Mesotherapy and Injection Lipolysis Pharmacology

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Mesotherapy

- From Greek mesos, “middle”, and therapy from Greek therapeia, “to treat medically”
- Non-surgical cosmetic medicine treatment
- Mesotherapy employs the technique of multiple injections of pharmaceutical and homeopathic medications, plant extracts, vitamins, and other ingredients into the subcutaneous fat
Mesotherapy (Dr. Pistor)

- Mesotherapy is an allopatic, light parenteral, polyvalent, and regionalized medicine
  - Allopatic: medications used form part of official pharmacological range
  - Light: doses used are low compared to traditional medicine
  - Parenteral: intradermic or subcutaneous injections are performed with active drugs while using procaine as a vehicle
  - Polyvalent: efficacy in multiple diseases
  - Regionalized: performed in vicinity of disease/condition

History of Mesotherapy

- 1845: Dr. Francis Rynd, inventor of the hypodermic needle and syringe, injected sedatives subcutaneously to treat neuralgia
- 1916: Dr. Rene Leriche injected intradermal procaine into stellate ganglion and in painful tendons
- 1947: Dr. Ana Aslan introduced the use of procaine in geriatric patients

History of Mesotherapy: Contributions of Dr. Michel Pistor

- 1948-1950: Performed multiple local infiltrations of procaine for pain
- 1952-1953: Gave IV injection to patient with shortness of breath. Saw no change in condition, however patient’s hearing improved. Decided to inject procaine locally into the dermis and around the patient’s ear. These injections worked better than systemic administration of medications. Many deaf people sought out Dr. Pistor to receive this new treatment, which did not alleviate the deafness. However, secondary problems like tinnitus and TMJ were resolved.
History of Mesotherapy

• 1958: French press suggested the name Mesoterapié for this new discovery
• 1961: Dr. Pistor’s first book, “La Mesotherapie” is published. Dr. Robert Wallace introduces Mesotherapy in the United States
• 1976: First International Mesotherapy Congress

History of Mesotherapy

• 1987: French Academy of Medicine gives formal recognition to the specialty
• 1987: Dr. Pistor resigns as President of the French Society of Mesotherapie
• 1995: Dr. Frank Greenway and George Bray published landmark article “Topical Fat Reduction” Authors unknowingly performed mesotherapy for weight loss. Their work is the standard on which many mesotherapy formulas for weight loss and cellulite are derived.

What is Mesotherapy?

Mesotherapy is a medical specialty not only used to treat cellulite and weight loss...
**Mesotherapy Treats a Variety of Conditions**

**Sports Injuries:**
- Arthropathy
- Barre-Lieou Syndrome
- Chronic Joint Swelling
- Ligament Strain
- Meniscal Tear
- Muscular Bruises
- Overuse Injuries
- Plantar Fasciitis
- Shin Splints
- Stress Fractures
- Tendon Calcifications
- Tendon Degeneration
- Tendon Strain

**Mesotherapy Treats a Variety of Conditions**

**Skin Conditions:**
- Acne
- Alopecia
- Cellulite
- Contusions
- Eczema
- Hair Loss
- Herpes Infection
- Hypertrophic Scars
- Lipodystrophy
- Psoriasis
- Scar Disorders
- Sun Damaged Skin
- Telangiectasias
- Venous Insufficiency
- Vitiligo
- Wrinkles

**How is Mesotherapy Administered?**

- Inject medications at the site of the problem
- Inject medications into the skin
- Inject small doses
**Mesotherapy vs. Oral/IV Method**

- Medication takes up to seven days in order to clear the body
- Mesotherapy injects small doses at the site of the problem
- Rare occurrence of systemic side effects or drug interactions
- May have short half-lives
- Large dosing, and does not guarantee medication gets to target tissue and may have systemic side effects
- May require other medication to counter side effects
- May have drug-drug interaction

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**Mesotherapy Medications**

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**Mesotherapy Medications**

- Aminophylline
- T3-T4 Thyroid
- Isoproterenol
- Pentoxifylline
- L-carnitine
- Hyaluronidase
- Yohimbine
- Glutathione
- Multiple Vitamins
- Trace Minerals
- Alpha Lipoic Acid
- Vitamin C
- Procaine
- Lidocaine
- Mellotus
- Cynara Scydomus
- Caffeine
- Dihydroergotamine
- Ethamylate
- Ginkgo Biloba
**Aminophylline**

- Bronchodilator
- Used to treat asthma
- Methylxanthine inhibits PDE→cAMP
- Induces diuresis by unknown mechanism
- Alpha antagonist: blocks lipogenesis, induces indirect lipolysis

**Aminophylline**

- Used in mesotherapy for fat reduction and cellulite
- Side effects
  - Tachycardia
  - Nausea
  - Vomiting
  - Headache
  - Elevated BP

**Caffeine**

- CNS Stimulant, methylxanthine
- Indicated for fatigue
- Used in mesotherapy for fat reduction & cellulite
- Mechanism of action: CNS stimulant
- Side effects
  - Insomnia
  - Gastrointestinal irritation
**Caffeine**
- Causes increase in intracellular concentration of cyclic AMP
- Immediate consequences in lipid metabolism of adipose tissue
- Blocks α-2 receptors

**Dihydroergotamine**
- Semisynthetic ergot alkaloid
- Used to treat acute migraine attacks and orthostatic hypotension
- Used in mesotherapy for cellulite (rarely used)

**Dihydroergotamine**
- Selective vasoconstrictive effect on veins and venules, accelerating venous return from lower extremities
- Adverse reactions: vascular spasm, transient tachycardia, hyper/hypotension
**Pure Isoproterenol**

- Non-selective beta agonist
- Increases cAMP
- Increases vasodilation
- Short half-life (3-4 minutes)
- Side effects: tachycardia, elevated BP

**Dilute Isoproterenol**

- Beta adrenergic agonist
- Used to treat asthma
- Used for fat reduction in mesotherapy
- Increases cAMP and vasodilation
- Does not increase heart rate or BP

**Melilotus**

- Homeopathic sweet clover extract
- Used for lymphatic or venous pathology
- Potentiates the effect of aminophylline
- Anti-spasmodic on smooth muscle of lymphatic system and capillaries
- Reduces capillary permeability
**Ethamsylate**

- Systemic hemostatic agent
- Indications: neonatal periventricular hemorrhage prophylaxis
- Used for fat reduction and cellulite (rarely used)

**Ethamsylate**

- Mechanism of action:
  - Reinforcement of capillary wall
  - Antihyaluronidase activity
- Side effects:
  - Nausea
  - Abdominal discomfort
  - Headache

**Ginkgo Biloba**

- Herb, botanical
- Indications:
  - ↑ cerebral blood flow
  - Improve cognition
  - Metastatic colorectal cancer
- Used for cellulite in mesotherapy for tissue regeneration
Ginkgo Biloba

- Mechanism of Action:
  - Antioxidant and free radical scavenging properties
  - Reduce cell membrane lipid peroxidation
- Adverse reactions
  - GI upset
  - Headache
  - Palpitations

L-Carnitine

- Amino acid synthesized from lysine and methionine
- Cofactor in fatty acid metabolism
- Improves beta oxidation of lipids to free fatty acids
- Transports long chain fatty acids into mitochondria

Yohimbine

- Homeopathic oral aphrodisiac found in inner tree bark of S. African tree
- Alpha antagonist
- Used in mesotherapy to treat cellulite
- Side effects: tachycardia, tremor, nausea, elevated BP
- Do not use in patients with Mitral valve prolapse
**Pentoxifylline**

- Xanthine derivative
- Used to manage sickle cell anemia, intermittent claudication from obstructed arteries
- PDE 4 inhibitor increasing intracellular cAMP and stimulating PKA activity

**Pentoxifylline**

- Decreases blood viscosity
- Increases red blood cell flexibility
- Enhances microcirculation
- Side effects: hypotension, bruising, dizziness, itching, swelling

**Hyaluronidase**

- Proteolytic enzyme for connective tissue
- Decreases viscosity of hyaluronic acid, tissue permeability
- Allergy test with 0.05 ml SQ
- Reaction is pruritic wheal/flare
- Reaction can be acute or delayed
**Procaine 1-2%**

- Local anesthetic
- Used for fat reduction and cellulite
- Prevents initiation and transmission of nerve impulses
- Facilitates diffusion
- Side effects: anaphylaxis (very rare)

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**Cynara Scylomus 2%**

- Homeopathic artichoke extract
- Choleretic, antilipidemic, hepatoprotectant
- Indicated for dyspepsia, hyperlipidemia
- Used for cellulite in mesotherapy

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**Cynara Scylomus 2%**

- Mechanism of action:
  - Reduction of blood cholesterol levels
  - Hepatoprotectant
- Increases cAMP
- Promotes lymphatic drainage
- Has precipitated gall bladder spasm via smooth muscle contraction
Butcher’s Broom
(Ruscus Aculeatus)

- Potent venous vasoconstrictor and has ability to diminish edema
- Acts as a adrenergic receptor agonist of smooth muscle of veins, reducing vascular permeability
- Active ingredients: saponins, ruscogenin, neuroruscogenin

Indian or Horse Chestnut
(Aesculus Hippocastanum)

- Active ingredients in seeds and shells
  - Triterpenoid saponins
  - Escin and aesculin
  - Flavones
  - Coumarins
  - Tannins
- Anti-inflammatory and anti-edema properties

MesoGlow Medications
MesoGlow Medications

- Alpha hydroxy acid
- Alpha lipoic acid
- Amino acids
- Bioflavinoid
- Coenzyme Q
- DMAE
- Hyaluronic acid
- Lidocaine
- L-polylactic acid
- Magnesium
- Selenium
- Silica
- Vitamin A
- Vitamin B₁
- Vitamin B₂
- Vitamin B₃
- Vitamin B₅
- Vitamin C
- Vitamin D
- Vitamin E
- Zinc

Alpha Hydroxy Acid

- Carboxylic group with attached hydroxy group
- Examples: glycolic, lactic, citric
- Enhances epidermal turnover

Alpha Lipoic Acid

- Antioxidant
- Free radical scavenger
- Antioxidant recycler
**Amino Acids**

- Amine and carboxyl functional groups
- Increase cell turnover
- Protein building blocks

**Bioflavonoids**

- Anti-inflammatory
- Vascular protection

**Coenzyme Q_{10}**

- Antioxidant
- Wound healing
- Generates ATP
- Decreases peroxidation
**Dimethylaminoethanol (DMAE)**
- Reduce fine lines and wrinkles
- Improve skin firmness
- Reduce sagging skin
- Free radical scavenger

**Hyaluronic Acid**
- Component of extracellular matrix
- Increases tissue moisture and hydration
- Free radical scavenger

**Lidocaine**
- Vasodilator
- Anesthetic
**Poly L Lactic Acid**

- Attracts water
- Supports tissue healing
- Increases epidermal thickness and elasticity

**Magnesium**

- Catalyst for enzymes utilizing ATP
- DNA synthesis
- RNA synthesis
- Stabilizes cell membranes

**Selenium**

- Cofactor for reduction of antioxidant enzymes
- Cofactor for thyroid hormone deiodinases
- Antioxidant properties
- Slows aging processes
Silica

- Maintenance of extracellular matrix
- Helps cross-linking of collagen fibers

Vitamin A

- Antioxidant
- Induces epidermal thickening
- Improves photodamage
- Reduces wrinkling
- Decreases skin laxity

Vitamin B₁ (Thiamine)

- Carbohydrate metabolism
- Proper function of nerve and muscle tissue
**Vitamin B₂ (Riboflavin)**
- Emollient
- Essential to healthy skin

**Vitamin B₃ (Niacin)**
- Antihyperlipidemic
- Detoxifier

**Vitamin B₅ (Panthenol)**
- Humectant
- Emollient
- Moisturizer
**Vitamin B₆ (Pyridoxine hydrochloride)**
- Amino acid metabolism
- Fat metabolism
- Reaction releasing glucose from glycogen

**Vitamin C (L-Ascorbate)**
- Stimulates collagen synthesis and repair

**Vitamin D (Cholecalciferol)**
- Lubricant
- Healing properties
**Vitamin E (Tocopherol)**

- Antioxidant
- Reduces post UV exposure
- Erythema
- Edema
- Maintains tissue integrity by fighting peroxide formation

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**Zinc**

- Antioxidant
- Antibacterial
- Astringent
- Skin conditioner
- Skin protectant

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**Injection Lipolysis Medications**
**Injection Lipolysis**
- Injection into adipose tissue of phosphatidylcholine to dissolve fat
- Reduction of localized subcutaneous fat deposits, destruction of subcutaneous adipocytes and stimulation of neocollagenesis

**Lipolysis**
- Hydrolysis and degradation of lipids into fatty acid and glycerol building blocks
- Occurs within adipocytes or within vascular space of muscle and fat
- Governed by hormone sensitive lipase (HSL) and lipoprotein lipase (LPL)

**HSL**
- Expressed in adipose tissue
- Activated by cortisone and catecholamines
- Inhibited by insulin
**LPL**

- Located in endothelial walls of capillaries
- Responsible for chylomicron and very low-density lipoprotein breakdown

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**Injection Lipolysis Medications**

- Phosphatidylcholine
- Deoxycholate
- Benzoyl Alcohol
- Saline

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**Phosphatidylcholine (PPC)**

- Phospholipid comprising 40% of cell membrane
- Composed of choline, phosphate, and 2 fatty acids
- One end polar; one end nonpolar
**Phosphatidylcholine**

- Major constituent of bile
- Emulsifies fat
- Naturally occurring phospholipid and surfactant
- Up-regulates alpha and beta receptors
- Functions include fluidization of cell membrane, signal transduction within cell, and formation of cellular energy
- Precursor to acetylcholine

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**Phosphatidylcholine**

- Oral/intravenous administration
  - Reduces serum triglycerides and LDL cholesterol
  - Increases HDL cholesterol
  - Induces hepatic collagenase
  - Protects against mitochondrial oxidation
  - Restores damaged cellular phospholipids, reducing liver fibrosis and fat accumulation

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**Phosphatidylcholine**

- Side effects
  - Redness
  - Burning
  - Itching
  - Swelling
  - Soreness
  - SQ nodules
Deoxycholate

- Bile acid
- Detergent effect in emulsifying fats in diet for absorption in the small intestine
- Used to improve water solubility of phosphatidylcholine

Mechanism of Action

- Phosphatidylcholine and deoxycholate act as detergents
- Cell wall disruption
- Apoptosis of adipocyte
- Enzymatic and lipoprotein transport of triglycerides and fatty acids out of adipocyte
- New collagen formation in basal dermis and subdermal plane
- Results in skin retraction