Natural Sciences Department presents:

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Medicinal Plants in Tibetan Medicine
Institute of General and Experimental Biology
Russian Academy of Science
Siberian Branch

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Student Government Association
Hostos Community College
Medicinal Plants in Tibetan Medicine

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What is Tibetan Medicine? Or Sowa Rigpa?

- It is a science because its principles are enumerated in a systematic and logical framework based on an understanding of the body and its relationship to the environment.
What is Tibetan Medicine?

It is an art because it uses diagnostic techniques based on the creativity, insight, subtlety and compassion of the medical practitioner.
What is Tibetan Medicine?

And it is a philosophy because it embraces the key Buddhist principles of altruism, karma and ethics.
What is Tibetan Medicine?

Science
Art
Philosophy
What is Tibetan Medicine?

SAP?

Energy

Vital body fluid

Solution of mineral salts, sugars, etc., that circulates in a plant
Medicinal plants used in Tibetan medicine

Scutellaria baicalensis

Leonurus sp.

Picrorhiza sp.

Gentiana urnula

Lagotis junnanensis
Development of Tibetan Medicine

Chinese Medicine

Ayurvedic Medicine

Persian Medicine

Folk medicine of Tibetans

Tibetan Medicine (early period VII century)

Tibetan Medicine (late period VIII-XII century)

Folk medicine of Mongolians

Tibetan Medicine (Mongolian branch VIII-XIX)

Folk medicine of Buryats

Tibetan Medicine (Buryat branch VIII-XIX)
Expansion of Tibetan Medicine to Mongolia and Buryatia

- paths of spreading of traditional medical systems (Aurvedic, Chinese, etc.)
Analysis of Tibetan treatises

- Tibetan treatise “Shel-phreng” described some botanical characteristics of medicinal plants, areas and habitats where plants grow. Also you can find information about identification of plants by many senses: taste, smell, color, etc.
### Comparative analysis of European and Tibetan botanical knowledge

#### Europe

- Appearance of plant show the similarity, which give rise to image. This image gives the name; for example *Glycyrrhiza* – sweet root;
- Some plants similar with animals; for example *Geranium* – the crane;
- Sometimes they looks like nature objects; for example *Selinum* – the Moon;
- Name of plant reflects its structure; for example *Aster* – the star;
- Treating activity usually used in plant names; for example *Althaea* – heal;
- Also you can know the place were plant grows; for example *Empetrum* – the rock;
- Sometimes plant names combine or reduce two or more words; for example *Anemone* – blow as a wind.

#### Tibet

- *Glycyrrhiza* calls shing mngar – sweet tree;
- *Pedicularis* – lug ru – twisted ram horn
- *Aster* – lug mig – ram eye
- *Capsella bursa pastoris* – sog ka ba – shoulder blade;
- *Momordica cochinchinensis* – gzong mchu – edge of drill;
- *Thermopsis* – gu mo glo sman – the main lung remedy;
- *Myricaria* – chu shing – river tree;
- *Aconitum* – gangs kyi zhun chung – a piece of melted ice;
- *Oxytropis* – lan pad phreng can – holding a lotus garland in arms.
# Ethno-botanical studies in Mongolia

<table>
<thead>
<tr>
<th>Family</th>
<th>Latin name</th>
<th>English name</th>
<th>Mongolian name</th>
<th>Tibetan name</th>
<th>Use in medicine</th>
<th>Other properties, comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lilaceae (Lily Family)</strong></td>
<td><em>Lilium pumilum</em></td>
<td>Low lily, Small lily, Coral lily</td>
<td>Odoi Saraana, Tsagaan Toms, Ulaan Saraana</td>
<td>A-bkhi-shja-gar-bo (bulbs)</td>
<td>Bulbs are used as medical treatment for liver diseases. Flowers are used to staunch the flow of blood.</td>
<td>Common in steppe communities. Locals eat bulbs with milk or cream.</td>
</tr>
<tr>
<td><strong>Caryophyllaceae (Pink Family)</strong></td>
<td><em>Dianthus versicolor</em></td>
<td>Variegated pink, Spotted pink</td>
<td>Alag Tsetseg Bashir, Bamara Tsetseg</td>
<td>Yu-mo-deu-chzhin</td>
<td>Used in traditional medicine for women’s and childbirth diseases.</td>
<td>Common in steppe communities.</td>
</tr>
<tr>
<td><strong>Ranunculaceae (Buttercup Family)</strong></td>
<td><em>Aconitum czekanovskyi</em></td>
<td>Monkshood</td>
<td>Chekanovskiin Khors</td>
<td>Bod-man-chen</td>
<td>Traditional medicinal uses include protection from diseases of the brain and nervous system.</td>
<td>All plant is very poisonous.</td>
</tr>
<tr>
<td><strong>Adonis sibirica</strong></td>
<td>Siberian adonis</td>
<td>Sibir’ Altan Khundaga</td>
<td>Njang-dzhi-bre</td>
<td></td>
<td>Contain heart-effected glycosides. Herb and flowers are good in treatment of cardiac and nervous system diseases.</td>
<td>Early blooming plant.</td>
</tr>
<tr>
<td><strong>Adonis mongolicus</strong></td>
<td>Mongolian adonis</td>
<td>Mongol Altan Khundaga</td>
<td></td>
<td>-</td>
<td>Contain heart-effected glycosides. Herb and flowers are good in treatment of cardiac and nervous system diseases.</td>
<td>Endemic and rare species. Early blooming plant.</td>
</tr>
<tr>
<td><strong>Aquilegia sibirica</strong></td>
<td>Siberian columbine</td>
<td>Sibir’ Udval</td>
<td>Udbal-on-bo</td>
<td></td>
<td>Flowers used for liver and bile diseases.</td>
<td>Beautiful blue-lilac flowers</td>
</tr>
</tbody>
</table>
Meetings with local Elders
Schematic of finding the definitions for Tibetan plant names

1. Tibetan name of the plant
2. Straight translation of Tibetan text to Russian
3. Analysis of plant’s pictures from treatises
4. Composing the translated description of the plant
5. Study of herbaria and raw material samples
6. Revealing the Mongolian, Chinese, and Sanskrit plant names
7. Analysis of other available data (e.g. information from local Elders, revising the old notes, etc)
8. Information from the literature and field guides
9. Final identification of the plant
These plants are known as “chudlens” – remedies that have a positive strengthening effect on the body (biostimulants).

Military Orchid also has a heating effect and can be helpful during detoxification.

Rhododendron also called “elixir of life”

On the left: Military Orchid *Orchis militaris*
On the top: Dahurian Rhododendron *Rhododendron dauricum*
Tibetan medicinal plants

*Iris sp.*
Dres ma (Tib.)
1. Male individual
2. Female individual
3. Asexual individual

*From Rahchun-chab treatise: “Iris fruits can heal the warm diseases”*
This plant heals the “cold” diseases (e.g. lung diseases, drying of throat, etc.)

The three kinds of this plant can be distinguished by the flowers: white, lilac, and lily-white. Distinguished by the roots: white, hard and rounded – male individuals, smaller and friable – asexual, big roots - female
Tibetan medicinal plants

Yarrow can help with the leg’s and hand’s edemas.

From Krungs dpe treatise: «Yarrow grows on the northern slopes and in meadows. It has leaves and stems similar to caraway. Has a strong, but not bad smell. Males have flowers, females do not have flowers.”

*Achillea millefolium*

Yarrow
Tibetan medicinal plants

- This plant has a hemostatic effect and treats liver “heat”.
- The species which is growing in Siberia can be named as a “meadow” species in Tibetan tradition because it has leaves like needles and red fruits with black pits.
Tibetan medicinal plants

Oxytropis lanata
Locoweed

From treatise:
«Locoweed is the king of the herbs. It can help with digesting. If you put it on the wound it will heal. If you take it internally it will constrict vessels”

There are two kinds of locoweed: black and white. They grow in the same places and look similar. Bigger plants with the sweet smell are the white locoweed. Smaller plants with the bitter smell are the black ones.
Shrubby Dragon's Head

*Dracocephalum fruticulosum*

From treatise:

“Dragon’s head grows in shady and sunny places.

It has blue flowers. Flowers looks like blue silk handkerchief.

The plant has a sweet and bitter taste and heals the liver diseases.

It can help stop blood flow and heal wounds.”
Tibetan medicinal plants

Alpine Aster *Aster alpinus*

- Alpine Aster is good in treatment of fever diseases and helpful with detoxification
- This plant is also called “the enemy of 404 diseases”

Tibetan name *lug mig* refers to the legend that says: “This plant starts to grow from the eye of Lug-skje-ma (Tibetan goddess)

The plants with big flowers looks like a sheep eye.
Conclusions for 1st chapter

- The level of botanical knowledge described in Tibetan treatises from XI-XVIII centuries corresponded with European period (XVIII century before Karl Linney’s system of plants).

- Originality of Tibetan botanical information revealed by analysis from different materials. The degree of adoption can be explained by historical and cultural connections between Central Asia, South-East Asia and Minor Asia.
Automatic Database “Tibetan Medicine” General structure

- **Automatic Database “Tibetan Medicine”**
  - General structure
    - 2 Болезни
    - 3 Справочник строения тела
    - 4 Справочник болезней
    - 7 Справочник терминов
    - 5 Лекарственные средства
    - 6 Справочник свойств
    - 9 Справочник используемых частей
    - 10 Названия лекарственных средств
    - 43 Справочник происхождений названий
    - 49 Библиографический справочник
    - 26 Рецепты
    - 27 Справочник единиц измерения
    - 28 Справочник глаголов
    - 29 Справочник лекарственных форм
    - 30 Рецептурник
    - 44 Справочник типов компонента
    - Европейская медицина
      - 14 Справочник болезней
      - 15 Справочник семейств растений
      - 16 Справочник видов фармакотерап. активностей
      - 17 Справочник по химии
      - 24 Справочник лекарственных средств латинский
      - 35 Справочник регионов
      - 37 Справочник флористические районы
      - 38 Справочник административных районов
      - 40 Справочник библиографический
      - 52 Справочник авторов
Institute of General and Experimental Biology, Siberian Branch, Russian Academy of Science

- Laboratory of Geography and Ecology of Soils
- Laboratory of Experimental Agro Chemistry
- Laboratory of Biochemistry of Soils
- Laboratory of Floristics and Geobotany
- Laboratory of Animal Ecology
- Laboratory of Microbiology
- Laboratory of Parasitology and Ecology of Aquatic Species

**Department of Biologically Active Substances**
- Laboratory of Experimental Pharmacology
- Laboratory of Medical and Biological Studies
- Laboratory of Safety of Biologically Active Substances
The Institute has been studying the heritage of traditional Tibetan medicine. On this basis new medicines from plants are developed using different biotechnological procedures.

The development of original medicines of significance far beyond the regional boundaries and is deemed as a revenue sources for Russia.

According to growing interest in Tibetan medicine worldwide, the Institute provides unique historical and cultural materials.
The major objectives of our Department

- to translate fundamental Tibetan medical treatises into Russian and other European languages and put them into scientific use;
- to study the Tibetan medical tradition, particularly diagnostics, therapeutic and preventive techniques;
- to study the Tibetan remedies and develop new medicines on their basis, while determining mechanisms of their action, efficiency and safety;
- to integrate rational methods and effectiveness with modern recommendations and introduce them into clinical and prophylactic medicine.
“Dzhud-Shi”

- This treatise was translated into Russian by our scientists.
- After its publishing all interesting methods and principles of Tibetan medicine became available.
Laboratory of Medical and Biological Studies

Scientific tendencies

**Pharmacognosy**
- Resource investigations
- Macroscopic analysis
- Anatomic structure

**Phytochemistry**
- Phytochemical analysis
- Merchandising analysis
- Structure modifications
- Authenticity criteria
- Quantitative analysis

HO OH
CH₃
O
OCH₃
O
+ Glc

[2% HCl / EtOH]
[10% HCl / MeOH]
(AF-3/5-2)
(AF-3/5-2-1)
(AF-3/5-2-2)
(AF-3/5-2-3) (AF-3/5-2-4)

Structure modifications
MODIFICATION OF 1-HYDROXI-2,3,4,5-METOXIXANTONE

1-ацетокси-2,3,4,5-тетраметоксиксантон

1-гидрокси-2,3,4,5-тетраметоксиксантон

1-аллилокси-2,3,4,5-тетраметоксиксантон

1-(2,3-эпоксипропоксил)-2,3,4,5-тетраметоксиксантон

1-[(3-бензиламино-2-гидрокси)-пропоксил]-2,3,4,5-тетраметоксиксантон
The main idea of the mechanochemical approach

The most effective mechanochemical technology combines physical and chemical transformation with milling operation.
Cellular Materials - Biologically Active Substances: alkaloids, acids, glycosides, phytosterols ...

Raw Plant Materials

Grinding

Extraction by organic solvents

Mechanochemical reactions of BAS

Extraction by water

Purification

Soluble bioavailable forms of BAS:
- Soluble salts and complexes
- Molecular complexes with soluble matrix
- Glycosides

New Product

Product

Product
Traditional Technology of BAS Production from Plant Materials

Raw Plant materials → Solvents → BAS and Ballast Compounds → Purification → Ballast Compounds

Alkaloids, acids, glycosides, phytosterols ...
Production scheme of alkaloids derived from *Sophora flavescens*

**Traditional method**

- *Sophora roots*
  - Extract 1
    - MeOH
    - pH9, CHCl₃
  - Extract 2
    - 2% HCl
  - Acid extract
    - pH10 CHCl₃
  - Drying
- Sum of alkaloids

**Mechanochemical approach**

- *Sophora roots* + sorbent
  - Reaction mass
    - MeOH
    - pH10 CHCl₃
    - Extract
      - pH10 CHCl₃
      - 2% HCl
      - Na salts of flavonoids
  - Drying
- Sum of alkaloids
  - 1%
New remedy “Phytourosept”

**Vaccinium vitis-idaea**
- Simple phenols, flavonoids, tanning agents

**Arctostaphyllos uva-ursi**
- Simple phenols, catechins, tanning agents

**Urtica dioica**
- Chlorophylls, phenolic acids, polysaccharides

**Calendula officinalis**
- Carotinoids, triterpens, flavonoids, polysaccharides

**Polygonum aviculare**
- Flavonoids, polysaccharides, silicon compounds
New remedy “Phytourosept”. Chemical composition

- **Flavonoids**
  - Rutine
  - Quercetine
  - Narcissine
  - Avicularine
  - Catechins

- **Tannin agents**
  - penta-, hexa-
  - galloizide
  - glusoses

- **Simple phenols**
  - Arbutin
  - Hydrochinone

- **Phenolic acids**
  - Coffee acid
  - Chlorogenic acid
  - Gallic acid

- **Polysaccharides**
  - Arabinogalactans
  - Glukans

- **Others**
  - Moisture: 2.33-3.27%
  - Ash: 9.76-11.03%
  - Other components: 13.27-14.12%
  - Simple phenols: 10.74-12.02%
  - Others: 2.01-2.75%
New remedy “Phytourosept”. Standartization

Authentical analysis

TLC

UV-spectrum

HPLC

Quantitative spectrophotometric analysis

The sum of flavonoids 11.73-14.79%.
New remedy “Phytourosept”. Biological activity

- Antibacterial
- Anti-inflammatory
- Immunomodulating
- Hypoazoithemic
- Diuretic
- Spasmolytic
- Vessel activating
- Coagulatory
- Antioxidative
- Membrane stabilizing
**Created medical preparations**

### Lamiaceae
- *Scutellaria baicalensis* herb flavonoid fraction (Escubai®) - hepatoprotective, immunostimulant
- *Lophanthus chinensis* herb extract (Lolique®) - antiapoplexy
- *Schizonepeta multifida* herb extract (Schimulique®) - cerebral circulation stimulant
- *Panzerina lanata* herb extract (Pala®) - hypotenzive

### Fabaceae
- *Sophora flavescens* herb (Soflaven®) - antiinflammatory, immunostimulant
- *Astragalus membranaceus* herb extract (Amemex®) - cerebral circulation stimulant
- *Caragana’s semen extract* (Caseks®) - immunostimulant

### Compositae
- *Cacalia hastata* leaves phytofilm (Hastaplen®) – anti-pododontosis
- *Inula helenium* roots extract (Inuliun®) – antiinflammatory
- *Saussurea lappa* roots extract (Salalium®) – antiinflammatory

### Succulents
- *Callisia fragrans* shoot juice - immunostimulant
- *Aloe arborescent* leave juice - biostimulant

### Gentianaceae
- *Gentianopsis barbata* herb extract (Gebahept®), *Halenia corniculata* herb extract (Hacohept®), - hepatoprotective
• Remedies developed by the Department of Biologically Active Substances
The patents (licenses)
Future plans:

- Translation into Russian of other valuable treatises of Tibetan medicine;
- Elaboration and development of new effective biotechnology methods;
- Integration of Tibetan medical tradition with achievements of modern medical and pharmaceutical sciences.
Questions?