

Introduction to medicinal plants biology essay



**ASSIGN
BUSTER**

About 250, 000 higher plant species on earth, more than 80, 000 species are reported to have at least some medicinal value and around 5000 species have specific therapeutic value.

Herbs are staging a comeback and herbal 'renaissance' is happening all over the globe. The herbal products today symbolize safety in compare to the synthetics that are considered as unsafe to human and environment. Even though herbs had been prized for their medicinal, flavoring and aromatic qualities for centuries, the synthetic products of the modern age surpassed their importance, for a while. However, the blind dependence on synthetics is over and people are returning to the herbals with hope of safety and security. Over three-quarters of the world population relies mainly on plants and plant extracts for health care. More than 30% of the entire plant species were used for medicinal purposes. (Joy, P. P., 2001)

Herbals in world market:

It is estimated that world market for plant derived drugs may account for about Rs. 2, 00, 000 crores. Presently, Indian contribution is less than Rs. 2000 crores. The annual production of medicinal and aromatic plant's raw material is worth about Rs. 200 crores. This is likely to reach US \$5 trillion by 2050. It has been estimated that in developed countries such as United States, plant drugs constitute as much as 25% of the total drugs, while in fast developing countries such as China and India, the contribution is as much as 80%. Thus, the economic importance of medicinal plants is much more to countries such as India than to rest of the world. (Joy, P. P., 2001)

Biodiversity of herbals in India:

India is one of the world's 12 biodiversity centers with the presence of over 45000 different plant species. India's diversity is UN compared due to the presence of 16 different agro-climatic zones, 10 vegetation zones, 25 biotic provinces and 426 biomes (habitats of specific species). Among these, about 15000-20000 plants have good medicinal value. However, only 7000-7500 species are used for their medicinal values by traditional communities.

In India, drugs of plant origin have been used in traditional systems of medicines such as Unani and Ayurveda since ancient times. The Ayurveda system of medicine uses about 700 species, Unani 700, Siddha 600, Amchi 600 and modern medicine around 30 species. About 8, 000 herbal remedies have been included in Ayurveda. The Rig-Veda (5000 BC) has recorded 67 medicinal plants, Yajurveda 81 species, Atharvaveda (4500-2500 BC) 290 species, Charak Samhita (700 BC) and Sushrut Samhita (200 BC) had described properties and uses of 1100 and 1270 species respectively, in compounding of drugs and these are still used in the classical formulations, in the Ayurvedic system of medicine. (Joy, P. P., 2001)

Sources of medicinal drugs:

The drugs are derived either from the whole plant or from different organs, like leaves, stem, bark, root, flower, seed, etc. Some drugs are prepared from excretory plant product such as gum, resins and latex. Plants, especially used in Ayurveda can provide biologically active molecules and lead structures for the development of modified derivatives with enhanced activity and /or reduced toxicity. Some important chemical intermediates needed for manufacturing the modern drugs are also obtained from plants

<https://assignbuster.com/introduction-to-medicinal-plants-biology-essay/>

(Eg. β -ionone). The forest in India is the principal repository of large number of medicinal and aromatic plants, which are largely collected as raw materials for manufacture of drugs and perfumery products. The small fraction of flowering plants that have so far been investigated have yielded about 120 therapeutic agents of known structure from about 90 species of plants. Some of the useful plant drugs include vinblastine, vincristine, taxol, podophyllotoxin, camptothecin, digitoxigenin, gitoxigenin, digoxigenin, tubocurarine, morphine, codeine, aspirin, atropine, pilocarpine, capscicine, allicin, curcumin, artemisinin and ephedrine among others. (Joy, P. P., 2001)

History of herbal medicine:

Ayurveda, Siddha, Unani and Folk (tribal) medicines are the major systems of indigenous medicines. Among these systems, Ayurveda is most developed and widely practiced in India. Ayurveda dating back to 1500-800 BC has been an integral part of Indian culture. The term comes from the Sanskrit root Au (life) and Veda (knowledge). As the name implies it is not only the science of treatment of the ill but covers the whole gamut of happy human life involving the physical, metaphysical and the spiritual aspects. Ayurveda is gaining prominence as the natural system of health care all over the world. Today this system of medicine is being practiced in countries like Nepal, Bhutan, Sri Lanka, Bangladesh and Pakistan, while the traditional system of medicine in the other countries like Tibet, Mongolia and Thailand appear to be derived from Ayurveda. Phytomedicines are also being used increasingly in Western Europe. Recently the US Government has established the " Office of Alternative Medicine" at the National Institute of

Health at Bethesda and its support to alternative medicine includes basic and applied research in traditional systems of medicines such as Chinese, Ayurvedic. (Joy, P. P., 2001)

Disadvantages:

A major lacuna in Ayurveda is the lack of drug standardization, information and quality control. Most of the Ayurvedic medicines are in the form of crude extracts which are a mixture of several ingredients and the active principles when isolated individually fail to give desired activity. This implies that the activity of the extract is the synergistic effect of its various components. About 121 (45 tropical and 76 subtropical) major plant drugs have been identified for which no synthetic one is currently available.

The scientific study of traditional medicines, derivation of drugs through bio prospecting and systematic conservation of the concerned medicinal plants is of great importance.

Unfortunately, much of the ancient knowledge and many valuable plants are being lost at an alarming rate. Red Data Book of India has 427 entries of endangered species of which 28 are considered extinct, 124 endangered, 81 vulnerable, 100 rare and 34 insufficiently known species (Thomas, 1997). There are basically two scientific techniques of conservation of genetic diversity of these plants. They are the in situ and ex situ method of conservation. (Joy, P. P., 2001)

In Situ conservation of medicinal plants:

It is only in nature that plant diversity at the genetic, species and eco-system level can be conserved on long-term basis. (www. ggssc. net)

<https://assignbuster.com/introduction-to-medicinal-plants-biology-essay/>

It is necessary to conserve in distinct, representative bio geographic zones inter and intra specific genetic variation.

Ex situ conservation of medicinal plants:

A. Ethno-medicinal plant gardens:

Creation of a network of regional and sub-regional ethno-medicinal plant gardens which should contain accessions of all the medicinal plants known to the various ethnic communities in different regions of India. This chain of gardens will act as regional repositories of our cultural and ethno medicinal history and embody the living traditions of our society's knowledge of medicinal plants. (www. ggssc. net)

Current status:

There are estimated to be around 50 such gardens in the country ranging from acre to 40 acres some of them were set up by an All India Health Network (AHN). More recently a network of 15 such gardens has been set up in 3 states of South India with the initiative of FRLHT. One of the gardens is located in TBGRI, (Tropical botanical garden research institute) Palode at Thiruvananthapuram.

B. Gene banks:

In India there is a large number of medicinal plant species are under various degrees of threat. The precautionary principles would suggest that an immediate and country-wide exercise be taken up to deposit seeds of wild medicinal plants with a first priority to known Red listed species and endemic species.

Current status:

The department of bio-technology, Government of India has recently taken the initiative to establish 3 gene banks in the country. One is with ICAR at the NBPGR (National Bureau of plant genetic Resources) Campus, the second is with CIMAPs, (Central Institute of Medicinal and Aromatic plants) Luck now and the third with TBFRI in Thiruvananthapuram.

C. Nursery network:

The most urgent and primary task in order to ensure immediate availability of plants and planting materials to various user groups is to promote a nationwide network of medicinal plant nurseries, which will multiply all the regional specific plants that are used in the current practice of traditional medicine. These nurseries should become the primary sources of supply of plants and seed material that can be subsequently multiplied by the various users.

Current status:

Planting material for 40 odd species of medicinal and aromatic plants is reportedly available in the ICAR and CSIR (CIMAP) network. In South India FRLHT (Foundation for Rural Revitalization of Local Health Tradition) has recently set up a network of 55 supply nurseries.

D. Cultivation of medicinal plants:

Figures projecting demand and trade in medicinal plant species globally indicate a step upward trend in the near future.

One estimate puts the figure of world trade in medicinal plants and related products at US \$ 5 trillion by A. D. 2050 (world bank report , 1996). The

<https://assignbuster.com/introduction-to-medicinal-plants-biology-essay/>

demand so far has been met mainly from wild sources. This can't go on for much longer; policy intervention is urgently needed to encourage and facilitate investments into commercial cultivation of medicinal plants. (Joy, P. P., 2001)

Cultivation of medicinal plants is inversely linked to prevalence of easy and cheap collection from the wild, lack of regulation in trade, cornering of the profits from wild collection by a vast network of traders and middlemen and absence of industry's interest in providing buy-back guarantees to growers.

Current status:

In the Govt. sector agro-technology of 40 odd species has been developed by ICAR - Agricultural University System and CSIR (CIMAOs & RRL, Jammu and Jorhat). In recent years industries like Dabur, Zandu, Indian Herbs, Arya Vaidya Shala, and Arya Vaidya Pharmacy and others have made some symbolic efforts to initiate cultivation. Since 1984 NABARD (National Bank of Agricultural and Rural Development) has formulated schemes for financing cultivation and processing of medicinal plants.

E. Community based enterprises:

The income generated by the traditional medicine industry benefits small section of the society. A strong case exists for promotion of community level enterprises for value addition to medicinal plants through simple, on site techniques like drying, cleaning, crushing, powdering, grading, packaging etc. This will also increase the stake of rural communities in conservation and change the skewed nature of income distribution of the industry.

Current status:

Three community based enterprises are known in south India, one in Gandhi gram Trust, (Dindigul), Premade development Society (Peer made) Kerala and the third by

VGKK in B. R. Hills, Mysore.

Importance of Herbal Medicines:

Herbal medicines are prepared from a variety of plant material such as leaves, stems, roots, bark, etc. They usually contain many biologically active ingredients and are used primarily for treating mild or chronic ailments.

([www. ggssc. net](http://www.ggssc.net))

Herbal remedies can also be purchased in the form of pills, capsules or powders, or in more concentrated liquid forms called extracts and tinctures. They can apply topically in creams or ointments, soaked into cloths and used as compresses, or applied directly to the skin as poultices.

A combination therapy integrating ayurveda and allopathy whereby the side effects and undesirable reactions could be controlled can be thought of.

Studies can show that the toxic effects of radiations and chemotherapy in cancer treatment could be reduced by Ayurvedic medications and similarly surgical wound healing could be accelerated by Ayurvedic medicines.

Modern science and technology have an essential role to play in the process.

Systems of Medicine:

There are mainly 3 systems of medicine practiced in the world today. They are,

<https://assignbuster.com/introduction-to-medicinal-plants-biology-essay/>

Modern System of medicine or Allopathy:

This system was developed in the Western countries. In this system drugs (tablets, capsules, injections, tonics etc.) are manufactured using synthetic chemicals and / or chemicals derived from natural products like plants, animals, minerals etc. This system also uses modern equipment for diagnosis, analysis, surgery etc. Medicines or drugs of this system is often criticized for its treatment of the symptoms rather than the cause of the disease, harmful side effects of certain drugs and for being out of reach of common / poor people due to the high cost of drugs and treatment. This system is used in all the countries of the world today. (www. ggssc. net)

Alternative Medicine or Traditional System:

Different countries of the world developed independently their own traditional systems of medicine using locally available materials like minerals and products of plants and animals. (www. ggssc. net)

The World Health Organization (WHO) is giving importance to these alternate medicine systems to provide Primary Health Care to millions of people in the developing countries.

Development of herbal medicine:

China developed the Chinese system of medicine, which is practiced in China, Singapore, Taiwan, Japan and other countries. In India, Ayurveda (developed in North India), Siddha (developed in Tamil Nadu) and Nagarjuna (developed in Andhra Pradesh) systems of medicine were developed.

Ayurveda is practiced in Sri Lanka, Pakistan and Bangladesh also. Herbo-mineral is another traditional system used in India and other neighbouring

countries. Drugs (balms, oils, pills, tonics, paste etc) are manufactured and marketed in these systems. (Joy, P. P., 2001)

Advantages of traditional medicine:

Traditional systems of medicine continue to be widely practiced on many accounts. Population rise, inadequate supply of drugs, prohibitive cost of treatments, side effects of several allopathic drugs and development of resistance to currently used drugs for infectious diseases have led to increased emphasis on the use of plant materials as a source of medicines for a wide variety of human ailments.

Folk Medicine or tribal medicine:

The medicinal systems followed by various tribals of different countries are popularly known as folk or tribal medicine. In the system, the “ medicine man” or the “ doctor” of the tribe who has the knowledge of treating diseases, keeps this knowledge as a closely guarded secret and passes it to the next generation by word of mouth. No written texts on these systems are available and different tribes follow different time tested methods. The treatment is often associated with lengthy and mystic rituals, in addition to prescription of drugs (decoctions, pastes, powders, oils, ashed materials etc.). Generally speaking, folk medicine can also be regarded as a traditional system of medicine. The basic aim of all the above systems of medicine is to alleviate the sufferings of human beings and their domesticated animals.
(www. ggssc. net)

Other Systems of medicine:

Yoga, Acupressure, Acupuncture, Reiki, Magneto therapy, Pyramid therapy, Flower therapy, Homeopathy, Nature Cure or Naturopathy etc. are some of the other systems of medicine practiced in different parts of the world today.

Utilization of Herbal Plants:

The utility of medicinal plants has four major segments they are, Medicinal plants utilized in indigenous or traditional systems of medicines (ISM) Ayurveda, Siddha, Unani and Homeopathy systems of medicines , OTC (over the counter, non-prescription) items / products involving plant parts, extracts galenicals etc. , Essential oils , Phyto pharmaceuticals or plants used in modern systems of medicine. (www. ggssc. net)

Medicinal plants used in Traditional Systems of Medicine:

As its name implies, it is the part of tradition of each country which employs practices that have been handed down from generation to generation. An important feature of traditional therapy is the preference of practitioner for compound prescriptions over single substance/drug as it is being held that some constituents are effective only in the presence of others.

This renders assessment of efficacy and eventually identification of active principles as required in international standards much difficult than for simple preparation.

In India, earlier the medicines used in indigenous systems of medicines were generally prepared by the practicing physicians by themselves, but now this practice has been largely replaced by the establishment of organized indigenous drug industries. It is estimated that at present there are more

<https://assignbuster.com/introduction-to-medicinal-plants-biology-essay/>

than 1, 00, 000 licensed registered practitioners of Ayurveda, Siddha, Unani medicine or Homeopathy. In fact reliable data on availability in different regions of country as well as supply and demand of medicinal plants used in production of indigenous medicines are not available. (www. ggssc. net)

Plants-parts, extracts and galenicals of medicinal herbs:

The direct utilization of plant material is not only a feature of ISM in the developing world but also in developed countries like USA, UK, Germany etc., the various herbal formulations are sold on health food shops. Preparation of decoctions, tinctures, galenicals and total extracts of plants also form a part of many pharmacopoeias of the world. The current trend of medicinal plants based drug industry is to procedure standard extracts of plants as raw material. (www. ggssc. net)

Essential Oils from herbal plants:

The essential oil industry was traditionally a cottage industry in India. Since 1947, a number of industrial companies have been established for large scale production of essential oils, oleoresins and perfumes. The essential oil from plants includes Ajowan oil, Eucalyptus oil, Geranium oil, Lavender oil, Palmarosa oil, Patchouli oil, Rose oil, Sandalwood oil, Turpentine oil and Vetiver oil.

Phyto-pharmaceuticals of medicinal plants:

During the past decades, bulk production of plant based drugs has become an important segment of Indian pharmaceutical industry. Some of the Phyto-pharmaceuticals which are produced in India at present include Morphine, codeine, papaverine (Papaver somniferum), quinine, quinidine, cinchonine

and cinchonidine (Cinchona sp., C. calisaya, C. Hyoscine, hyoscyamine (Hyocyamus Niger and H. muticus), colchicine (Gloriosa superbad, Colchicum luteum and Iphigenia stellata), cephaeline and emetin (Cephalis ipacacuanha), sennosides A & B (Cassia angustifolia and C. acutifolia), reserpine, rescinnamine, ajmalicine and ajmaline (Rauvolfia serpentina); vinblastine and vincristine, ajmalicine (raubacine) (Catharanthus roseus); guggul lipid (Commiphora wightii); taxol (Taxus baccata); artemisinin (Artemisai annua) etc. (www. ggssc. net)

Table I: Represents about plants containing Therapeutic value (Joy, P. P., 2001)

Plant groups

Plant species

Family

Genera

Species

Thalophytes

230

I. Monocots

A)Liliaceae

45

165

B)Orchidaceae

45

135

Bryophytes

39

II. Dicots

A)Compositae

89

331

Pteridophytes

382

B)Leguminosae

91

313

Gymnospermae

55

C)Ranunculaceae

31

208

Angiospermae:

a) Monocotyledones

b) Dicotyledones

676

3495

D) Lamiaceae

46

189

E) Rosaceae

28

146

F) Umbelliferae

34

123

G) Rubiaceae

35

118

H)Euphorbiaceae

30

104

Total**4877**

I)Asclepiadaceae

29

101

CLASSIFICATION OF HERBAL PLANTS:

They are classified according to the part used, habit, habitat, therapeutic value etc, besides the usual botanical classification. Based on Therapeutic value they are classified as follows. Anti malarial : *Cinchona officinalis*, *Artemisia annua* , Anticancer : *Catharanthus roseus*, *Taxus baccata* , Antiulcer : *Azadirachta indica*, *Glycyrrhiza glabra* , Antidiabetic : *Catharanthus roseus*, *Momordica charantia* , Anticholesterol : *Allium sativum* Anti inflammatory : *Curcuma domestica*, *Desmodium gangeticum* , Antiviral : *Acacia catechu* Antibacterial : *Plumbago indica* , Antifungal : *Allium sativum* , Antiprotozoal : *Ailanthus sp.*, *Cephaelis ipacacuanha* , Antidiarrhoeal : *Psidium guava*, *Curcuma domestica* , Hypotensive : *Coleus forskohlii*, *Alium sativum* , Tranquilizing : *Rauvolfia serpentina* , Anaesthetic : *Erythroxylum*

<https://assignbuster.com/introduction-to-medicinal-plants-biology-essay/>

coca , Spasmolytic : Atropa belladonna, Hyoscyamus niger , Diuretic : Phyllanthus niruri, Centella asiatica , Astringent : Piper betel, Abrus precatorius Anthelmentic : Quisqualis indica, Punica granatum , Cardio tonic : Digitalis sp., Thevetia sp. Antiallergic : Nandina domestica, Scutellaria baicalensis , Hepatoprotective : Silybum marianum, Andrographis paniculata. (Joy, P. P., 2001)

Safety of medicinal plants:

The safety and effectiveness of alternative medicines have not been scientifically proven and remains largely unknown. A number of herbs are thought to be likely to cause adverse effects. Furthermore, “ adulteration, inappropriate formulation, or lack of understanding of plant and drug interactions have led to adverse reactions that are sometimes life threatening or lethal.” Proper double-blind clinical trials are needed to determine the safety and efficacy of each plant before they can be recommended for medical use. Although many consumers believe that herbal medicines are safe because they are “ natural”, herbal medicines may interact with synthetic drugs causing toxicity to the patient, may have contamination that is a safety consideration, and herbal medicines, without proven efficacy, may be used to replace medicines that have a proven efficacy. (Joy, P. P., 2001)

Eg: Ephedra has been known to have numerous side effects, including severe skin reactions, irritability, nervousness, dizziness, trembling, headache, insomnia, profuse perspiration, dehydration, itchy scalp and skin, vomiting, hyperthermia, irregular heartbeat, seizures, heart attack, stroke, or death. Poisonous plants which have limited medicinal effects are often not

sold in material doses in the United States or are available only to trained practitioners, these include: Aconite, Arnica, Belladonna, Bryonia, Datura, Gelsemium, Henbane, Male Fern Phytolacca, Podophyllum and Veratrum. Furthermore, herbs such as Lobelia, Ephedra and Eonymus that cause nausea, sweating, and vomiting, have been traditionally prized for this action. Plants such as Comfrey and Petasites have specific toxicity due to hepatotoxic pyrrolizidine alkaloid content. There are other plant medicines which require caution or can interact with other medications, including St. John's wort and grapefruit. (Phytotherapy, www.wikipedia.com)

INTRODUCTION TO DIABETES MELLITUS

In recent years, developed nations have witnessed an explosive increase in the prevalence of diabetes mellitus (DM) predominantly related to lifestyle changes and the resulting surge in obesity. The metabolic consequences of prolonged hyperglycemia and dyslipidemia, including accelerated atherosclerosis, chronic kidney disease, and blindness, pose an enormous burden on patients with diabetes mellitus and on the public health system. (Goodman & Gilman's, 2006)

In 1869, a German medical student, Paul Langerhans, noted that the pancreas contains two distinct groups of cells the acinar cells, which secrete digestive enzymes, and cells that are clustered in islands, or islets, which he suggested, served a second function. Direct evidence for this function came in 1889, when Minkowski and von Mering showed that pancreatectomized dogs exhibit a syndrome similar to diabetes mellitus in humans (Goodman & Gilman's, 2006)

In the early 1900s, Gurg Zuelzer, an internist in Berlin, attempted to treat a dying diabetic patient with extracts of pancreas. Although the patient improved temporarily, he sank back into a coma and died when the supply of extract was exhausted. E. L. Scott, a student at the University of Chicago, made another early attempt to isolate an active principle in 1911. Using alcoholic extracts of the pancreas Scott treated several diabetic dogs with encouraging results; however, he lacked clear measures of control of blood glucose concentrations. Between 1916 and 1920, the Romanian physiologist Nicolas Paulesco found that injections of pancreatic extracts reduced urinary sugar and ketones in diabetic dogs. Although he published the results of his experiments, their significance was fully appreciated only years later.

(Goodman & Gilman's, 2006)

Banting assumed that the islets secreted insulin but that the hormone was destroyed by proteolytic digestion prior to or during extraction. Together with Charles Best, he attempted to overcome the problem by ligating the pancreatic ducts. The acinar tissue degenerated, leaving the islets undisturbed; the remaining tissue then was extracted with ethanol and acid. Banting and Best thus obtained a pancreatic extract that decreased the concentration of blood glucose in diabetic dogs. (Goodman & Gilman's, 2006)

Insulin was purified and crystallized by Abel within a few years of its discovery. Sanger established the amino acid sequence of insulin in 1960, the protein was synthesized in 1963, and Hodgkin and coworkers elucidated insulin's three-dimensional structure in 1972. Insulin was the hormone for

which Yalow and Berson first developed the radioimmunoassay (Goodman & Gilman's, 2006)

Insulin regulation is achieved by the coordinated interplay of various nutrients, gastrointestinal hormones, pancreatic hormones, and autonomic neurotransmitters. Glucose, amino acids, fatty acids, and ketone bodies promote the secretion of insulin. The islets of Langerhans are richly innervated by both adrenergic and cholinergic nerves. Stimulation of α_2 adrenergic receptors inhibits insulin secretion, whereas β_2 adrenergic receptor agonists and vagal nerve stimulation enhance release. In general, any condition that activates the sympathetic branch of the autonomic nervous system (such as hypoxia, hypoglycemia, exercise, hypothermia, surgery, or severe burns) suppresses the secretion of insulin by stimulation of β_2 -adrenergic receptors. Predictably, β_2 adrenergic receptor antagonists increase basal concentrations of insulin in plasma, and β_2 adrenergic receptor antagonists decrease them. The sugar is more effective in provoking insulin secretion when taken orally than when administered intravenously because the ingestion of glucose (or food) induces the release of gastrointestinal hormones and stimulates vagal activity. Several gastrointestinal hormones promote the secretion of insulin. The most potent of these are gastrointestinal inhibitory peptide (GIP) and glucagon like peptide 1 (GLP-1). Insulin release also is stimulated by gastrin, secretin, Cholecystokinin, vasoactive intestinal peptide, gastrin-releasing peptide, and Enteroglucagon. (Goodman & Gilman's, 2006)

Distribution:

Insulin circulates in blood as the free monomer, and its volume of distribution approximates the volume of extracellular fluid. Under fasting conditions, the pancreas secretes about 40 mg (1 unit) of insulin per hour into the portal vein to achieve a concentration of insulin in portal blood of 2 to 4 ng/ml (50 to 100 minutes/ml) and in the peripheral circulation of 0.5 ng/ml (12 minutes/ml) or about 0.1 nM. After ingestion of a meal, there is a rapid rise in the concentration of insulin in portal blood, followed by a parallel but smaller rise in the peripheral circulation. (Goodman & Gilman's, 2006)

Half Life:

The half-life of insulin in plasma is about 5 to 6 minutes in normal subjects and patients with uncomplicated diabetes. This value may be increased in diabetics who develop anti-insulin antibodies. (Goodman & Gilman's, 2006)

Metabolism:

Degradation of insulin occurs primarily in liver, kidney, and muscle. About 50% of the insulin that reaches the liver via the portal vein is destroyed and never reaches the general circulation. Insulin is filtered by the renal glomeruli and is reabsorbed by the tubules, which also degrade it. Severe impairment of renal function appears to affect the rate of disappearance of circulating insulin to a greater extent than does hepatic disease. Peripheral tissues such as fat also inactivate insulin, but this is of less significance quantitatively. The important target tissues for regulation of glucose homeostasis by insulin are liver, muscle, and fat, but insulin exerts potent regulatory effects on other cell types as well. Insulin is the primary hormone

responsible for controlling the uptake, use, and storage of cellular nutrients. (Goodman & Gilman's, 2006)

Figure 1: Insulin release from β -cell

DIABETES MELLITUS:

Diabetes mellitus (DM) consists of a group of syndromes characterized by hyperglycemia; altered metabolism of lipids, carbohydrates, and proteins; and an increased risk of complications from vascular disease. Most patients can be classified clinically as having either type 1 or type 2 DM. Criteria for the diagnosis of DM have been proposed by several medical organizations. The American Diabetes Association (ADA) criteria include symptoms of DM (e. g., polyuria, polydipsia, and unexplained weight loss) and a random plasma glucose concentration of greater than 200 mg/dl (11.1 mM), a fasting plasma glucose concentration of greater than 126 mg/dl (7 mM), or a plasma glucose concentration of greater than 200 mg/dl (11 mM) 2 hours after the ingestion of an oral glucose load

In the United States, about 5% to 10% of all diabetic patients have type 1 DM, with an incidence of 18 per 100,000 inhabitants per year. A similar incidence is found in the United Kingdom. The incidence of type 1 DM in Europe varies with latitude. The highest rates occur in northern Europe (Finland, 43 per 100,000) and the lowest in the south (France and Italy, 8 per 100,000). The one exception to this rule is the small island of Sardinia, close to Italy, which has an incidence of 30 per 100,000. However, even the relatively low incidence rates of type 1 DM in southern Europe are far higher than the rates in Japan (1 per 100,000 inhabitants). There are more than

125 million persons with diabetes in the world today, and by 2010, this number is expected to approach 220 million. (Goodman & Gilman's, 2006)

Both type 1 and type 2 DM are increasing in frequency. The reason for the increase of type 1 DM is not known. The genetic basis for type 2 DM cannot change in such a short time; thus other contributing factors, including increasing age, obesity, sedentary lifestyle, and low birth weight, must account for this dramatic increase. In addition, type 2 DM is being diagnosed with remarkable frequency in preadolescents and adolescents. Up to 45% of newly diagnosed children and adolescents have type 2 DM. There are genetic and environmental components that affect the risk of developing either type 1 or type 2 DM

Types:

Diabetes can be divided into