

Pharmaceutics I

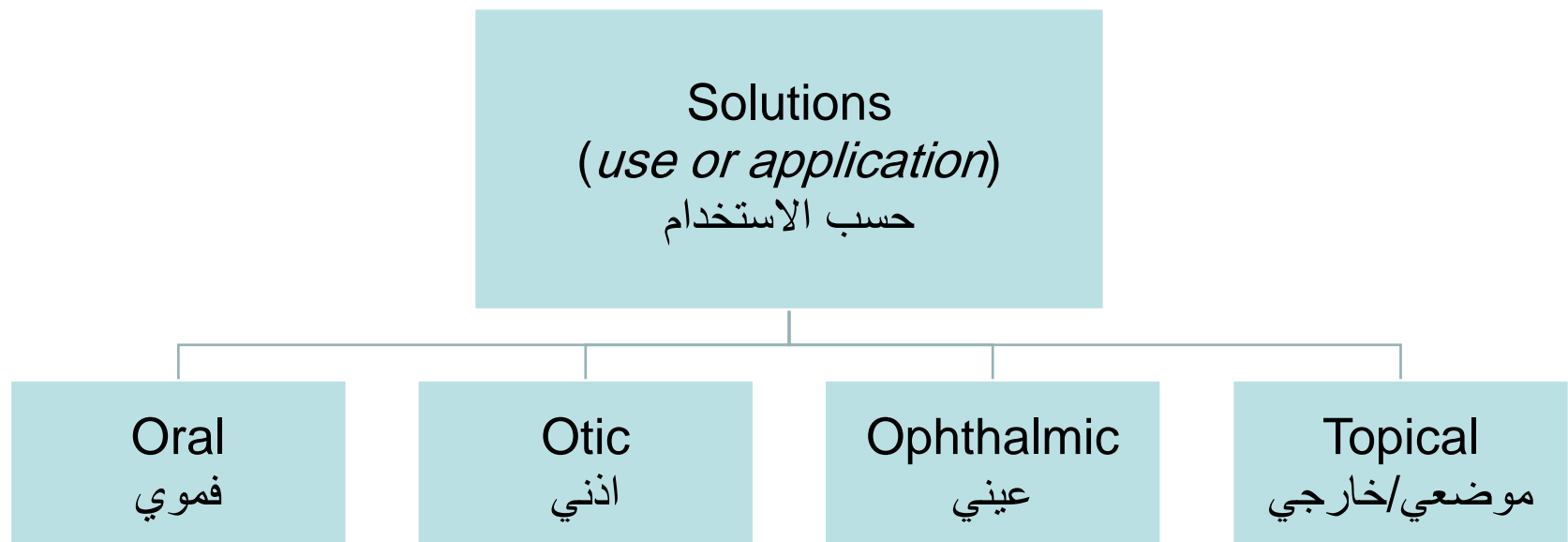
صيدلانيات ١

Solutions

المحاليل

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- In pharmaceutical terms, **solutions** are: liquid preparations (مستحضرات/تركيبات سائلة) that contain one or more chemical substances dissolved (مذابة) in a suitable liquid or mixture of mutually miscible liquids (مزيج من المذيبات المذوبة بشكل متبادل).



Solutions
(*composition*)
حسب التركيبة

Aqueous
مائي

Syrup
الشرابات
المحلاة

Elixir
الأكاسير

Spirit
الارواح

Tincture
الصبغات

- Advantage of oral solutions (aqueous, syrups, spirits, and tinctures) when intended for systemic effects (تأثيرات جهازية / غير موضعية) is:

⇒the solution form means the drug is soluble in aqueous systems (such as GIT fluid سائل القناة الهضمية) and the absorption (الامتصاص) from the GIT into the systemic circulation (الدورة الدموية) may be expected to be more rapid than from suspensions (المعلقات) or solid dosage forms (الاشكال الجرعية الصلبة) of the same medicinal agent (المادة الدوائية)why?

- Composition of solutions: solvent مذيب + medicinal agent + additives مواد مضافة .

- Additives include:
 - Colorants ملونات
 - Sweeteners محليات
 - Stabilizers مثبتات
 - flavoring agents منكهات
 - Preservatives مواد حافظة

- The formulation problem مشكلة تحضير المحاليل : whether it contains single solute or multiple solute solutions
 - Solubility: الذائبية
 - Stability: chemical and physical stability الثباتية الكيميائية و الفيزيائية

Solubility

- Definition: the solubility of substance is the maximum concentration (اعلى تركيز) to which solution may be prepared (مذيب) with that substance in a particular solvent (يمكن تحضيره) (محلول مشبع) at a given temperature \Rightarrow saturated solution (معين)
- Solution theory : cohesive versus adhesive forces.
- Examples: at 25 °C,
 - Calcium hydroxide: 140 mg per 100 ml purified water
 - Potassium iodide: 100 g per 100 ml purified water (700 times more)

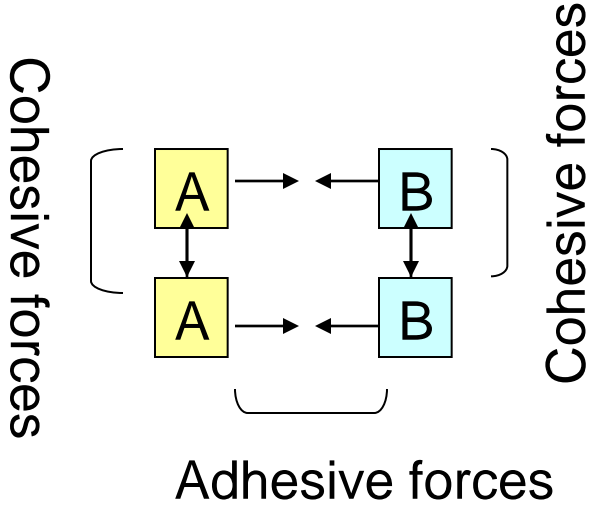
Intermolecular forces
القوى بين الجزيئات

Attraction
تجاذب

Repulsion
تنافر

Cohesion

Adhesive

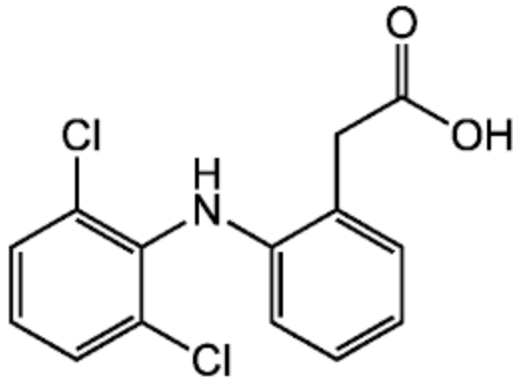


■ العوامل المؤثرة على الذائبية

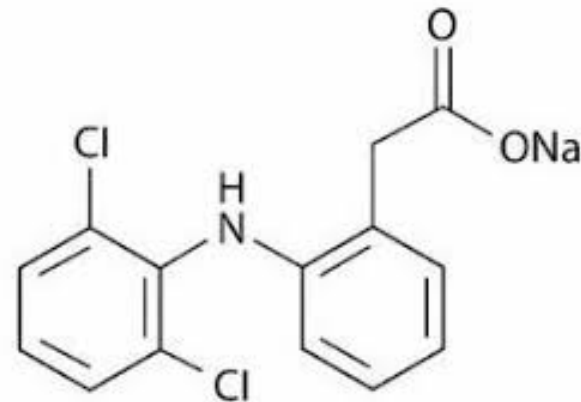
على الذائبية:

1. التركيب الكيميائي للمذاب
Chemical constitution of the solute

- الشكل الحر: free from
- الشكل الملحي: salt from



Diclofenac acid



Diclofenac sodium

1. pH of solution: درجة الحمضية
2. Additives: complexation agent العوامل المشكلة للمعقدات
 - Iodine solubility = 1 g/ 3000 ml water, maximum possible concentration = 0.03 %. In the presence of KI or NaI, water soluble complex will form and iodine topical solution of concentration up to 2.4 % can be prepared.
3. Temperature: if the compound has
 - Positive heat of solution حرارة ايجابية للمحلول :
↑ temperature ⇒ solubility ↑
 - Negative heat of solution حرارة سلبية للمحلول :
↑ temperature ⇒ solubility ↓

- How do we express solubility? In pharmaceutical practice it is expressed as grams of solute dissolving in milliliters of solvent, e.g., 1 g of sodium chloride in 2.8 ml of water.

Descriptive solubility terms according to USP

Descriptive term	الوصف	Parts of solvents required for 1 part of solute
Very soluble	ذواب جدا	< 1
Freely soluble	ذواب بشكل حر	1 – 10
Soluble	ذواب	10 – 30
Sparingly soluble	ذواب بشكل ضئيل	30 – 100
Slightly soluble	ذواب بشكل طفيف	100 – 1000
Very Slightly soluble	ذواب بشكل طفيف جدا	1000 – 10,000
Insoluble	غير ذواب	> 10,000

- Dissolution (the rate of solution/ سرعة الذوبان): the speed at which a compound dissolves.
- the Noyes-Whitney model

$$\frac{dM}{dt} = \frac{DA}{h} (C_s - C_b)$$

$$\frac{dM}{dt} = \frac{DA}{h} (C_s - C)$$

Where

- dM/dt : the rate of increase of the amount of material in solution dissolving from a solid.
- C_s : the saturation solubility of the drug in solution in the diffusion layer
- C : the concentration of the drug in the bulk solution.
- A : the area of the solid particles exposed to the solvent
- h : the thickness of the diffusion layer
- D : the diffusion coefficient of the dissolved solute

- All the following factors affect dissolution according to the Noyes-Whitney equation:
 - Diffusion coefficient (معامل الانتشار) of the solute in solution.
 - Surface area (المساحة السطحية) of exposed solid : *Area* (*A*) is determined by particle size حجم الجسيمات.
 - \downarrow in particle size \Rightarrow \uparrow surface area, *A*
 - \uparrow surface area, *A* \Rightarrow \uparrow increases dissolution rate.
 - Thickness of diffusion layer: depend on the extent of agitation تعتمد على سرعة التحريك.
 - Solubility of the drug.

- Effects of chemical constitution of the solute (free from versus salt) and pH on solubility:

⇒ most of medicinal agents are either

- weak acids *احماض ضعيفة*
- weak bases *اسس/قلويات ضعيفة*

Example of weak bases:

- Alkaloids: morphine, atropine and codeine.
- Antihistamines: diphenylhydramine and triproleamine
- Local anesthetics: cocaine, procaine and tetracaine.

⇒ Soluble in diluted acidic solutions *تذوب اكثر في المحاليل الحامضية المخففة*

Examples of weak acids

- Barbiturates: phenobarbital.
- Sulfonamides: sulfadiazine and sulfacetamide

⇒ Soluble in diluted basic solutions تذوب اكثر
في المحاليل القلوية المخففة

- For such drug, the salt form might prove more advantageous than the original free form.

Water and alcohol solubility of some weak acids and bases and their salts.

drug	ml of solvent to dissolve 1 g of drug	
	Water	alcohol
Atropine	455	2
Atropine sulfate	0.5	5
Codeine	120	2
Codeine sulfate	30	1,280
Codeine phosphate	2.5	325
Morphine	5,000	210
Morphine sulfate	16	565
Sulfadiazine	13,000	Sparingly soluble
Sodium sulfadiazine	2	Slightly soluble

Solvents for Liquid Preparations

- For oral, ophthalmic or parenteral solutions: water is the solvent of choice.
- Auxiliary solvents مذيبات مساعدة may be used to augment the solvent action مفعول المذيب of water or to contribute يساهم to the product's chemical or physical stability.
- Most widely used auxiliary solvents: alcohol, glycerin, propylene glycol
- Acetone, ethyloxiide (ether) and isopropyl alcohol are excellent solvents for organic compounds but they are very toxic عالية السمية and can't be used to prepare pharmaceutical dosage forms.

➤ Alcohol USP

- Other names: ethyl alcohol, ethanol, C_2H_5OH
- The second most useful solvent in pharmacy.
- Water + alcohol \Rightarrow hydroalcoholic mixture مزيج مائي كحولي
- Alcohol USP is 94.9 to 96 % (v/v) C_2H_5OH in water.
- Dehydrated alcohol USP الكحول منزوع الماء/الجاف contains > 99.5 C_2H_5OH by volume (water-free alcohol).
- Characteristics of alcohol as a solvent:
 1. Ability to dissolve many water-insoluble drugs and additives
 2. Water miscibility قابل للمزج بالماء
- In united states: FDA regulation states that alcohol in OTC products should be less than 0.5 % in children less than 6 years. And less than 5 % for those between 6-12 and 10% for adults.

➤ Diluted alcohol, NF.

- Prepared by mixing equal volumes of alcohol USP and purified water.
- However, the final volume of the mixture is not the sum of the individual volumes **مجموع** of the components **المكونات** **...why?** **الاحجام** **الافرادية** Because the liquid contracts upon mixing **بسبب تقلص السوائل بعد المزج**
- The final volume is always 3 % less than what otherwise expected.
- Example: if you mix 50 ml alcohol USP and 50 ml water ⇒ the final volume will be 97 ml.
- For that reason the strength of diluted alcohol NF is 49 % (slightly greater than what is expected).

➤ Rubbing alcohol كحول الدعك

- Contains 70 % ethyl alcohol by volume. The remainder الباقي consist of water, denaturants مسمخات with or without color additives, perfume oil زيت معطر and stabilizers.
- Denaturants: bitter substances مواد مرّة that prevent accidental عرضي or abusive مؤذي oral ingestion التناول الفموي .
- Example of denaturants:
 - Sucrose octa-benzoate: 355 mg per 100 ml solution.
 - Denatonium benzoate: 1.4 mg per 100 ml solution.
- Caution: volatile and flammable متطاير و قابل للاشتعال .
- Uses:
 - Rubefacient محمر للجلد .
 - Germicide for instruments مطهر .
 - Skin cleanser منظف للجلد prior to injection الحقن .

➤ Glycerin USP

- Other names: glycerol
- Characteristics:
 - Clear syrupy liquid سائل شرابي
 - Sweet taste حلو الطعم
 - Miscible with water and alcohol.
 - Good preservative qualities له خصائص كمادة حافظة .
- Glycerin is very viscous لزج and solutes will dissolve slowly unless it is rendered تم جعله less viscous by heating.
- Uses: can be used in internal preparation المستحضرات الداخلية
 - Stabilizer: by rendering the solution more viscous
 - Auxiliary solvent with water and alcohol.

➤ كحول الدعك الايزوبروبيلي Isopropyl rubbing alcohol

- Consist of 70 % by volume of isopropyl alcohol. The remainder consist of water, with or without color additives, perfume oil and stabilizers.
- Uses: use externally يستعمل خارجيا as:
 - Rubefacient ملطف احتكاك and soothing rub محمر
 - Vehicle for topical products سواغ للمستحضرات الموضعية
 - Disinfecting skin prior to injection مطهر/معقم للجلد
 - Disinfecting instruments, needles, syringes

➤ Propylene glycol USP

- Characteristics:
 - Viscous لزج
 - Miscible with water and alcohol
- Its frequently substituted for glycerin يستبدل الجليسيرين به in modern pharmaceutical formulation.

➤ Purified water, USP الماء المنقى

- Tap water (ماء الصنبور) : not suitable for pharmaceutical preparation
⇒ contains dissolved inorganic solids يحتوي مواد صلبة ذائبة غير عضوية , dissolved and un-dissolved organic matter, and microorganisms.
- If used in compounding pharmaceuticals it may lead to Chemical incompatibilities عدم التوافق الكيميائي between dissolved salts الاملاح .
المادة الدوائية and medicinal agent الذائبة .
- Signs of incompatibilities include:
 1. Precipitation الترسيب
 2. Discoloration زوال اللون
 3. Efferevesence الفوران
- what to use? Purified water USP.

▪ Methods of preparation of purified water USP:

1. Distillation method التقطير
2. Reverse osmosis التناضح العكسي
3. Ion exchange method تبادل الشوارد/الايونات

Advantages:

- No heat is needed
- more cost effective
- less complex and less maintenance effort
 - ease of operation سهل الاستعمال
 - available in lab scale موجود على نطاق صغير/مختبري

Composed of:

- a) Cation (acid-exchange) resin: removes cations from water
- b) Anion (base-exchange) resin: remove anions from water.

⇒ The water purified by ion exchange method is usually referred to as deionized and demineralized water ماء منزوع الشوارد او منزوع الاملاح

» Preparation of solutions:

- Fact: most of pharmaceutical solutions are unsaturated غير مشبعة with the solute (medicinal agent) ⇒ the amount dissolved is well below the capacity of the solvent الكمية المذابة اقل من قدرة المذيب على الاذابة

- Therefore, for extemporaneous compounding (التحضير الفوري) , solubility it is not usually an issue (ليست مشكلة) for the pharmacist. Instead, the dissolution could be problematic سرعة الذوبان قد تكون (المشكلة).
- Methods for enhancing the dissolution in extemporaneous compounding:
 1. Heating التسخين
 2. Particle size reduction تصغير حجم الجسيمات /الطحن
 3. Solubilizing agent مادة مذيية مساعدة على التذويب
 4. Vigorous agitation التحريك العنيف

» Preparation of oral solutions:

- Oral solutions usually contains, in addition to medicinal agent,
 - Colorants and flavorants: attractively and palatability. جذاب و سائغ
 - Stabilizers: maintain physical and/or chemical stability of medicinal agent and solution
 - Preservatives: prevent the growth of microorganisms تمنع نمو الميكروبات
- A common formulation issue is: the physical or chemical interaction التاخر الكيمياءى او الفيزياءى between the various components بين المكونات المختلفة leading to alteration تغير in the preparation's stability ثباتية المسحضر and/or potency تركيز/عيار المستحضر.

❖ Example of an compatibility issue is:

Parabens + flavoring oils:

- Parabens are preservatives made from esters of p-hydroxybenzoic acid :
 - Methyl paraben: methyl p-hydroxybenzoic acid
 - Ethyl paraben
 - Propyl paraben
 - Butyl paraben.
- Parabens have a tendency to partition (تنزع للتقاسم) into certain flavoring oils leading to drop (نقص) of paraben concentration in the aqueous medium (الوسط المائي) below the preservative level (تحت المستوى اللازم للتأثير الحافظ) ⇒ microorganism growth (نمو الميكروبات) .

- Common doses الجرعات المعتادة of liquid pharmaceuticals for oral administration:
 - 5 ml (teaspoonful)
 - 10 ml
 - 15 ml (tablespoonful)
- Few solutions has an exceptional (غير عادي) volume to be administered such as: magnesium citrate oral solution, USP. ⇒ adult dose = 200 ml.
- Some pediatric solutions محاليل الاطفال are given drop wise using a calibrated dropper قطارة معيرة

Dry mixtures for solutions

الامزجة الجافة للمحلول

- Composition: all the formulative components (جميع المكونات التركيبية) mentioned previously except the solvent (باستثناء المذيب). Available as dry powder (مسحوق جاف) or granules (حثيرات) for reconstitution (مقدار موصوف) with a prescribed amount (الحل/الاستنشاء) of purified water immediately before dispensing to the patient (قبل الصرف للمريض).
- Reason for using dry mixture for solutions: insufficient stability (ثباتية غير كافية) in aqueous environment of the medicinal agent to meet extended shelf life periods (فترة صلاحية / عمر تخزيني ممتد).

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- After reconstitution: stable for 7-14 days in the refrigerator (البراد) and should be discarded (ترمی) after that.

- Examples of commercial (تجاري) dry mixtures intended for reconstitution to oral solution:
 - Cloxacillin sodium: antibiotic.
 - Penicillin V potassium: antibiotic.
 - Potassium chloride (KCl): potassium supplement.

المحاليل الفموية Oral solutions

لدى ممارسة مهنة الصيدلة فان الصيدلاني يمكن ان يطلب منه:

- Dispense commercially prepared oral solutions صرف محلول فموي محضر تجاريا
- Dilute a concentrated solution (for pediatrics from an adult product) تخفيف محلول مركز للاطفال من منتج اصلا للبالغين
- Reconstitute dry powder mixture استنشاء/حل مزيج مسحوق جاف
- Extemporaneously compound an oral solution from bulk components تركيب اني/فوري لمحلول فموي من مكونات بحجم كبير

Oral solutions المحاليل الفموية

- Pharmacist responsibilities are to advice the patient about: مسؤولية الصيلااني ان ينصح المريض بما يتعلق:
 - Proper use الاستعمال الانسب : can it be mixed with juices, milk and other beverages (المشروبات الاخرى) عند administration (الاعطاء) or not.
 - Dose الجرعة
 - Method of administration طريقة الاعطاء
 - Storage of the product تخزين المنتج

Oral Rehydration Solutions

محاليل الاماهة الفموية

- Diarrhea الاسهال is a normal physiological body response (استجابة فيزيولوجية طبيعية) to rid itself ليخلص نفسه from toxic substances المواد السامة such as rotavirus or E coli.
- In diarrhea, the rapid fluid and electrolyte (sodium, potassium and bicarbonate) loss الفقد السريع للسائل و الكهارل can lead to dehydration الجفاف → acidosis الحماض and vomiting القيء → hypovolumic shock صدمة نقص حجم الدم و and ultimately death in some patients (mainly infants الرضع).
- The goal is not to stop diarrhea but to replace تعويض lost water and electrolyte with oral rehydration solutions.
- Oral rehydration solution are OTC بدون وصفة طبية .

➤ Oral Rehydration Solutions:

- Mechanism: Oral Rehydration Solutions contains glucose which is actively absorbed *يتمص بشكل فاعل* in the small intestine *الامعاء الدقيقة*. Glucose absorption is coupled *يترافق* with Sodium absorption. Sodium absorption promotes *يعزز* anions absorption, which in turn promotes water absorption.
- For maximum absorption to take place from an isotonic solution *محلول مساوي التوتر* you will need:
 - Glucose concentration = 60 mM
 - Sodium concentration = 110 mEq
- Bicarbonate and citrate ions are also included to help correct metabolic acidosis *تصحيح الحماض الاستقلابي*.

➤ Oral Rehydration Solutions:

- Typically, one liter of oral rehydration solution will contain: 45 mEq Sodium, 20 mEq potassium, 35 mEq chloride, 30 mEq citrate, and 25 g glucose.
- Available as liquid or powder packets for reconstitution.
- Important use considerations:
 - For powder forms, add the specific amount of water needed only.
 - Avoid mixing or giving with other electrolyte containing solutions such as: milk or fruit juices. تجنب مزجها مع محاليل اخرى محتوية على كهارل مثل الحليب او عصير الفاكهة

Magnesium Citrate Oral Solution

محلول سيترات المغنيسيوم الفموي

- Other names: citrate of magnesia.
- Characteristics الخصائص : colorless عديم اللون to slightly yellow اصفر خفيف , clear effervescent liquid سائل فوار صاف , sweet with acidulous taste مذاق حمضي and lemon flavor.
- Strength العيار : its required to have an amount of magnesium citrate equivalent to 1.55-1.9 g of magnesium oxide in each 100 ml.
- It's a carbonated solution محلول مكرين , i.e., contains dissolved carbon dioxide gas. Carbonation الكربنة can be achieved by adding potassium carbonate (usually in a tablet form) or using pressurized carbon dioxide.

Magnesium Citrate Oral Solution

- Require sterilization **تعقيم** during preparation as it provides an excellent medium **وسط ممتاز** for the growth of molds **العفن** .
- The solution comes usually in 300 ml bottle.
- Uses: saline laxative **مسهل ملحي** . may be used to treat occasional constipation, but it should not be used regularly for this purpose.
- Magnesium citrate should be taken with plenty **الكثير** of additional water. It usually takes only 30 minutes to 2 hours for magnesium citrate to work, so advice patients not to take it late in the day or at bedtime **وقت النوم** .

Sodium Citrate and citric Acid Solutions

محلول سيترات الصوديوم و حمض السيتريك الفموي

- The official solution **المحلول الدستوري** contains 100 mg of sodium citrate and 67 mg of citric acid in each milliliter of aqueous solution.
- Dose: 10-30 ml qid (اربع مرات يوميا)
- Use: systemic alkalinizer **مقلون جهازى** for patients for whom long-term maintenance **المحافظة طويلة الامد** of an alkaline urine **بول قلوي** is desirable **مرغوبة**, such those with uric acid and cystine calculi **الحصى السيستينية** of the urinary tract. Also as an adjuvant **مساعد** with uricosuric agents **المواد** in gout therapy **علاج النقرس**, since urates tend to crystallize out **التبلور** of an acidic urine.

الشرابات Syrups

- Definition: concentrated aqueous preparations مستحضرات/تركيبات مائية of sugar or sugar substitute بديل السكر with or without flavoring agent and medicinal substances. مركزة
 - When it lacks medicinal agents لا تحتوي على مواد دوائية , its referred to as non-medicated or flavored vehicle سواغات لادوائية او منكهة.
- ⇒ Examples:
- simple syrup (syrup NF): 85 % sucrose in purified water.
 - Cherry syrup شراب الكرز - Orange syrup شراب البرتقال
 - Cocoa syrup شراب الكاكاو - Raspberry syrup شراب الفراولة
- Use of non-medicated syrup: pleasant-tasting vehicle سواغات سائغة in extemporaneous compounding of medical syrups. المذاق

- Advantages:
 - Taste masking of disagreeable-tasting drugs
اخفاء طعم الادوية المرة/غير مقبولة المذاق
 - Provide a mean وسيلة for extemporaneous compounding of medications that comes in tablets and capsules for those who can't swallow بلع اللذين لا يستطيعون بلع such dosage forms.
 - Very appealing to children محببة للاطفال therefore, it useful for administration of medications to children.

- Components المكونات : in addition to purified water and medicinal agent, syrup contains:
 1. Sugar or sugar substitute: provide sweetness التحلية and viscosity اللزوجة
 2. Preservatives
 3. flavorants
 4. Colorants

It may also contain special solvents, solubilizing agents عوامل تذويب , thickeners رافعات / مثخنات and stabilizers. اللزوجة

- Sucrose is the most frequently employed sugar in syrup.
- Sucrose can be replaced **بشكل كلي** or in part **بشكل جزئي** by either:
 - Other glycogenetic substances **مواد جلايكوجينية** (materials that convert to glucose in the body **مواد منقلبة الى جلوكوز في الجسم**): Sorbitol, glycerin and propylene glycol.
 - Non-glycogenetic substances: methyl cellulose and hydroxyl ethylcellulose.
- Non-glycogenetic substances are not hydrolyzed nor absorbed in the body **لا تتحطم بوجود الماء ولا يتم امتصاصها**. They provide an excellent syrup-like vehicle **سواغ شبيه بالشراب** for administration of medication intended for diabetic patients **or those on controlled or restricted to non-glycogenetic diet** **مرضى السكري** . **حمية غير سكرية** .
- Such artificial syrups contain artificial sweetener **محلّيات صناعية** to produce similar syrup-like taste.

- All the aforementioned materials are intended to impart viscosity لاضفاء to the syrup.
- Mechanism of taste-masking effect of syrup:
 - Viscosity together with sweetness and flavorants are responsible for the taste-masking advantage of syrups.
 - When the syrup is swallowed, only a small portion قسما of the dissolved drug makes contact تلامس with the taste buds الحليمات الذوقية. The remainder القسم المتبقي just being carried past them يحمل متجاوزا الحليمات الذوقية and down the throat الحلق in the viscous syrup.
- In the antitussive مضاد السعال syrup preparations: the thick ثخين/الزج sweet syrup will also have a soothing effect تأثير ملطف on the irritated tissues الانسجة المتهيجة of the throat as it passes over them.

- Most syrups contain 60-80 % w/v of sucrose:
 - Desirable sweetness and viscosity *الحلاة و اللزوجة المطلوبة*
 - Stability: resistance to microbial and mold growth.
- In theory, syrup NF (85 % w/v sucrose) requires no preservatives. However, preservatives are added when syrup is intended to be stored.
- The inherent stability *الثبات المتأصل* of syrup is due to the unavailability of water *عدم وجود الماء* required for microorganisms growth.

- Specific gravity of syrup = 1.313 (each 100 ml weighs 131.3 g. Since syrup NF is 85 % w/v sucrose,
 $\Rightarrow 131.3 - 85 = 46.3 \text{ g water}$
 In other words, 46.3 g of water are being used to dissolve 85 g of sucrose.
- Solubility of sucrose in water is: 1 g in 0.5 ml. therefore, to dissolve 85 g of sucrose you will need 42.5 ml of purified water.
 $\Rightarrow \text{Excess water} = 46.3 - 42.5$
 $= 3.8 \text{ ml per } 100 \text{ ml of syrup.}$
- Saturated syrups are not recommended since some sucrose might crystallize out at low temperatures which, acting as crystallization nuclei نواة , will result in separation of a considerable amount of sucrose from the syrup solution \Rightarrow this will dilute the syrup resulting in susceptibility for microorganism growth.

Example formula:

substance	Quantity
Chlorpheniramine maleate	0.4
Glycerin	25.0
Syrup	83.0
Sorbitol solution	282.0
Sodium benzoate	1.0
Alcohol	60.0
Color and flavor	q.s
Purified water, to make	1000.0

Sorbitol solution, USP is 64 % w/v sorbitol
in purified water

➤ Antimicrobial preservatives:

- How much preservative do we need to protect a syrup against microbial contamination? It depends on:
 - The proportion of water available to growth نسبة الماء المتوفر لنمو الميكروبات
 - The nature and inherent preservative activity طبيعة و فعالية الحافظ المتأصلة of some formulative materials (e.g. flavoring oils, glycerin and alcohol)
 - The inherent capability of the preservative itself مقدرة الحافظ نفسه.
- Preservation of syrups:
 - Maintaining a high concentration of sucrose.
 - Storage at low temperature.
 - Adding preservative

- However, the first two options are not pharmaceutically practical and the need for adequate preservation is obvious.
- Example of preservatives:
 - Benzoic acid: 0.1- 0.2 %
 - Sodium benzoate: 0.1- 0.2 %
 - Combination of parabens: 0.1 %
- Note: alcohol is usually employed in syrups to aid in dissolving poorly soluble ingredients. However, its not present in the final product at amounts that offers full preservation (15 – 20 %).

➤ Flavorants:

- Uses: to render the syrup pleasant tasting.
- Either synthetic مصنعة/مخلقة or natural materials مواد طبيعية.
- Examples:
 - Volatile oils
 - Vanillin
- Requirements:
 - Water solubility
 - Compatibility with other formulation ingredients.

➤ Colorants:

- Uses: to enhance the appeal of the syrup تحسين مظهر الشراب.
- It should correlate يجب ان تتناسب with the used flavorants, e.g. green with mint and brown with chocolate.
- Requirements:
 - Water solubility
 - Compatibility with other formulation ingredients
 - pH - color stability ثباتية اللون
 - Light – color stability

➤ Preparation of syrups:

1. Solution with the aid of heat مساعدة الحرارة
2. Solution with agitation without the aid of heat التحريك دون استعمال الحرارة
3. Addition of sucrose to a medicated liquid or a flavored liquid اضافة السكر لسائل دوائي او سائل منكه محضر مسبقا
4. Percolation التزحيل لكل من مصدر المادة الدوائية و السكر

1. Solution with the aid of heat

- Quick
- Volatile substances (المواد الطيارة alcohol, flavoring oils) or thermo-sensitive substances (المواد المتخربة بالحرارة) may be added after cooling of the hot solution.
- Over heating will result in formation of inverted sugar (السكر المقلوب) ⇒ altered (sweeter) taste, darker color and more susceptible for microorganism growth.
- Excess over-heating will result in caramelization (الشرابات المفككة اكثر قابلية للتخمر و نمو المايكروبات ⇒ الكرملة)

2. Solution with agitation without the aid of heat:
- Advantage: maximum stability as it avoids heat conversion of sucrose.
 - Time consuming.
-
- Note: when simple or non-medicated syrup are employed as a sweetening and a vehicle, its better to dissolve solid materials in minimal amount of purified water first, then add the resulting solution to syrup...why?
 - the viscous nature of the syrup does not permit enough distribution of the solid material throughout the available water in the syrup.
 - limited amount of available water in concentrated syrup.

3. Addition of sucrose to a medicated liquid or flavored liquid
- Examples of medicated or flavored liquids: tinctures and fluid extracts.
 - Add sucrose to the aqueous solution to make a syrup.

4. Percolation:

- a) Sucrose may be percolated to form the syrup.
- b) The medicinal agent may be percolated to form an extractive to which sucrose or syrup may be added.

⇒ Example: Ipecac syrup.

Elixirs الاكاسير

- Elixirs: sweetened hydroalcoholic solutions محاليل كحولية مائية intended for oral use and are usually flavored to enhance their palatability لتحسين استساغتها.
 - Non-medicated
 - Medicated
- Elixirs versus syrups:
 - elixirs are less sweet and less viscous → less effective in taste masking of medicinal substances.
 - Elixirs possess improved solvent capacity قدرة تذويب احسن : the hydroalcoholic nature makes elixirs better in maintaining both, the water-soluble and alcohol-soluble components in solution.

- How much alcohol is present in elixirs?

⇒ It varies widely تتنوع/تختلف بشكل واسع depending on 1) the intrinsic solubility الخصائص الذوبانية of the individual components in water an alcohol as well as 2) the presence of adjuvant solvents.

⇒ If the compound has poor water solubility, more alcohol will be required to prepare the elixir.

- Elixirs can be sweetened with sucrose syrup, sorbitol, glycerin and/or artificial sweeteners.
- Sucrose is slightly soluble in alcohol ⇒ artificial sweeteners can be advantageous in sweetening of elixirs having high alcohol content as only a small amount will be required.

- Advantages of elixirs:
 1. Convenient dosing اعطاء جرعة مناسبة : The patient receives the usual adult dose of the drug in quantities of 5-10 ml rather than large quantities required for aqueous solutions of the same medicinal agent.
 2. Flexibility and ease مرونة و سهولة of dosage administration: for patients who have difficulty to swallow solid forms of the medicinal agent.

- Disadvantages:
 1. Alcoholic content: not suitable for children.

- Preparation of elixirs:

There are two ways to prepare elixirs:

- Simple solution with agitation
- Admixture مزج of two or more liquid ingredients: involves two steps,
 1. alcohol-soluble and water-soluble components are dissolved in their corresponding solvents تذويب المكونات الذوابة في الكحول و الذوابة في الماء بشكل منفصل.
 2. The aqueous solution is added to the alcoholic solution, rather than the reverse, to maintain the highest possible alcoholic strength للحفاظ على اعلى كحولية at all times to avoid separation (precipitation ترسيب) of the alcohol-soluble component.

➤ Examples of medicated elixirs:

1. Diphenhydramine HCL: antihistamine.
2. Digoxin elixir: cardiotoxic.
3. Phenobarbital elixir: sedative, hypnotic.

substance	Quantity
Phenobarbital	4.00 g
Orange oil	0.25 ml
Propylene glycol	100.00 ml
Alcohol	200.00 ml
Sorbitol solution	600.00 ml
Color	q.s
Purified water, to make	1000.00 ml

Tinctures الصبغات

- Tinctures: alcoholic or hydroalcoholic solution prepared from vegetable material مواد نباتية or from chemical substance مواد كيميائية.
- Examples: Iodine and thimerosal tinctures.
- Alcohol content: ranging from 15 - 80 %.
- Advantages of the high alcohol content:
 - Maintain solubility of formulation ingredients. يحافظ على ذوبانية المكونات الداخلة في التركيبة
 - Protection against microbial contamination. الحماية من التلوث الميكروبي

■ Special Considerations:

- Avoid mixing with liquids too diverse in solvent character, e.g. water
تجنب مزجها مع سوائل مختلفة كثيرا بخاصية المذيب مثل الماء
⇒ precipitation of ingredients upon addition of water.
- The bottle should be always tightly stoppered
تسد باحكام and not exposed to excessive temperature
لا تتعرض لدرجات حرارة عالية.
- Use amber glass bottles
قناني مقاومة للضوء to protect against photochemical degradation
التحطم الكيميائي الضوئي of tincture ingredients.
- As most tinctures are not intended for oral use, advice the patient for the proper use, e.g. topical use.

Topical Solutions and Tinctures

المحاليل و الصبغات الموضعية

- Sprays: تعرف البخاخات على انها محليل مائية او زيتية على شكل قطيرات او اجسام صلبة مطحونة بشكل ناعم و تستخدم coarse droplets خشنة للتطبيق موضعيا
- Usually applied to
 - Nasopharyngeal tract السبيل الانفي البلعومي
 - Intranasally: داخل الانف
 - Skin الجلد
- Intranasal sprays are used to relieve nasal congestion and inflammation . They usually contain: antihistamines, sympathomimetic agent and/or antibiotics.

- Advantages of intranasal sprays
 - Noninvasive غير الغزوية: لا داعي لجرح او اختراق الجلد
 - Ease of application سهولة الاستعمال / الاستخدام
 - Local as well as systemic delivery الحصول على تأثير محلي او جهازى
 - Insulin spray: withdrawn from the market
- Topical sprays: البخاخات الموضعية
 - Uses:
 - To treat sun and heat burns علاج حروق الشمس و الحرارة
 - local anesthetics مخدرات موضعية
 - Antiseptics مطهرات
 - skin protectants واقيات الجلد
 - Antipruritics مضادات الحكة

– Throat sprays البخاخات الحلقية

- Contains antiseptics deodorants and flavorings to treat

- Sore throat قرحة الحلق
- Halitosis : البخر او نتن النفس
- laryngitis: التهاب الحنجرة

– other uses of topical sprays that contain antifungals:

- Athlete's foot : مرض القدم الرياضي
- fungal infections: الامراض الفطرية

Example Topical Solutions and Tinctures

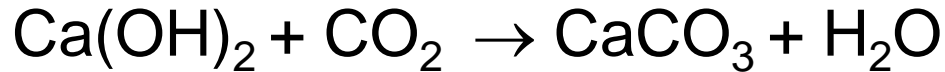
- **Aluminum acetate solution** (burow's solution).
 - Colorless عديم اللون solution with a faint acetous odor رائحة خل ضعيفة.
 - Application and use: first diluted with 10 to 40 parts of water then applied to the skin as an astringent wash غسل قابض or wet dressing ضماد رطب .
 - It is a common ingredient in dermatological lotions, creams and ointments.
 - Comes in solutions or as tablets and packets of powder to be prepared.

➤ **Calcium hydroxide topical solution** (limewater ماء الجير):

- Strength: must contain not less than 140 mg of Ca(OH)_2 in 100 ml of water (saturated solution).
- Ca(OH)_2 has a negative heat of solution.
- preparation:
 - to ensure saturation, add excess زيادة of Ca(OH)_2 , 300 mg, for each 100 ml to be prepared.
 - Agitate vigorously and repeatedly بشكل متكرر with the purified water for 1 hr.
 - Allow enough time for the excess of Ca(OH)_2 to settle down يترسب in the bottom of the container. Do not remove the excess of Ca(OH)_2 .

➤ **Calcium hydroxide topical solution** (limewater):

- Why the excess Ca(OH)_2 should not be removed from the preparation?



- CaCO_3 will also settle to the bottom of the container and its not distinguishable, by appearance, from Ca(OH)_2 .
- The Ca(OH)_2 dissolves as calcium is being removed from the solution the form of carbonate to maintain the saturation of the solution.

➤ **Calcium hydroxide topical solution** (limewater):

■ Special considerations:

- The solution should be tightly stoppered محكمة الاغلاق to prevent the absorption لمنع امتصاص of carbon dioxide .
- The solution should be kept in a cool place مكان بارد to maintain adequate concentration تركيز كاف of the dissolved solute.
- Only the clear supernatant should be dispensed.
يصرف فقط السائل الصافي الطافي

- Uses: $\text{Ca}(\text{OH})_2$ solution is categorized as astringent. its general employed in combination with other ingredients in dermatological solutions and lotions.

➤ **Coal Tar Topical Solution** (LCD solution)

المحلول الموضعي لقطران الفحم

- Composition: its an alcoholic solution containing
 - 20% coal tar
 - 5% polysorbate 80
- Characteristics: black viscous liquid having a characteristic naphthalene-like odor and a sharp, burning taste مذاق حاد حارق .
- Other names: liquor carbonis detergens , LCD.

➤ Coal Tar Topical Solution (LCD solution)

- The LCD solution is frequently mixed or diluted with aqueous preparation during extemporaneous compounding ⇒ Coal tar is slightly soluble in water which will lead to its separation from the solution... this is never happened due to the presence of 5% polysorbate 80
- Uses: local antieczematic. مضاد اكزيما موضعي
- Application: usually applied to the skin after dilution with 9 parts of water or after incorporation in lotions and ointments form.

➤ **Hydrogen Peroxide Topical Solution** المحلول الموضعي
لبيروكسيد الهيدروجين

- Composition: contains 2.5 to 3.5% (w/v) hydrogen peroxide, or H_2O_2 .
- Characteristics: clear, colorless liquid that might be odorless or have the odor of ozone.
- Stability:
 - it usually deteriorates upon long standing, forming water and oxygen. \Rightarrow require stabilizer (acetanilide) to retard decomposition.
 - Its light and heat sensitive حساس للضوء و الحرارة: store in a tightly closed, light-resistant bottle at temperatures not exceeding $35\text{ }^\circ\text{C}$

➤ Hydrogen Peroxide Topical Solution

- It is also decomposed **يتخرب او يتحطم** by practically all organic matter **المود العضوية** and reducing agents **العوامل المختزلة**. It reacts with oxidizing agents **يحرر/يطلق**, metals and alkalis to liberate **العوامل المؤكسدة** oxygen and water.
- Uses:
 - local anti-infective **مضاد عدوى موضعي**
 - The germicidal activity **الفعالية المبيدة للجراثيم** is based on the release of nascent oxygen **التماس** with the tissues. **الاكسجين الوليد** on contact
 - Wound cleanser **تنظيف الجروح**

➤ Chlorhexidine gluconate Solution

- Uses: broad spectrum antiseptic مطهر واسع الطيف in clinical and veterinarian medicine الطب السريري و البيطري . Its spectrum encompasses gram-positive and gram-negative bacteria, including *Pseudomonas aeruginosa*.

⇒ In concentrations of 4% it is used as:

- Surgical scrub منظف جراحي
- Hand wash غسول يدين
- Skin wound and general skin cleanser منظف لجروح الجلد و منظف عام للجلد

⇒ In concentration of 0.12%, its used as

- Antiplaque مضاد لالتهاب اللثة , antigingivitis مضاد تسوس , with antimicrobial activity mouth rinse مضمضة فموية .

➤ Chlorhexidine gluconate Solution

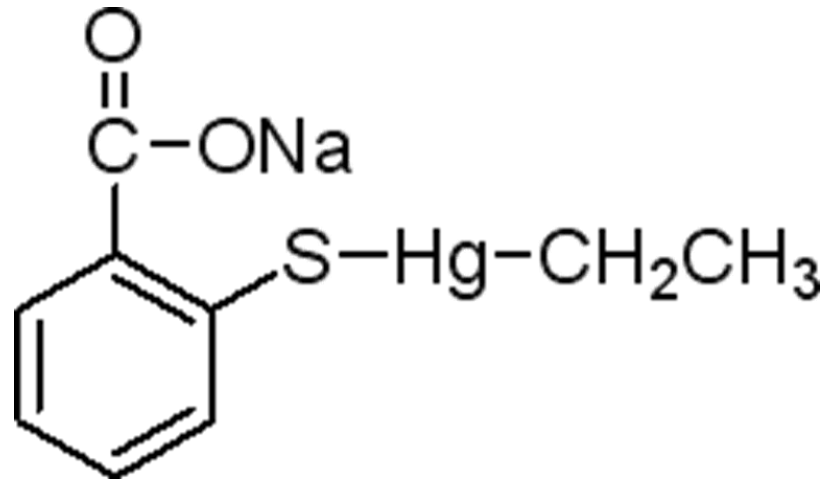
- As an oral rinse: it has been shown to reduce aerobic and anaerobic bacteria from 54 to 97 % after 6 months of use.
- Dose: 15 ml twice a day (morning and night) of undiluted solution that is used for 30 seconds then expectorated after rinsing.
- Side effects: formation of extrinsic yellow-brown stain بقع صفراء-بنية خارجية on the teeth and tongue after few days of use. The extent of stain will depend on chlorhexidine concentration and individual susceptibility. Tannin-containing substances such as tea and coffee, will increase the level of discoloration.
- Solution: maintain good dental hygiene الحفاظ على وسط فموي و اسنان صحية

➤ Povidone Iodine Topical Solution

- Composition: it's a complex **معقد** of iodine and polyvinylpyrrolidone that contain 10% of available iodine.
 - ⇒ M.Wt of PVP = 40,000 daltons
- Advantage of complex over solution: slow release **اطلاق بطيء** of iodine when applied to the skin.
- Uses: applied topically as an antiseptic

➤ Thimerosal Topical Solution

- Its is a water soluble organic mercury antibacterial agent
عامل مضاد للبكتيريا (قاتل للبكتيريا) من الزئبق العضوي و ذائب في الماء



- Composition:
 - 0.1% thimerosal
 - Ethylene diamine and sodium borate: to maintain alkalinity (pH 9.8 to 10.3) required for solution stability.
 - Monoethanolamine: as additional stabilizer

➤ Thimerosal Topical Solution

- Uses: antibacterial and mild antifungal,
 - Used to disinfect skin تطهير الجلد as an application to wounds الجروح and abrasions السحجات/الكشط .
 - Upon dilution (1:1500): can be applied to the eye, nose, throat and urethra.
 - Preservative in pharmaceutical preparations.
- Special consideration: the solution is light-sensitive and thus must be protected from light.

Vaginal and Rectal Solutions

المحاليل المهبلية و المستقيمية

- Vaginal douches الوابلات (الدش) المهبلية
- Use:
 - Mainly for their hygienic effect , e.g., irrigation cleansing of the vagina .
تأثيراتها المتعلقة بالنظافة بالانزافة للمهبل .
 - Some contain a therapeutic anti-infective agent for treatment of monilial and trichomonal infections.
- Might come as powder مسحوق or liquid concentrate مركزات سائلة .
 - Powder: dissolve in specific volume of water.
 - Liquid concentrate: add a prescribed amount of the concentrate (teaspoonful or capful) to a certain amount of water

➤ Vaginal douches

- Composition: among the components of the douche are the following:
 - Boric acid or sodium borate
 - Astringents: potassium, alum الشب , ammonium alum and zinc sulfate.
 - Antimicrobials: oxyquinoline, sulfate and povidone iodine
 - Quaternary ammonium compounds: benzethonium chloride
 - Detergents منظفات : sodium lauryl sulfate
 - Oxidizing agent عوامل مؤكسدة : sodium perborate
 - Salts: NaCl and sodium citrate
 - Aromatics عطريات : menthol, thymol, eucalyptol, methyl salicylate and phenol

➤ Evacuation Enema الحقن الشرجية للافراغ

- Uses: bowel cleansing تنظيف الامعاء
- Comes in a disposable (تستعمل مرة واحدة) plastic squeeze bottle (قوارير بلاستيكية قابلة للعصر) containing a pre-measured amount (مقدار مقاس مسبقا) of enema solution.
- Composition: the solution contains,
 - Sodium phosphate
 - Glycerin
 - Light mineral oil
 - Sodium biphosphate
 - Docusate sodium

➤ Evacuation Enema الحقن الشرجية للافراغ

- Considerations: the pharmacist should advice the patient
 - To insert the enema under steady pressure ان يدخل محتويات الحقنة الشرجية داخل المستقيم تحت ضغط ثابت
 - Its is not absolutely necessary to squeeze all of the contents out of the disposable bottle ليس من الضروري اطلاقا عصر كل المحتوى خارج القارورة البلاستيكية وحيدة الاستعمال
 - It takes 5- 10 minutes to work مفعول المنتج سيتم غالبا بعد ٥-١٠ دقائق

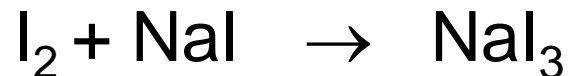
Topical Tinctures الصبغات الموضعية

1. Iodine tincture صبغة اليود
2. Compound benzoin tincture صبغة
البنزوين المركبة
3. Thimerosal tincture صبغة الثيومرسال

Topical Tinctures

➤ Iodine Tincture

- Preparation: التحضير
 - Dissolve 2% iodine crystals and 2.4% sodium iodide in alcohol
 - Qs (يخفف للحجم المطلوب) with purified water to produce 50% hydroalcoholic solution.



Qs: add sufficient quantity

- Formation of the complex had a dual function: ان تكون المعقد يؤدي مهمتان
 - Maintain the water solubility should the tincture be diluted with water. يحافظ على ذائبية اليود في الماء في حال ما تم تمديد/تخفيف المنتج بالماء
 - Prevent formation of ethyl iodide from the reaction between iodine and alcohol. يمنع تكون الايثيل الايودي من خلال التفاعل بين الايودين و الكحول (يمنع تخرب المنتج)

- Uses: local anti-infective مضاد عدوى موضعي.
 - يطبق على الجلد في حالات الاسعاف الاولي في المنازل
 - اللون ابني المحمر الذي يلطخ الجلد يفيد في توضيح نطاق التطبيق للصبغة على الجلد المصاب

- يجب حفظها في اوعية محكمة الاغلاق لمنع نقصان الكحول

➤ Compound benzoin tincture

- Preparation: by maceration (التعطين او النقع) in alcohol of
 - (اللبنان: نوع من صمغ الاشجار من فصيلة 10% benzoin معينة)
(معينة)
 - And Lesser amounts (و مقادير اقل) of
 - الصبار Aloe
 - Storax نوع اخر من انواع صمغ الشجر
 - Tolu balsam بلسم تولو (brownish, sticky, semisolid mass)

■ Uses:

1. Skin protectant **حامي/محصن للجلد**

- Bedsores **قرحات الفراش**
- Ulcers **القرحات (الجلدية)**
- Cracked nipples **تشقق الحلمات (عند المرضعات عادة)**
- Lips fissures **تشققات الشفاه**

2. Bronchitis **(التهابات القصبات)** and other respiratory conditions **الحالات التنفسية الأخرى**

- One teaspoonful is added to a pint **(مكيال يكافئ** of boiling water. The volatile components of the tincture travel with the steam vapor and being inhaled by the patient **يستنشق من قبل المريض**

Topical Oral (Dental) Solution

المحاليل الفموية (السنية) الموضعية

- There is a variety of medicinal substances that are employed topically in the mouth for a number of purposes and in a wide range of dosage forms:

1. benzocaine: topical anesthetic. مخدر موضعي

Temporary relief of pain, soreness, and irritation in the mouth associated with teething, orthodontic appliances, new or poorly fitted dentures, and canker sores

للتفريغ المؤقت للآلام و القرحات و التهيج المصاحب للسنين و جهائز تقويم الاسنان و البدلات السنية الجديدة او غير الملائمة بشكل جيد او القرحات الاكلة (في باطن الخد)

2. Lidocaine oral spray: dental anesthetic مخدر لاسنان
3. Camphorated parachlorophenol: dental anti-infective.
مضاد عدوى سني
- Eutectic liquid سائل يوتكتي/اصهري (65% camphor + 35% parachlorophenol).
 - Used for sterilization of deep root canals. يستخدم لتعقيم جذور (اقنية) الاسنان العميقة
4. Carbamide peroxide topical solution: dental anti-infective. مضاد عدوى سني يؤثر كعامل تنظيف كيميائي و ميكائينيكي من خلال اطلاق فقاعات الاوكسجين
- Commercial products usually contain 10% carbamide in flavored anhydrous glycerin

➤ Topical Oral (Dental) Solution

5. Cetylpyridinium chloride solution and lozenges (اقراص)

مضاد عدوى موضعي local anti-infective (مص)

Used primarily as a freshening mouth cleanser . Lozenges have benzyl alcohol as a local anesthetic مخدر تهدئة تهيجات in soothing throat irritations موضعي الحلق.

6. Erythrosine sodium topical solution and tablets:

مساعد تشخيصي (عامل كشف) diagnostic aid

Solutions applied to the teeth to reveal plaque left by inadequate brushing. Tablets are chewed for the same reason and should not be swallowed. لا يبلع.

7. Eugenol: dental analgesic مسكن سني .
it's a pale yellow liquid having an aromatic odor of clove القرنفل and a spicy taste مذاق لاذع .

8. Sodium fluoride oral solution and tablets: dental caries prophylactic عامل وقائي لنخر الاسنان
Solutions applied to the teeth or dilute solution swallowed when drinking water doesn't contain adequate fluoride. Tablets are chewed or swallowed for the same reason. ممكن بلعها

9. Sodium fluoride and phosphoric acid gel or sodium fluoride and phosphoric acid solution: dental caries prophylactic عامل وقائي لنخر الاسنان
Solutions or gel applied to the teeth.

10. Nystatin oral suspension معلق النيسطاتين الفموي :
antifungal مضاد فطريات

for oral fungal infections by retaining in the mouth as long as possible before swallowing
يجب ابقاؤه في الفم لاطول فترة ممكنة قبل البلع

11. Triamcinolone acetonide dental paste معجون سني :
topical anti-inflammatory. مضاد التهاب موضعي

applied to oral mucosa membranes يطبق على
الاعشية المخاطية الفموية as 0.1% paste.

- In addition, there is a variety of products in various dosage forms for hygienic purposes او اغراض تصحيحية او تنظيفية, e.g. mouthwashes.

Miscellaneous Solutions

- **Diluted acid:** الأحماض المخففة
- Aqueous solutions prepared by diluting the corresponding acid with purified water.
- Strength (القوة) (التركيز)
 - Diluted acid: usually expressed on a percent weight-to-volume basis. نسبة مئوية من وزن الحامض لحجم المحلول (١٠٠ مل)
 - Concentrated acids: always expressed in terms of percent weight-to-weight basis. نسبة مئوية من وزن الحامض لوزن المحلول (١٠٠ غ)
- How to prepare diluted acids from the corresponding concentrate? بالتمديد من الأحماض المركزة

- The strength of concentrated acids varies widely from one acid to another, depending on the
 - Solubility
 - Stability
 - Ease of preparation
- Concentrated sulfuric acid: 95-98% w/w
- Concentrated nitric acid: 69-71% w/w
- Concentrated phosphoric acid: 85-88.5 w/w

Spirits الأرواح

- Spirits: alcoholic or hydroalcoholic solutions of volatile substances مواد طيارة . In general, the alcoholic concentration of spirits is rather high (> 60%).
- The solubility of aromatic or volatile substances in alcohol is quite high compared to water ⇒ when you add water, a milky preparation مستحضر حليبي will form.
- Uses: could be used as (1) Flavoring agent منكهات or (2) Medicinally طبيا for the therapeutic value of the aromatic solute للقيمة العلاجية للذائبة العطرية .

- For medicinal purposes للاغراض الطبية , spirits may be taken
 - Orally فمويا
 - Applied externally تستخدم خارجيا
 - By inhalation عن طريق الاستنشاق
 - Depending upon the particular preparation حسب المستحضر المعين.
- When taken orally, they are generally mixed with a portion of water to reduce the pungency لخفض لذع of the spirit.
- Depending on the materials, spirits may be prepared by simple solution النحلل البسيط , solution by maceration النقع , or distillation التقطير .
- Example of official spirits: aromatic ammonia spirit, camphor spirit, compound orange spirit and peppermint spirit.

Nonaqueous solutions المحاليل الالامائية

➤ Liniments المروخات

- Alcoholic or oleaginous solutions or emulsions مستحلبات of various medicinal agents to be rubbed on the skin لذلك على الجلد.
- Uses:
 - Rubefacient تاثير محمر
 - Counterirritant مضاد للتهيج
- Oleaginous liniments are employed primarily when massage is desired.
- By their nature, oleaginous liniments are less irritating اقل تهيجا to the skin than alcoholic liniments

- Solvents for oleaginous liniments:
 - Fixed oils زيت ثابت : almond oil زيت اللوز , peanut oil زيت السمسم or sesame oil زيت الفول السوداني or cottonseed oil زيت القطن .
 - Volatile oils زيت طيار : wintergreen oil زيت شاي كندا or turpentine oil زيت التربنتين
 - Combination of both type of oils. توليفة/مزيج من النوعين
- Special consideration: for external use only.

➤ Collodions الكولوديونات

- Liquid preparation of pyroxylin dissolved in a solvent mixture of alcohol and ether, with or without medicinal agent.
- Pyroxylin: consist chiefly of cellulose tetranitrate ⇒ obtained by the action of nitric acid and sulfuric acid on cotton.
- Preparation: by dissolving pyroxylin (4% w/v) in a 3:1 mixture of ether and alcohol.
- Uses: for external use as to provide occlusive protecting film فلم واقى غالق on the skin.
- Special consideration:
 - For external use only
 - Extremely flammable قابل للاشتعال جدا

➤ Flexible Collodins الكولوديون المرن

- Preparation: by adding 2% camphor and 3% castor oil زيت الخروع to collodion.
- Castor oils: acts as a plasticizer ملدن that renders the product flexible يجعل المنتج مرن ⇒ makes it comfortable to use يسمح باستعماله المريح over skin areas that are normally moved such as, fingers and toes.
- Camphor: It makes the product waterproof مقاوم للماء

➤ Salicylic acid collodion كولوديون حمض الصفصاف

- Composition: 10% solution of salicylic acid in flexible collodion.
 - Uses: it is a keratolytic الحالة (المذيبة) للتقرن for the removal of warts الثآليل or corns مسامير لحم from the toes.
 - Special consideration: salicylic acid can irritate يهيج the normal healthy skin. Therefore, the pharmacist should advice the patient on the proper way to use it.
- ⇒ The product should be applied one drop at a time on the corn or wart, allowing time to dry before applying the next drop. A useful preventive measure is line the adjacent healthy skin تغطية الجلد السليم المجاور with some petrolatum prior application.