

Chapter 1

INTRODUCTION

The brief information about biomedical strips and biomedical cutter and the classification of biomedical strips are being discussed in this chapter.

1.1 Biomedical strips

Biomedical strips are paper like materials which are used to detect the presence of some biomedical components like glucose, ketones etc. Biomedical strips have large number of advantages in the daily life of human beings. Using these biomedical strips the result can be obtained very fast (i.e within 3 seconds). In some cases the strips will give the output results simultaneously when the required sample is taken on it but in some cases these strips have to be inserted in some other devices in order to obtain the result.

Some of the biomedical strips that are used in daily life are:

- Glucose Strips/ Diabetes Test Strips
- Urinary Pregnancy test strips
- Ketone body strips
- Malaria dip strips

Glucose strips are used in blood glucose meters to test the blood glucose levels. These small disposable strips of plastic may look insignificant but they provide a very important role in helping people with diabetes to monitor and control their diabetes. In the vast majority of cases, each meter will take one type of test strip only.

When blood is placed onto the test strip, it reacts with a chemical called glucose oxidase producing gluconic acid from the glucose in the blood. At the other end of the test strip, the meter transfers a current to the test strip. The test strip has electric terminals which allow the meter to measure the current between the terminals. The current between the terminals changes depending on the level of gluconic acid that has been produced. The blood glucose meter then uses an algorithm to work out the blood glucose level based upon the difference in current.

Some blood glucose test strips allow the reapplication of more blood to the same test strip if needed during the test. The amount of blood required by a test strip can vary between manufacturers. Generally, between 0.5 μ l to 1 μ l of blood is required. Some test strips, not so commonly used these days, do not require a meter. When blood is placed on the active part of the strip and then wiped off after a specified number of seconds, the reagent will change colour and the result can be obtained by matching the colour of against a colour chart on the side of the pot.

The presence of elevated levels of ketones in human urine is a primary indicator that the body is in ketosis. Ketosis simply means that the body's stored fat cells are being utilized as a primary fuel source to produce energy. The by-products of fat metabolism are ketones. Ketones are not stored by the body and are eliminated as detectable waste products in urine. Therefore, monitoring the level of ketones is presumptive of, and directly correlated to the metabolizing, or burning of stored fat cells to produce energy. Likewise the conclusion can be drawn that the higher the concentration of ketones in urine, the higher is the amount of fat cells metabolized by the body. Ketone test strips are used routinely to help measure the progress of dieters especially those maintaining a low carbohydrate diet. Additionally, ketones are monitored in individuals with Type 1 diabetes. In diabetics, high ketone levels indicate ketoacidosis, a complication of inadequate insulin levels that can lead to diabetic coma. In overall health considerations, high ketone levels are generally an indication of abnormal nutritional conditions, including starvation, fasting, anorexia, high protein or low carbohydrate diets.

A home pregnancy test detects the presence of the pregnancy hormone, human chorionic gonadotrophin (hCG), in the urine. The body starts to produce hCG when a fertilised egg implants in the uterus (womb). HCG is secreted by the cells which will go on to form the baby's placenta. It can be detected in your urine from about six to 14 days after fertilisation. In the first few days after implantation levels of hCG rise quickly. Most home pregnancy tests are sensitive enough to detect hCG in urine on the first day period is due. If user have a negative result when you first test, it may be that the amount of hCG has not yet reached a level where it can be detected. Sometimes levels may still not be high enough to detect on the day the period is due. If the period is late, and the result is negative, wait a few days then test again. User will find some pregnancy tests are more sensitive than others. The most sensitive tests can tell users pregnant even if you have

only a small amount of hCG in your system. User can find out how sensitive a home pregnancy test is by reading the information that comes in the test box. User will see that concentrations of hCG are reported in milli-International Units (mIU) per milli liter. A test with a sensitivity of 20mIU/ml is more sensitive than one with a sensitivity of 50mIU/ml.

Urine Malaria Test (UMT), currently in clinical validation, is indicated for use in individuals who present with fever suspected of being malaria. The UMT (licensed with exclusive global rights from Johns Hopkins University, Baltimore, Maryland) incorporates a novel dipstick technology that is ideal for rapid point-of-need diagnosis of clinical malaria from urine instead of blood, and offers significant advantages over microscopy and other malaria diagnostics, which require the use of blood. The UMT dipstick detects novel Plasmodium proteins shed in the urine of febrile malaria patients and can be performed and read by persons with little or no training. These novel proteins or fragments are not cleaved by any known proteases, are highly immunogenic and elicit early immune response, and thus present as early markers of clinical malaria.

1.2 Biomedical cutter

Biomedical cutter is a machine which is used to cut the biomedical strips. These strips have to be cut with accurate dimensions and hence well developed machines are used. Since the accuracy needed is more the cost of the cutter is also more. In present system continues monitoring by a human is needed and works in only manual mode. Since the whole system is made up of only mechanical components the cost and weight of system is more.

In order to come out with these drawbacks the developed system is implemented. The system is designed using an embedded system. The microcontroller ATMEL 89S52 is used here. This system works in two modes parametric and automatic mode. In manual mode the width is given manually using keypad and cutter motor is run by selecting CUT key from keypad. RTC is used here to store the parametric mode values. Here movement of stepper is based on the width given. The movement of stepper motor represents the sliding of strips and movement of dc motor represents cutter operation.