use it a lot.
- It is made from durum wheat.
- Coarse pieces of endosperm (ie) : semolina from durum wheat are blended with water, eggs, salt and good quality vegetable oil.
- The pasta is rolled and shaped.
- Commercial pasta is dried.
- Examples of pasta shapes include :
    - Shells.
    - Spaghetti.
    - Lasagne.
    - Macaroni.
    - Canneloni.
    - Tagliatelle.
    - Ravioli.

COOKING PASTA

- Cook in boiling salted water.
- Add a little vegetable oil to the water to stop pasta sticking together.
- 50-75g pasta per person.
- Cook ‘al dente’.
- Fresh pasta cooks in approximately 3 minutes.
- Dried pasta cooks in approximately 12 minutes.
- When cooked, drain and serve immediately.
- If using pasta for cold salads, always rinse out cooked pasta in cold water to stop it from sticking.



PAST QUESTIONS

2011 Q3(B) HIGHER LEVEL (20 MARKS) : 5 @ 4 Marks

(a) Give an account of the factors that affect a consumer's choice of food. **(20)**

CULTURE/RELIGION

- Influences what food choices people make as they grow up with specific foods and meals depending on the country they are from or the religion they follow.
- For example, pasta is a popular food choice in Italy, seafood is a popular food in Spain. Hindus will not eat cow/beef as they believe the cow is a sacred animal, Muslims will not eat pig meat.

HEALTH STATUS

- The state of a person's health may influence their food choices.
- For example, a person suffering from high cholesterol will lean protein foods (eg) : white fish, chicken and functional foods (eg) : Benecol spread. Coeliacs will choose gluten free products.

SENSORY ASPECTS

- Refers to the smell, appearance, taste and texture of food.
- Most people like meals to be colourful (eg) : salads, stir fries, and to contain a variety of textures (eg) : crisp salad, juicy meat, creamy smooth potato, chunky salsa. Some people have personal preferences (eg) : they might not like sauce over their food but prefer it 'dry'.

MONEY AVAILABLE

- The amount of money available to spend on food will influence food choices. Those on a limited income will look for (eg) :

'special offers', own brand goods, class II vegetables, cheaper cuts of meat.

- Those on a higher income will be able to afford organic food, expensive cuts of meat (eg) : fillet steak, tropical fruits.

NUTRITIONAL AWARENESS

- More and more people are becoming nutritionally aware about healthy food choices as there is a lot of information available on healthy food choices on TV programmes, in schools etc.
- People are following the new food pyramid (2017) and buying more fruit/vegetables (7+ servings per day). They are reading food labels more and many are avoiding foods with high sugar as they know current dietary guidelines indicate 6 teaspoons/day (maximum adult serving)

2011 Q3(B) HIGHER LEVEL (20 MARKS)

(b) Profile a food of your choice that has undergone extensive processing. Give details of **each** of the following:

- stages of production
- packaging
- labelling.

(20)

NAME OF FOOD : Milling of Wheat to Flour (2M)

1 : CLEANING THE GRAIN (2M)

- Dirt, stones etc. are removed.
- The grain is washed and dried.

2 : CONDITIONING (2M)

- The grain is given the correct amount of moisture.

3 : GRIST (2M)

- Various types of wheat are blended to get the correct 'blend'

4 : BREAK ROLLING (2M)

- Wheat grains are passed through metal rollers, the grains are split open (wholemeal flour at this stage)

5 : SIEVING (2M)

- Brand and germ are separated from endosperm.
- Flour is sieved numerous times to give correct texture.

6 : AIR CLASSIFYING (2M)

- Air is blown through flour to remove any lumps and add lightness to the flour.

7 : ADDITIVES (2M)

- White flour is bleached with E928 (Benzoyl Peroxide), Calcium is added (Calcium Carbonate), Vit B1, Niacin, Iron are added.

PACKAGING (2M)

- The four is weighed.
- The flour is packed into paper bags (1kg, 2kg bags)

LABELLING (2M)

- Description of the product must be given (eg) : plain household flour or self raising flour.
- Brand name must be on the front label (eg) : Odlum's flour.

2011 Q3(B) HIGHER LEVEL (10 MARKS)

(c) Outline the protection provided to the consumer by the Sale of Food and Drugs Acts (1875, 1879, 1899 and 1936). **(10)**

SALE OF FOOD + DRUGS ACT

- It is an offence to mix or add any harmful ingredient to a food and then sell it.
- Under this act, any consumer can have food analysed by any one of the three Public Analyst Laboratories (on payment of a fee)
    - 200g food sample costs 200EURO – Dublin PAL)

Q3(B) LEAVING CERT TOPICS

2016 Q3(B) HIGHER LEVEL

- Freezing, Packaging

2015 Q3(B) HIGHER LEVEL

- Moulds, Uses of micro-organism.

2014 Q3(B) HIGHER LEVEL

- HACCP/Toxic + Infectious food poisoning.

2013 Q3(B) HIGHER LEVEL

- Action of enzymes, Food poisoning bacteria, Irradiation.

2012 Q3(B) HIGHER LEVEL

- Jam, Department of Agriculture.

2011 Q3(B) HIGHER LEVEL

- Extensive processing, Sale of foods and drugs act.

2010 Q3(B) HIGHER LEVEL

- Compare two types of preservation, Packaging, Labelling regulations (EU Rules)

2009 Q3(B) HIGHER LEVEL

- Causes of food spoilage, Actions of enzymes, Toxic/Infectious food poisoning, Incubation period.

2008 Q3(B) HIGHER LEVEL

- HACCP, Role of EHO's (Environmental Health Officers)

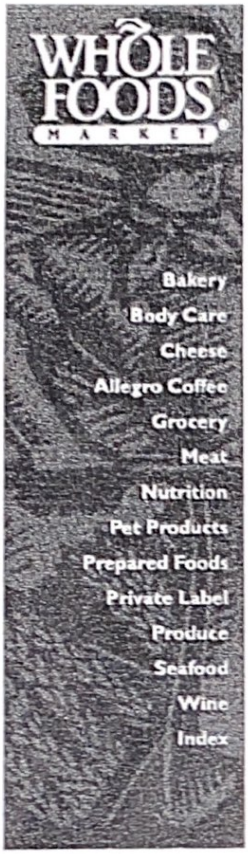
2007 Q3(B) HIGHER LEVEL

- Sensory analysis

2006 Q3(B) HIGHER LEVEL

- Convenience foods, Food additives.

(16)



The Role of Gluten in Baking

For people following a gluten free diet, finding acceptable gluten-free baked goods can be extremely challenging. Why do gluten free breads and cakes often pale in comparison to their gluten-rich cousins? The answer lies in the way traditional baking methods make use of the properties of gluten. Once you understand these properties, you can begin to work around them and find or make acceptable alternatives.

"Gluten" is defined as the mixture of many protein fragments (called peptide chains or polypeptides) found in common cereal grains such as wheat, rye, barely and oats. Wheat is the only grain considered to contain true "gluten" and the peptides that predominate in wheat gluten are gliadin and glutenin. In baking terminology, "gluten" is defined as a network of intertwined water insoluble proteins (gliadin and glutenin) with water molecules trapped in between. The fibrous protein strands of glutenin and gliadin have properties of elasticity and plasticity that make raised breads possible. Rye flour contains gluten consisting of only glutenin and not gliadin, making it inferior to wheat gluten for baking. Other grains such as barley and oats have small amounts of gluten. This is why wheat flour is often added to rye and other non-wheat flours when making raised breads.

NB

Gliadins and glutenins are both long molecules. Under a microscope, gliadins look like compact balls while glutenin molecules resemble fishing line that has been coiled or folded back upon itself. When mixed together, as they are in dough, these two proteins form a tangle of strands. Carbon dioxide gas from yeast and sourdough (as well as other leavening agents such as baking powder or baking soda used in quick breads and cakes) are trapped by the strands of gluten which must both expand and simultaneously contain the gas. This is where elasticity and plasticity come into play. The gluten must be plastic enough to stretch with the gas but also elastic enough (think "memory yarn" from L'eggs pantyhose here) so as to hold its shape. Otherwise the gas would simply escape the dough and dissipate into the surrounding air. As the yeast dough is exposed to processing such as kneading or beating, the tangled strands of gluten begin to unfold into a more uniform mass and the dough becomes more stiff, smooth and shiny. Those who have ever attempted to bake bread will recognize this as the stage at which the recipe typically says, "knead dough until smooth and elastic."

NB

Baking Gluten-Free

The challenge in gluten free bread baking is finding a combination of flours and binders that can fulfill or at least approximate the functions of gluten. Fortunately, a wide variety of specialty flours are now available. These include rice flour, sweet rice flour, bean flour, tapioca flour, potato starch flour, potato flour, corn flour, popcorn flour, arrowroot flour and nut flours.

Additional specialty ingredients such as rice polish, corn starch, arrowroot starch, rice bran, xanthan gum, guar gum, and corn meal are all useful ingredients for