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Cannabis Testing Solutions:

Let’s Talk Quality

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Outline

- The Hemp Plant: Valuable from Top to Bottom
- Brief History of Cannabis Medication
- Why is Cannabis Analysis required?
- The targets of Cannabis Testing
  - → Active Ingredients
  - → Contaminants
- Solutions for Cannabis Analysis

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The Cannabis plant: valuable from top to bottom

Flowers

- Medication
- CBD Oil
- Cosmetics
- Food

Leaves

- Animal Bedding
- Compost
- Mulch

Roots

- Health Remedies
- Organic Compost
- Soil Nutrients

SEEDS

- **Industrial products (e.g.** Coatings, Fuel, Lubricants, Oil paints, Printing Inks, Solvents, Varnishes)
- **Personal Care (e.g.** Balms, Cosmetics, Lotions, Shampoos, Soaps
- **Food (e.g.** Animal Feed, Beer , Essential Fatty Acids, Food Supplements, Protein Powder, Seed Hearts, Seed Oil

STALK

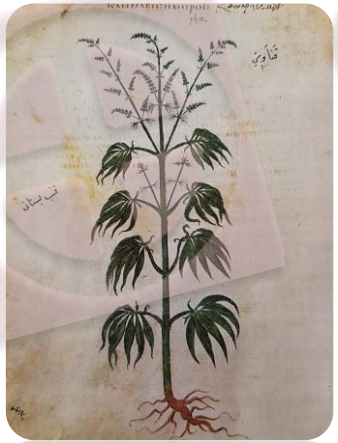
- **Industrial textiles (e.g.** Canvas, Carpeting, Caulking, Molded Parts, Netting, Rope, Tarp)
- **Building materials (e.g.** Acrylics, Fiberboard, Fiberglass, Substitute, Insulation, Textiles)
- **Consumer textiles (e.g.** Clothing, Diapers, Denim, Fine Fabrics, Handbags, Shoes)
- **Paper (e.g.** Cardboard, Packaging, Printing, Newsprint)

A very brief history of Cannabis Medication

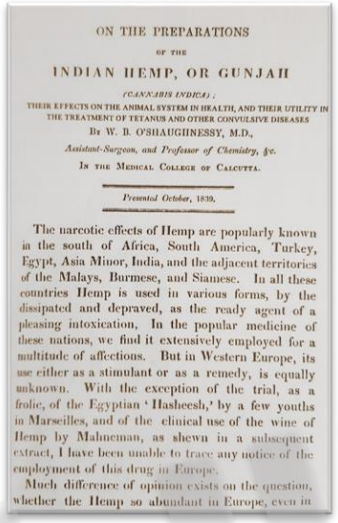
512 AC

Codex Vindobonensis

First known illustration of the hemp plant by Greek physician Dioskurides



early 19th century



ON THE PREPARATIONS
OF THE
INDIAN HEMP, OR GUNJAH
(CANNABIS INDICA):
THEIR EFFECTS ON THE ANIMAL SYSTEM IN HEALTH, AND THEIR UTILITY IN THE TREATMENT OF TETANUS AND OTHER CONVULSIVE DISEASES
By W. B. O'SHAUGHNESSY, M.D.,
Assistant-Surgeon, and Professor of Chemistry, &c.
In the Medical College of Calcutta.

Presented October, 1839.

The narcotic effects of Hemp are popularly known in the south of Africa, South America, Turkey, Egypt, Asia Minor, India, and the adjacent territories of the Malays, Burmese, and Siamese. In all these countries Hemp is used in various forms, by the dissipated and depraved, as the ready agent of a pleasing intoxication. In the popular medicine of these nations, we find it extensively employed for a multitude of affections. But in Western Europe, its use either as a stimulant or as a remedy, is equally unknown. With the exception of the trial, as a frolic, of the Egyptian 'Hasheesh,' by a few youths in Marseilles, and of the clinical use of the wine of Hemp by Mahneman, as shewn in a subsequent extract, I have been unable to trace any notice of the employment of this drug in Europe.

Much difference of opinion exists on the question, whether the Hemp so abundant in Europe, even in

Indian hemp
– CANNABIS INDICA –
found its way to Europe

Numerous health benefits lead to a rapid increase in its popularity

1880 - 1920

Cannabis formulations were commercially available from Pharmaceutical companies.

1961

Single Convention on Narcotic Drugs prohibited the use of Cannabis for recreational and medical use, as well as research purposes.

Cannabis Analysis – Why?

- Cannabis contains more than 500 unique compounds, including over 80 chemical alkaloids known as cannabinoids and more than 140 terpene components, many of which are of medicinal interest
- The sticky trichomes of the budding plant produce the highest concentrations
- Concentration and composition varies with plant species, strain growing conditions and other variables

Potency testing

	Antibiotic	Antifungal	Anti-inflammatory	Analgesic	Anxiolytic	Antioxidant	Antispasmodic	Antiemetic	Sedative	Euphoriant
Cannabigerolic Acid (CBGA)										
Cannabigerol (CBG)										
Cannabichromene (CBC)										
Cannabidiolic Acid (CBDA)										
Cannabidiol (CBD)										
Δ-9-THC										
Δ-9-THCV										
Cannabinol (CBN)										

[S. Kuzdzal et al., A Closer Look at the Emerging Cannabis Industry, Shimadzu Journal, Third Edition: December 2017]

Terpene screening

Pine needles

- Anti-inflammatory
- Aids memory
- Bronchodilator for better cannabinoid absorption

Lavender

- Anti-anxiety
- Analgesic
- Anti-cancer

Citrus

- Anti-bacterial
- Anti-cancer
- Anti-depression

Cannabis Analysis – Why?

Pesticides

Fungicides

Moisture

Residual Solvents

Heavy Metals

Mycotoxines

Pesticide Poisoning

NEWS / SCIENCE & TECHNOLOGY

UN: 200,000 die each year from pesticide poisoning

Report says pesticides are having 'catastrophic impacts' on human health and environment while failing to end hunger.

Pesticide Poisoning Kills 23 in Indian Elementary School

BY JSAGER99 AUGUST 13, 2013 ENVIRONMENT FOREIGN POLICY PESTICIDES REGULATION

Shortly after lunch was served, those who ate started to suffer from acute organophosphate poisoning symptoms. Initially, many were of the children became violently sick to their stomachs, preceding the onset of severe neurological and respiratory symptoms.

Piperonyl butoxide – highly toxic to aquatic life with long lasting effects

Myclobutanil – health hazard, suspected of damaging the unborn child

Imidacloprid – May be fatal if swallowed and enters airways

Permethrin – May cause allergic reactions

Trifloxystrobin – Danger to life through through inhalation

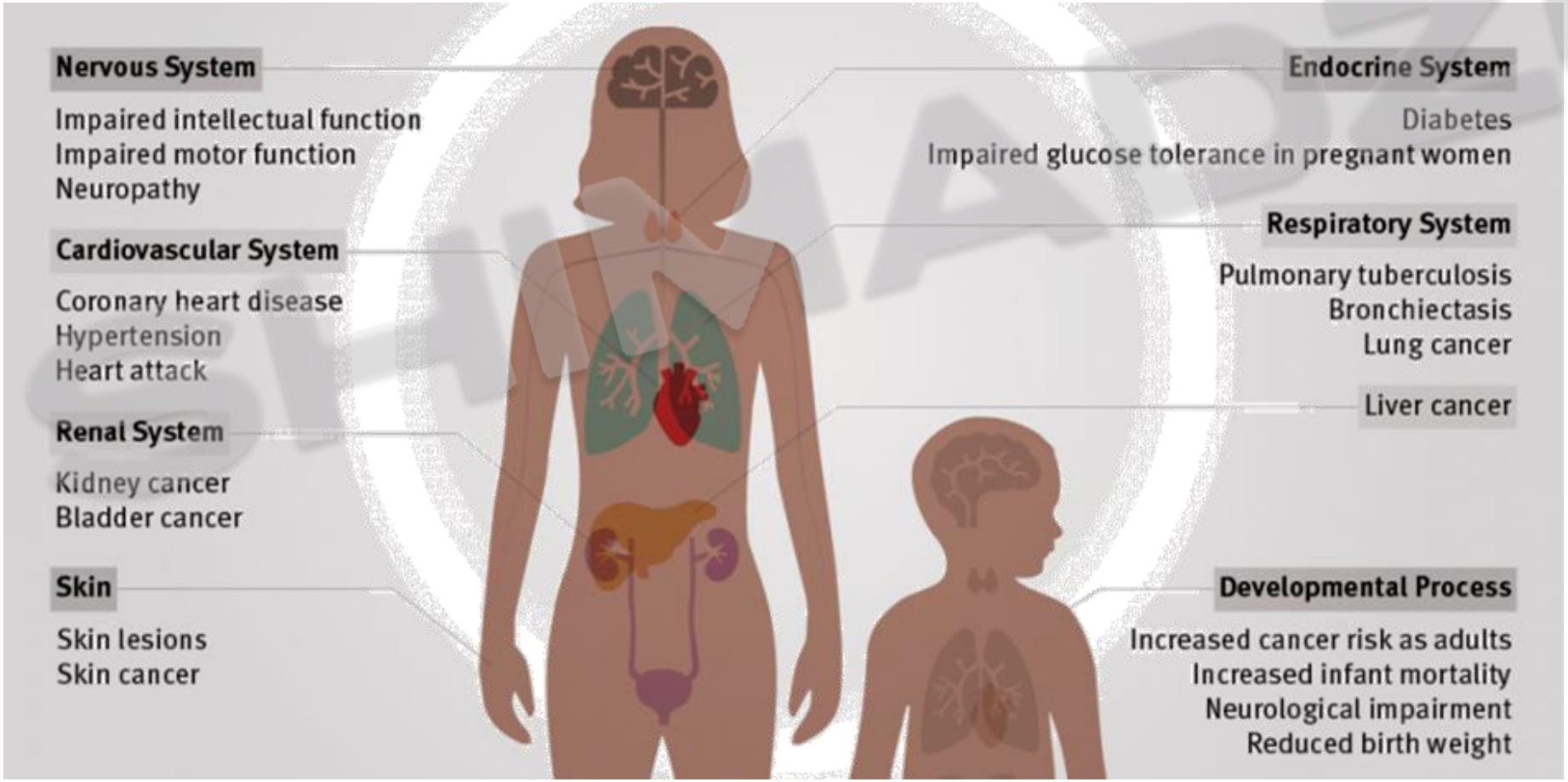
Bioaccumulation of Heavy Metals

Groundwater
Industrial Waste
Pollution
Fertilizer / Pesticides

- As plants grow, they bioaccumulate metals from soil and water
- The Cannabis plant is a "Hyperaccumulator", a plant with the ability to uptake high amounts of toxins, without a negative effect on growth and development
- Potentially toxic and/or harmful elements, such as arsenic, cadmium, mercury and lead are enriched in the plant

Heavy Metal Poisoning

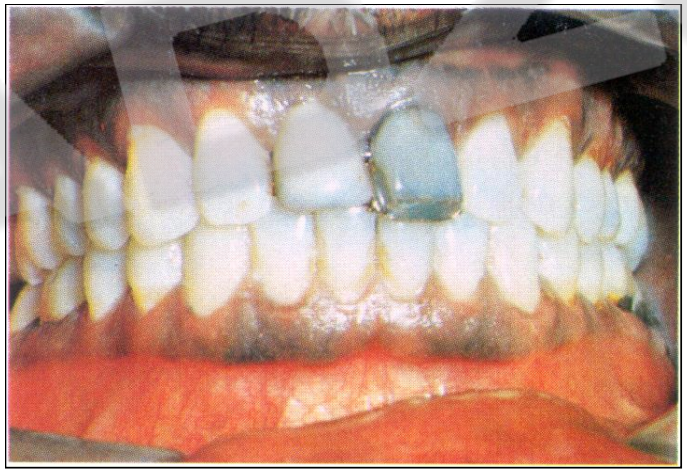
- Arsenic 



Heavy Metal Poisoning

- Arsenic 
- Lead 

  → Lead accumulates in teeth and gingival



- Mercury 
- Cadmium 

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Cannabis Analytical Testing

- Potency profiling
- Terpene Profiling
- Pesticide screening
- Fungicide analyses
- Residual solvents
- Mycotoxins
- Heavy metals
- Moisture content

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Cannabis Testing Solutions

Potency Testing

HPLC

Heavy Metals

ICP-MS

Terpene Profiling

GCMS

Moisture Content

Moisture Balance

Pesticide Screening

GCMS or LCMS

Mycotoxine Screening

LCMS

Disclaimer

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