observations suggest the possibility of controlling dieback disease using tetraploids of *C. roseus*.

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EMERGING SYNTHETIC BLOOD SUBSTITUTES-PERFLUROCHEMICALS

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ADEQUATE supply of blood products has always been a difficult problem at the Indian Hospitals. This problem has been aggravated in recent years by the enormous increase in demand and the alarming knowledge on blood transmitted diseases, such as hepatitis and acquired immunodeficiency syndrome (AIDS). It is therefore not surprising that the search for blood substitutes which dates back to the early part of the century, has acquired fresh urgency. The advent of perfluorochemicals as a synthetic blood substitute assumes particular importance in this context.

Since the classic observation in 1966 by Clark and Gollan[1], that mice submerged in a beaker of perfluorocarbon could survive, because of the bioavailability of dissolved oxygen, the interest in perfluorocarbons as possible blood substitutes has grown. Perfluorocarbons are fluorinated aromatic and aliphatic organic chemicals in which the reactive hydrogen groups have been replaced by non-reactive fluoride ions (figure 1). This structure enables them to dissolve large quantities of gases such as oxygen, carbondioxide and carbon monoxide. They also have low surface tension, high mobility and a high degree of clarity.

The oxygen transporting property of these compounds is however limited at ambient pressures. In

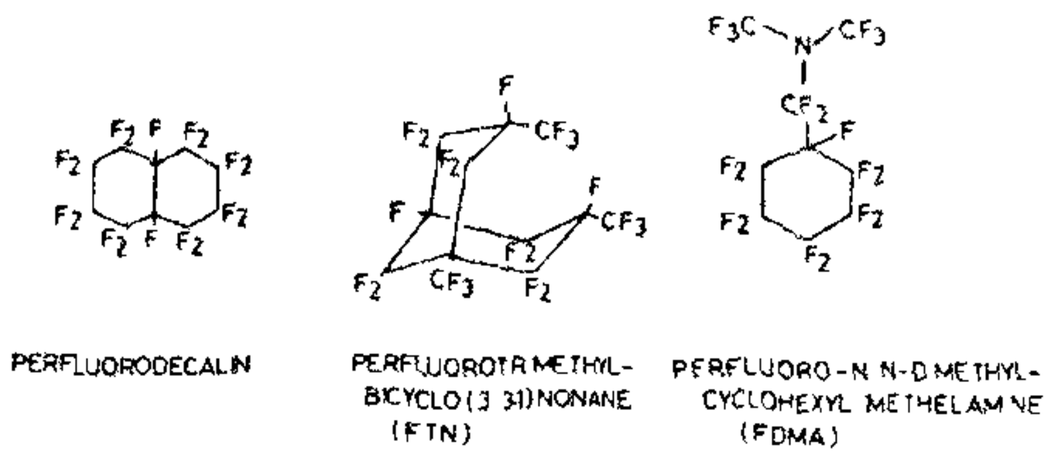

Figure 1. Chemical structure of perfluorochemicals

blood, the oxygen dissociation curve of haemoglobin is sigmoid with respect to oxygen, whereas in perfluorocarbons it is linear[2] (figure 2). Blood delivers 5 to 9 volume percent oxygen to tissues at ambient pressures, whereas at the same pressures, fluosol-DA 20% (an aqueous emulsion of perfluorodecalin and perfluorotripropylamine with other ingredients) can only deliver about 1 to 2 volume percent oxygen[3].

These chemicals have a finite life span intravascularly. In spite of the short intravascular life, they tend to be deposited in tissues, making long term use impossible[3]. Adverse reactions like transient hypotension and pulmonary infiltrates have been reported in some human trials[4]. However, 181 patients treated in Japan with fluosol-DA have not demonstrated any adverse reactions[5]. Large doses of perfluorochemicals have also been found to cause reticuloendothelial blockade leading to immuno depression[6].

Another great drawback of fluosol is that it must be

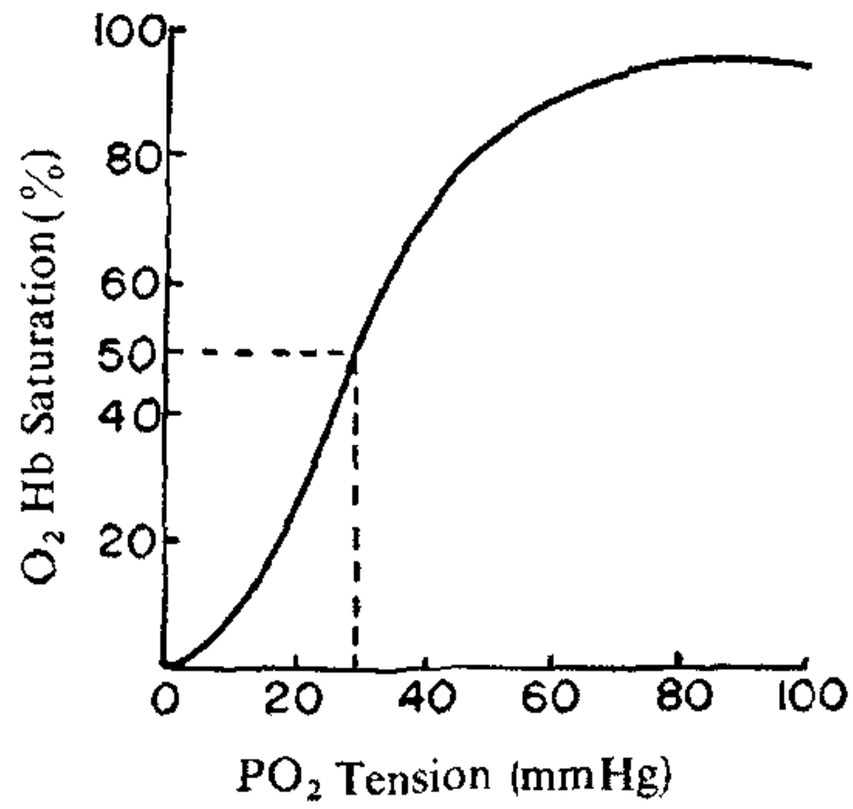

Figure 2. Oxygen dissociation curve of Haemoglobin

kept frozen since it breaks down when kept as a liquid for long periods. However, frozen fluosol has a shelf life of 3 years as compared to 3 weeks for whole blood[7].

The clinical uses of perfluorochemicals are many. Fluosol-DA has been used as a primer for the oxygenator during cardiopulmonary bypass in dogs[8] as a liquid membrane oxygenator[9], as a systemic hypothermic agent during surgery[6] and as a cardioplegic medium[10]. Experiments using fluosol for preservation of organs before transplantation have been successful[11]. Yet another field of use is in radiography. When brominated perfluorocarbon emulsions are given to animals with malignant tumours, the tumours became radio-opaque[12]. This property could be made use of in tumour imaging using conventional radiography and also with computerized tomography[6].

The earlier clinical drawbacks of fluosol-DA, have spurred the development of second generation substitutes, which include perfluorotrimethyl bicyclo (3,3,1) nonane (FTN), perfluoro N,N-dimethyl cyclohexyl-methylamine (FDMA), N-methyldecahydroquinoline, 1-methyl octa hydroquinolizine and N-cyclohexylpyrolidine. Till date, the most advanced are FTN and a 4 to 6 FDMA/FTN mixture[7]. The main advantages of the newer products are stability at room temperature for over a year[7], but they still need a highly saturated oxygen atmosphere for use.

The research on perfluorochemicals has currently reached a stage when their acceptance for regular clinical use is imminent. Nevertheless the need to use them at high oxygen concentration, their short intravascular half life, relatively long body life and toxic characteristics constitute a challenge for the development of an ideal blood substitute.

30 March 1984

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HYPOGLYCEMIC ACTION OF *BOUGAINVILLEA SPECTABILIS* LEAVES

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DIABETES mellitus is a metabolic disease for which complete cure is unknown. But a number of plant products are traditionally known to alleviate diabetic condition. Studies of some plants like *Momordica charantia* (bitter gourd)[1], *Pterocarpus marsupium*[2] and *Phillanthus niruri*[3] have shown encouraging results. Recently there was a strong claim in newspapers[4] that the leaves of *Bougainvillea* (B.V.) can cure diabetes mellitus. A preliminary scientific study of the above claim was, therefore, undertaken.

B.V. spectabilis[5], common in Maharashtra was taken for the present investigation. The shade-dried, powdered (100 mesh) leaves (500 g) were extracted at room temperature, 4 times successively, by cold percolation of 2 lit of alcohol each time. Most of the solvent was removed in vacuo below 60°C and dried in a lyophilizer below 10°C giving 50 g of dried extract. This dried alcoholic extract was administered orally as an emulsion in water using Tween-80, to normal and