Still and Dilutable Drinks

Contents

1 HISTORY

Barley water was probably the first soft drink made in the domestic kitchen by pouring hot water over barley flour. It was known in the 14th century by Chaucer's time. In Tudor times the history books refer to water imperial which seems to have been a sweetened drink containing cream of tartar, flavoured with lemons. Another 'dilutable' was 'Manays Cryste' a sweetened cordial for invalids which was made using rosewater, violets or cinnamon.

At this time cordials or dilutables were homemade drinks – highly flavoured and syrupy, similar in consistency to that of an alcoholic liqueur – used to tempt the palettes of invalids. They were promoted to be 'dilutable if so desired'. However, it was not until Charles II's reign that 'fruit-flavoured drinks', as they were known, became popular.

The first real fruit-flavoured drink came in the form of lemonade during the 1660s, though it was nothing like the lemonade we know today (see **Carbonated Drinks**). Being a still drink made from lemon juice and water, sweetened with sugar or honey, this drink was made and sold 'on the premises' rather than being bottled to take away. The lemonade we know today only became available in the late 19th century.

Dilutables or still drinks continued to be popular throughout the next century but became the poor brother in the industry compared to the emerging carbonated beverages sector. (These drinks began to achieve greater attention from the late 1700s.) However, the decision by the Admiralty to make the

provision of lime juice to seamen a requirement under the Merchant Shipping Act 1867 did raise the profile of dilutables slightly during this period. Lime juice had been chosen by the Admiralty because of its benefits in preventing scurvy. The anti-scorbutic virtues of lemon juice had been recognised in the 1790s but lime juice was found to keep better and was cheaper. The lime juice issued to seamen was preserved using 15% alcohol. Laughlan Rose, a ship supplier who was familiar with the method used to preserve wines (by burning sulphur candles in the casks), decided to try a similar technique with juices. A sulphur dioxide solution was prepared and added to fruit juice. It prevented fermentation, mould, darkening of colour and loss of flavour – all problems associated with stored, unpreserved juices. Rose went on to patent his process producing the first lime juice cordial.

The late 19th century and early 20th century saw the emergence of the 'squash' trade which helped to further revive this sector. Squash was developed using the juice and the pulp of the fruit (see **Fruit Juice**). A lemon variant was introduced named 'Kia-Ora' which is a Maori word meaning 'good health'. Large orders of the drink were supplied to the British troops during the First World War. It became very popular with the soldiers ensuring the prosperity of the Kia-Ora company. Other fruit squashes such as orange and grapefruit followed.

In 1908, J N Nichols began production of Vimto, a mixed fruit drink, from premises in Manchester. This drink became very popular in the Northwest of England. It was nearly 30 years later before barley water began to be produced commercially as a ready-to-use concentrate. Robinsons, a Norwich-based company, had been making the product for use in the home for a number of years. They advised that their new dilute-to-taste barley water beverage should be made using one part concentrate and four parts water.

Throughout the Second World War, the food industry was required to concentrate its production to improve food distribution and achieve economies in the use of manpower, transport, factory space and raw materials. Factories were closed, production was limited and brand names were sacrificed as all drinks were to be made anonymously to a standard recipe. This scheme, instigated by the industry and the Minister for Food, was called the Soft Drinks Industry Scheme. It freed up a large area of factory space which was released for other purposes. This scheme continued until 1947.

At the beginning of the war the proportion of soft drinks sales achieved by dilutables was around 21%. Under the agreement, the production share was increased to 42%. Recipes were standardised to certain quantities of sugar, saccharin, citric acid and fruit juice content. A lasting effect of this initiative was the boost to sales of dilutables which remained at double their pre-war level. Another effect of this period was that concentrated or dilutable drinks producers began to use low calorie sweeteners (saccharin) as part of regular, 'full sugar' drinks. This was with the encouragement of the Government because of the continuing rationing of sugar which was available in limited supplies. Saccharin had already been in use for nearly 50 years in a variety of food products. Manufacturers discovered that the blending of these two sweetening agents gave a synergistic effect, i.e. 1 + 1 = 3, resulting in less sweetening ingredients being required to produce a drink of the same level of sweetness.

Throughout 1948 requisitioned factories were re-equipped and branded drinks began to reappear on the market. By 1953, with technological developments resulting in better juice made from concentrate – prior to this juice concentrate had been used for the production of soft drinks rather than reconstituted juice – (see **Fruit Juice**) – and also the means to allow fruit to be imported as a whole, manufacturers began to introduce whole orange drinks. These were drinks made with the fruit and a portion of the skin. Dilutables made in this way were said to taste 'fresher' and to be closer to consumers' expectations of an orange drink. Within a few years they were out-selling the traditional squash made only with juice.

Over the last 40 years, dilutables have become mainly children's drinks. This is because their formulation is often lower in acidity and osmolality making them often more acceptable to sensitive stomachs. Britain has the biggest market for dilute-to-taste drinks in Europe. Following the war, the drinks lost their way in terms of popularity enjoying a revival in the 1980s with the development of new low calorie sweeteners. Another growth area has been the emergence of still drinks or ready-to-drink products which are often brand extensions of traditionally dilutable products or less than 100% fruit juice drinks. These products are often referred to as juice drinks or fruit drinks.

2 DEFINITION OF STILL AND DILUTABLE DRINKS

In 1964, the Government laid down compositional standards across the whole spectrum of soft drinks. These standards were in part based upon the basic guidelines set down during the war years. These regulations detailed how drinks should be named and minimum criteria for their contents. Under these requirements still and dilutable drinks were given special definitions depending on how they were made and in some cases were required to contain certain quantities of sugar and fruit juice, with limits on saccharin content:

Comminuted citrus drink was a soft drink produced by a process involving the comminution of the entire citrus fruit.

Crush was a soft drink containing fruit juice, not being a comminuted citrus drink, intended for consumption without dilution and included cordials intended for consumption without dilution.

Squash was a soft drink containing fruit juice, not being a comminuted citrus drink, intended for consumption after dilution and included any cordial intended for consumption after dilution.

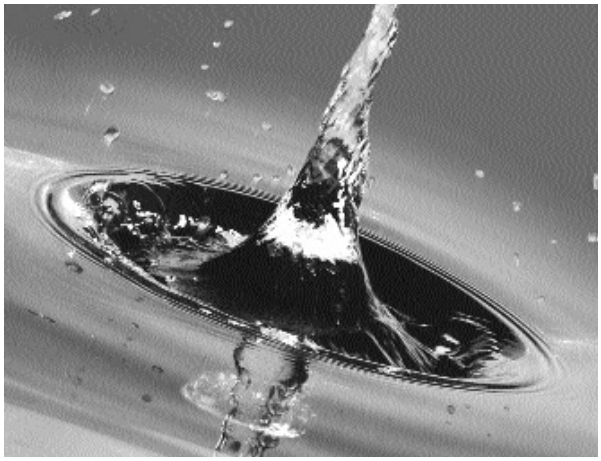
As a result of the revocation of the Soft Drinks Regulations in 1996, compositional standards and definitions no longer apply to soft drinks except in certain special cases. However, the industry is still closely regulated but in a different way. The new legislation, which replaced the 1964 regulations, governs the ingredients used in the production of soft drinks and emanates from European Directives covering products across the whole of the European Union.

Within the industry a description has been developed grouping those drinks together that are considered to be soft drinks, which includes still and dilutable drinks. This is: ‘a manufactured drink, optionally sweetened, acidulated, carbonated and which may contain fruit, fruit juice and salts; the flavour may derive from vegetable extracts or flavourings’.

Traditional terms such as ‘squash’ and ‘crush’ have created an impression in consumers’ minds as to their contents. For example crush contained 5% v/v fruit juice, whilst ‘squash’ contained 25% v/v citrus juice before dilution. However, with the changes in these regulations came another new regulation – the Quantitative Ingredient Declaration Directive, otherwise known as QUID. This requires producers to indicate the percentage of juice or fruit in a drink made with fruit juice or fruit as part of the ingredients panel. The revocation of the 1964 regulations has allowed manufacturers to include different levels of fruit and juice in dilutable products with clearer indications of contents now available to consumers through the introduction of QUID. Although not a legal requirement until the year 2000, UK producers began to implement the Directive as of 1996.

3 INGREDIENTS

3.1 Water



At least 86% of made up dilutable or a ready-to-drink still drink is purified water. In the case of dilutable products, where water is required to make the final drink the concentrate contains around 65% (low calorie dilutables). The concentrate is usually diluted between four and six times with water.

3.2 Sweetening agents

a) Bulk sweeteners

The three main bulk sweeteners used in the UK are sucrose, fructose and glucose syrup. Sweetness in soft drinks is traditionally provided by sugar (sucrose), which is extracted from either cane or beet, the resulting sugar being chemically identical. Cane grows in tropical areas and beet in temperate areas, but in either case it is obtained by water extraction from the crushed plant followed by purification by re-crystallisation.

In the UK, sugar is received in the soft drink factory either as the 'granulated' solid or as ready-made syrup (67°Brix). In the presence of acid, sucrose will hydrolyse to form an equal mixture of glucose and fructose, known as invert sugar. In the final soft drink, after a period of weeks you would expect to find a mixture of three sugars: sucrose, fructose and glucose.

b) Intense sweeteners

There are currently six intense sweeteners permitted for use by manufacturers within the European Union: Saccharin, Cyclamate, Aspartame, Acesulfame-K, Neohesperidin dihydrochalcone (NHDC) and Sucralose. All of these sweeteners are intense because measured against the main bulk sweetener sucrose, they are many times sweeter. This enables manufacturers to develop products with less sugar and therefore fewer calories to produce the same sweetness levels as sugar in soft drinks. Sweetening power varies depending upon the type of product and the level of usage.

3.3 Acids

Acidity is one of the basic properties of a soft drink. With the exception of soda water, soft drinks are acidified either by the addition of fruit juice or by the inclusion of an acid. A number of acids can be used in soft drinks including tartaric and lactic acids. The two most commonly used in still and dilutables are citric and malic acid. Citric acid is found in citrus fruits, such as oranges, lemons and limes. Malic acid is found in apples, cherries, plums and peaches.

Acid performs two main functions. Most importantly it performs a microbiological control function inhibiting the growth of certain organisms such as mould or bacteria and releasing the preservative action. In addition it benefits the taste profile of the drink. The acidity of a soft drink will vary according to the recipe, but most fall into certain broad bands.

Percentage of acid and pH levels of dilutable soft drinks after dilution

Type of dilutable drink	Acid (%)	pH
Regular dilutable drinks	0.15 to 0.25%	2.6 – 3.0
Lemon flavoured dilutable drinks	Up to 0.4%	2.6 – 3.0
Low calorie dilutables	0.15 to 0.4%	3.0 – 3.2

Note: the acid contained in products is citric acid

Source: BSDA members, 1996

3.4 Flavours

Flavourings may be obtained from natural or artificial sources. Natural flavourings are derived from fruits, vegetables, nuts, bark, fruit juices, leaves, herbs, spices, oils and other natural extracts. In soft drinks containing natural flavours and fruit juices, a preservative may be added to prevent spoilage.

Synthetic flavourings are also used to give consumers greater choice in taste. Synthetic flavourings often reproduce those found naturally and are 'nature identical'. Around 5% are not found in nature.

3.5 Fruit and juice

The juice ingredient in still and dilutables can be sourced from the range of fruit juices sold for consumption as juice. Both single juices and mixtures of juices are used. In the same way that other food products are often made from specially grown bitter oranges or other strongly flavoured fruit, juices that are not normally consumed as 100% juice may be specially prepared for use in a still or dilutable drink. These tend to be highly acidic

juices which are unpalatable for direct consumption, such as lime, blackcurrant and passion fruit juice.

Citrus comminutes (homogenised fruit) became popular because of the increased benefits experienced in terms of flavour, appearance and mouthfeel. Orange, lemon and grapefruit are typical examples. Citrus comminutes include low levels of peel oil and finely ground citrus peel as well as the juice. They have a high flavour intensity and can therefore be used at relatively low concentrations in the final product.

3.6 Preservatives

Some drinks contain preservatives, others do not. The need for preservatives is dependent upon the type of product and the processing used, e.g. aseptically filled or in-pack pasteurised drinks do not require preservatives.

The preservative is intended to prevent spoilage by micro-organisms, i.e. yeasts, moulds and bacteria.

All soft drinks are sufficiently acid to prevent the growth of food poisoning organisms. High levels of acidity also inhibit the growth of yeasts and lactic acid bacteria. Soft drinks formulated in this manner do not require additional preservative provided good hygiene standards are maintained.

Preservatives enable products to have longer shelf lives, by maintaining the integrity of the product. The presence of fruit or fruit juice provides additional nutrients which may enable organisms to grow despite high levels of acidity and carbonation. In summary, the soft drinks likely to ferment are the mildly acid types containing fruit juice. In these cases preservative must be added to prevent microbiological spoilage.

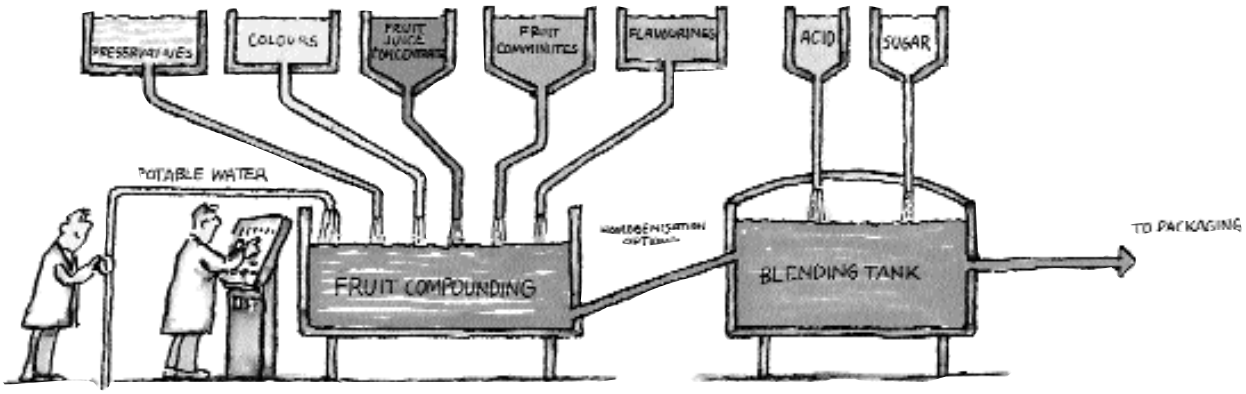
3.7 Colours

Colour plays an important part in consumer acceptability. Consumers will frequently perceive a more strongly coloured product as being more strongly flavoured. Colours restore the colour lost from food during processing, ensure batch consistency, and also make the food look brighter. Owing to technological developments a variety of colours can be man-made. There are some 20 man-made colours approved for use in the UK.

4 PRODUCTION

All ingredients are blended in accordance with the required recipe in the syrup room. The batches are mixed in stainless steel tanks and even the order in which the ingredients are added is carefully

THE PRODUCTION LINE



controlled. The syrup room is often air-conditioned and must be kept as sterile as possible since it is vital that no micro-organisms get into the mixing process. Once the syrup is mixed it is conveyed to the filling machine along stainless steel pipes.

There are two principal methods of filling still and dilutable soft drinks containers. In the first method a measured quantity of syrup is placed into each bottle and a filler adds water to the syrup already in the bottle. In the other method, the syrup and water are mixed together in a proportioner before passing to the filling machine where the bottles are filled with finished product. Some products may be pasteurised.

Modern filling machines have multiple heads and work on a rotary principle so as to function continuously at a very high output. A machine with 100 filling heads can fill up to 36,000 litre bottles an hour. From the filling heads the bottles pass to the capping heads where closures are applied.

The filled bottles are then checked for:

- appearance
- height of the content
- bottle faults
- foreign matter
- faulty closures

5 TYPES AND FLAVOURS

5.1 Types

Dilutables: The general principle of a concentrated or dilutable drink is that it would be diluted in the ratio of one part concentrate with four parts of water. Quantities of fruit juice and fruit content vary and are indicated upon the label. The category is divided into three:

- regular (products made with sugar)
- low sugar (products made using low calorie sweeteners – the sugar comes from the juice or fruit itself)
- high juice (products containing high fruit juice contents)

Fruit drinks, juice drinks, still drinks or ready to serve: These drinks all contain less than 100% fruit content. They are separated by the amount of juice they contain: 0–5% juice, 5–25% juice and 25–99% juice.

Nectars: Products known as nectars have their fruit content regulated by legislation. The amount varies depending upon the fruit. Thus citrus nectars must contain 50% juice whilst blackcurrant and others have around 25%.

Nectars provide a close alternative to pure fruit juices. Many juices are not suitable for 'pure' consumption and a nectar is an ideal way of presenting these products, e.g. mango or mixtures of several juices. These products have not achieved great popularity in the UK but hold significant market shares on the continent.

5.2 Flavours

Dilutables: Among the dilutable products orange is the most popular flavour followed by blends, blackcurrant, lemon and lime. Full sugar varieties hold the second highest market share out-sold by low calorie products.

Fruit drinks, juice drinks, still drinks or ready to serve: The most popular flavours of still fruit drinks are blends, orange and blackcurrant. The majority of these drinks contain between 5 and 25% juice. However, high juice content drinks, i.e. 25–99%, remain popular.

6 PACKAGING

Soft drinks may be packed in:

- glass bottles – both returnable and non-returnable
- PET (polyethylene terephthalate) bottles – plastic bottles
- plastic cups (polystyrene/polyethylene)
- cartons
- foil pouches

6.1 Glass

When re-useable glass bottles are used they must be sorted into correct sizes and, where necessary, have their caps removed. They are given a hot bath in huge washing machines, where each bottle is washed in a detergent solution at temperatures as high as 80ºC (175ºF) and finally rinsed with cold water. Powerful jets of solution also remove the labels from the bottles. The liquid from the jets passes on to a series of filters which retain all the label fibre and dirt. The wash process can take up

to 15 minutes. When discharged from the washer, clean and sterile, the bottles are inspected to make sure that they are not cracked, chipped or contaminated. In some factories this inspection is visual but more frequently today a camera scans each bottle at an inspection point and automatically ejects a defective bottle from the line before it reaches the filler.

Some one-trip bottles are supplied by the glass manufacturers pre-labelled with a special sleeve, but all returnable and most non-returnable bottles have to be passed to a labelling machine. This applies body labels (and sometimes neck labels) with special gum which will stick the label securely even in chilled, wet conditions, yet will wash off easily when returnable bottles are being refilled. Sometimes the labels have already been notched to show the 'best before' date on the calendar edge. Otherwise the bottles will pass in front of an ink-jet machine which shoots quick-drying ink at the closure, body or label to print on it the 'best before' date.

Next the bottles travel to a wider conveyor where they are loaded into crates, cardboard cartons or cardboard trays covered with shrinkwrap film. Returnable bottles, when empty, come back to the factory in the same crates. Plastic crates are cleaned and washed in special machines before being used again for the despatch of product.

6.2 Plastic

Many soft drinks manufacturers 'blow' their own PET bottles daily in the factory as required (see **Wrapping Up**).

Packaging of still drinks

Type of container	Approximate percentage of still (ready-to-drink) drinks
Paper – small cartons (mainly 280 ml)	30%
Plastic – HDPE, PET	33%
Paper – cartons (1 litre)	18%
Plastic – cups	7%
Others – pouches, glass, bag-in-box, plastic (HDPE)	12%

Source: Zenith International, 2002

Packaging of dilutable drinks

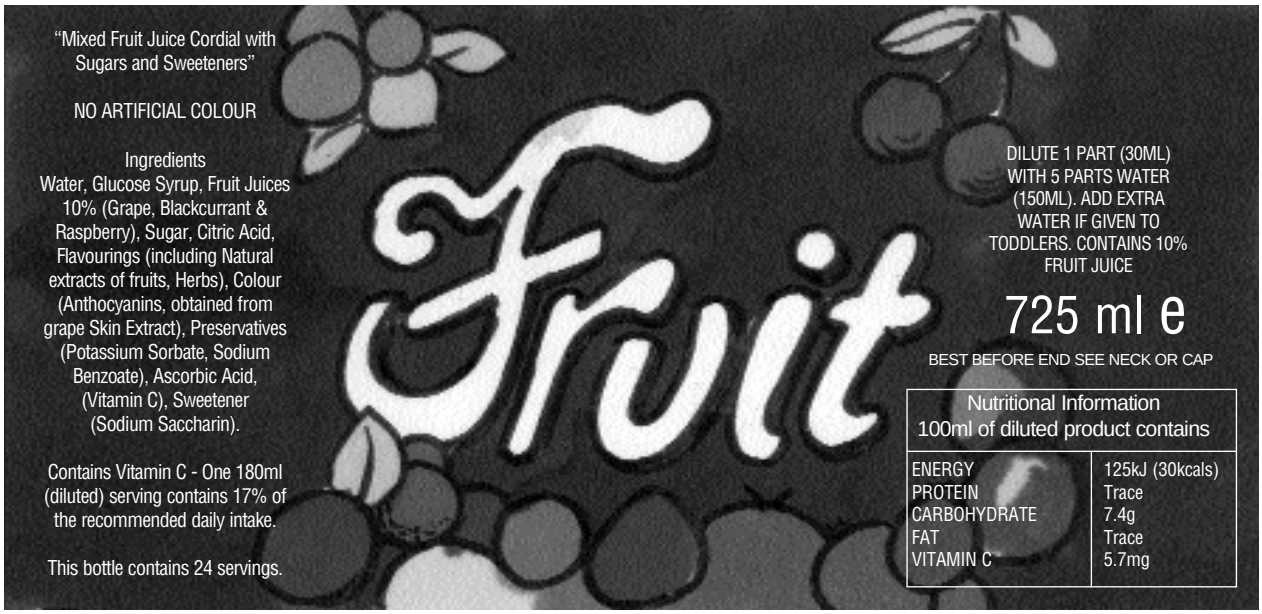
Type of container	Approximate percentage of dilutable drinks
Plastic – mainly PET (up to 1 litre)	55%
Plastic – mainly PET (over 1 litre)	35%
Others – glass, bulk	10%

Source: Zenith International, 2002

6.3 Labels

As in the case of other soft drinks, still and dilutable drinks will include all the ingredients, listed in descending order by weight.

Sometimes some of the ingredients may be listed by means of their E numbers to provide maximum information in a small space. All ingredients that have an E number are approved for use throughout the European Union. An example of an E number is E330 which stands for citric acid.



7 NUTRITION AND THE IMPORTANCE OF FLUID

7.1 The importance of fluid

Water is essential for the functioning of almost all the body's living cells. Human blood is 95% water, bones are 22% water and even 75% of the human brain is water. Without food humans can live for 14 days or more, but without water the body can only survive a few days.

Water is the principal constituent of cells and tissues and is the means of transport of essential nutrients around the body. [The digestive system breaks down solid foods into smaller units that the bloodstream can carry to the liver and other organs where they are converted into body substances for use by the cells as building materials. New materials are carried to the cells and waste products removed by the flow of blood and glandular secretions.] Without water to moisten the lungs there could be no intake of oxygen and no expulsion of carbon dioxide.

Water also plays a vital role in controlling body temperature. Normally maintained at about 37ºC, whether the outside temperature be arctic, temperate or tropical, the body temperature is controlled by a process called 'homeostasis', which includes the evaporation of water through the skin. In warm conditions or in a hot dry atmosphere heat loss is increased by perspiration and in extreme conditions can exceed one litre an hour.

However, at low temperatures water is transferred from the blood into the tissues, so that less of it is brought to the surface of the skin and heat is conserved. During periods of intense physical effort, body heat also rises and needs to be regulated.

Water is eliminated from the body in a number of ways:

- respiration
- perspiration
- waste product expulsion – indeed, water transports the body's waste products to the external environment

The body gets its water from three sources:

- water itself or the water in beverages
- water in solid foods, which contains wide ranging amounts, from 5% or so in biscuits, 60% in steak, to 90% in the juiciest fruits
- water produced in the body as a byproduct of chemical changes that convert food into cell material

We eliminate around 2.5 litres of water per day, through urine, perspiration and respiration. The food we ingest brings in about 1 litre. So 1.5 litres need to be ingested in the form of beverages in order to recover normal water loss.

However, the body's water requirements vary greatly according to the outside temperature, the age and activity levels of an individual, as well as

other factors. A normal resting person in a temperature around 23ºC and medium humidity, loses about 0.65 litres a day from the skin and lungs. It was reported that on one occasion, a football player lost almost ten times that amount of water in an hour and ten minutes. Babies and children need more water, as do pregnant women to maintain hydration for themselves and the baby, and later for breast feeding. Elderly people should be careful to consume enough water because the sensation of thirst diminishes with age. However, it should be noted that thirst is an indication that a person is significantly dehydrated.

The two human organs that contain the most water in our body are the brain (75% water) and the skin 70% water. They are the first to suffer from the effects of dehydration, such as headaches. The water lost in sweat (during sports for example) should therefore be replaced as soon as possible to avert fatigue, one of the earliest symptoms of water shortage. The aesthetic qualities of the skin are directly linked to its water content.

Dehydration does not just occur in hot climates. The body also loses water in cold, dry weather – a cloud of vapour can be seen when people exhale. Indoor conditions, such as air conditioning or central heating, also have a dehydrating effect on the body. Re-circulated air in planes, cars, buses and trains has a drying effect and of course exercise also reduces the amount of water in our bodies.

7.2 Carbohydrates

Soft drinks are non-alcoholic and do not contain significant amounts of fats or proteins, but many do contain carbohydrates in the form of sugars. The amount of sugar in soft drinks is about the same as in many fruit juices – and your body cannot tell the difference between the sugar you get from fruit or that added to soft drinks.

Percentage of sugar contained in dilutable soft drinks after dilution

Type of dilutable drink	Percentage sugar
Regular dilutable drinks	2 – 10%
Lemon flavoured dilutable drinks	2 – 6%
Low calorie dilutables	<1%

Source: BSDA members, 1996

Sugar is a source of energy for your body. In fact during intense physical activity it is the main energy source. A soft drink after sport, therefore, not only helps to replace the fluids lost during that activity, but also provides energy.

7.2.1 Sports drinks

Sports drinks are formulated to supply fluid quickly and maintain the body's blood glucose levels. Some of these drinks are isotonic, i.e. in balance with the body's own fluid, containing the same number of dissolved solids as the blood. They contain low amounts of sugar as high amounts (of sugar) would reduce the body's ability to absorb fluid quickly.

Sports drinks can be divided into:

Hypotonic – contain smaller amounts of carbohydrate and therefore provide fluid quickly with little energy.

Hypertonic – contain higher quantities of carbohydrate and thus provide energy but are not a fast way to rehydrate.

Isotonic – contain about 5 – 8% carbohydrate and are in balance with the body's own fluids. They are the best choice for delivering fluid and carbohydrate simultaneously.

7.3 Minerals

Soft drinks will contain a range of minerals as a result of the ingredients used in their manufacture. Sodium, calcium and magnesium come mainly from the major ingredient – water. Potassium and phosphate come from any fruit materials the drinks contain. The levels of these minerals are very low.

7.3.1 Sodium

Many people confuse sodium with common table salt. The two are not the same. Sodium is an element, the sixth most common on earth. Table salt – or sodium chloride – is one of its numerous compounds. Table salt contains 40% sodium and is one of many sodium sources in the diet. On average soft drinks are low in sodium and contain less than 20 milligrams per 200 ml serving. Sports rehydration drinks may contain about 100 mg of sodium per 200 ml serving. Sodium in soft drinks comes from the water content and from small amounts of sodium in the ingredients. The sodium content of water can vary seasonally and by location.

Five basic sodium compounds may also be used in preparing soft drink syrups. These include:

- sodium benzoate – a food preservative
- sodium chloride (or salt) – for flavouring
- sodium citrate – an acidity regulator
- sodium saccharin – a sweetener
- sodium metabisulphite – a food preservative

Each plays an important role in the soft drink in which it is used. The quantity used is negligible when compared to other sources of sodium in the diet.

Sodium is an essential nutrient in human physiology and can be found everywhere in the food supply. From soft drinks and water to tuna and milk, nearly every food, even fresh fruits and vegetables, contain a measurable amount of sodium. This is because the plants and animals that make up our food supply also use sodium for their life processes.

In humans sodium:

- helps regulate water in the body by controlling the transfer of water and other nutrients across cell membranes
- helps maintain blood pressure and volume
- transmits nerve impulses
- supports the activity of certain enzyme systems

Today's emphasis on fitness and good health is encouraging consumers to keep a watchful eye on food ingredients. Medical experts suspect that people who have a genetic susceptibility to high blood pressure may benefit from reducing their sodium intake. In a moderate climate the amount of salt needed by an adult is less than 3,000 milligrams daily. Extra sodium is needed by people unacclimatised to, or exercising in, very hot conditions.

7.3.2 Calcium

Calcium is required to form healthy teeth and bones, but it is also needed for blood circulation as well as functions of the nervous system and muscles. Deficiency in this mineral can result in stunted growth, rickets, osteoporosis and convulsions.

7.3.3 Magnesium

Magnesium plays an essential role in normalising the metabolism, muscle contraction and bone development. It is also necessary for maximising the benefits of vitamin D and calcium intake.

Deficiency can result in reduced blood pressure and neuromuscular dysfunction. High intake may cause nausea, vomiting and hypertension.

7.3.4 Potassium

Potassium contributes to the acid base and the body water balance, blood pressure regulation, nerve function and muscle contraction. In particular it contributes to the good functioning of the cardiac muscle. Deficiency can result in muscular weakness. Excess could lead to an irregular heart rate.

7.3.5 Phosphorus

Phosphorus helps bone and tooth formation and the body's acid balance. It also intervenes in the conservation and use of energy in enzymatic systems. A deficiency can cause demineralisation of bone and loss of calcium. A high intake may affect the phosphorus:calcium ratio in the body.

7.4 Vitamins

Still and dilutable drinks are good sources of vitamin C which is largely obtained from the fruits that are used to produce the drinks. Vitamin A may also be present in small amounts. Soft drinks provide a good medium for vitamin fortification.

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