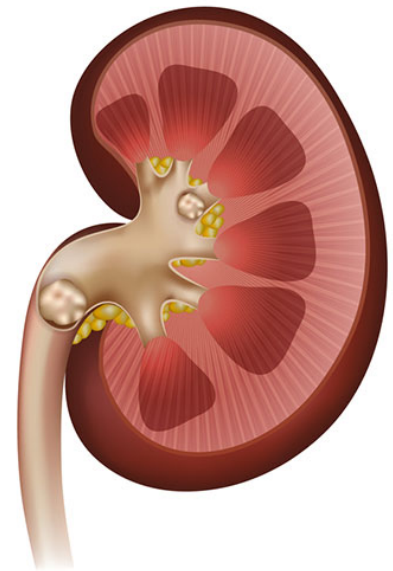


Πως εντοπίζουμε τη σύσταση των λίθων και τι μέτρα λαμβάνουμε

Σταύρος Σφουγγαριστός, MD, PhD

Ακαδημαϊκός Υπότροφος Α΄ Ουρολογικής Κλινικής ΑΠΘ



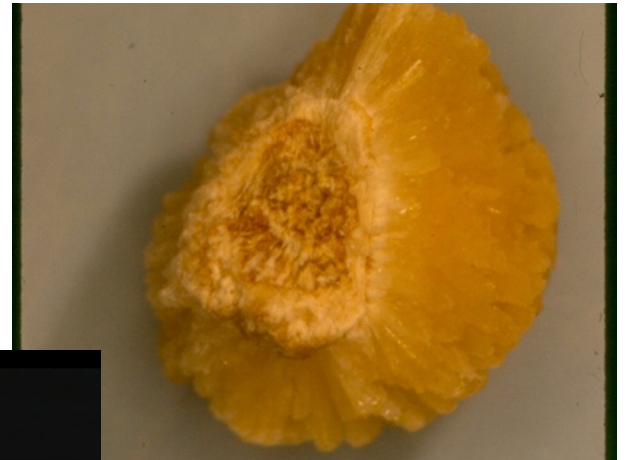
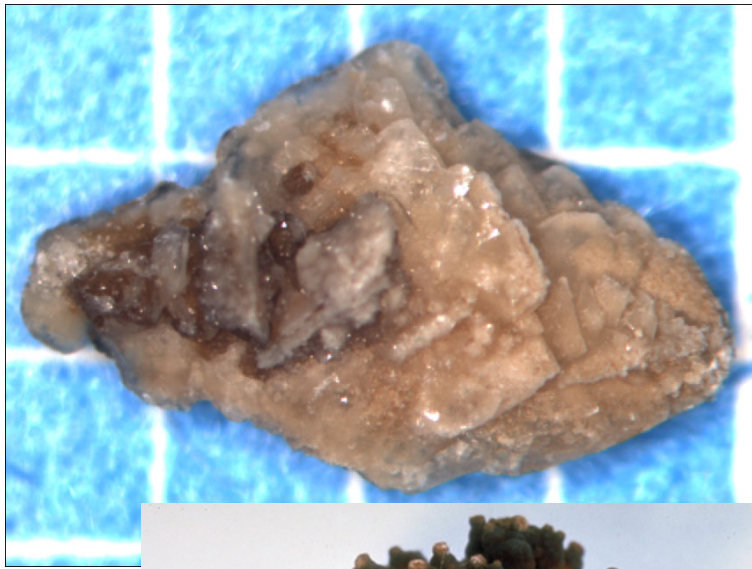


Δήλωση συμφερόντων: ουδεμία



Table 2.3: Stone composition

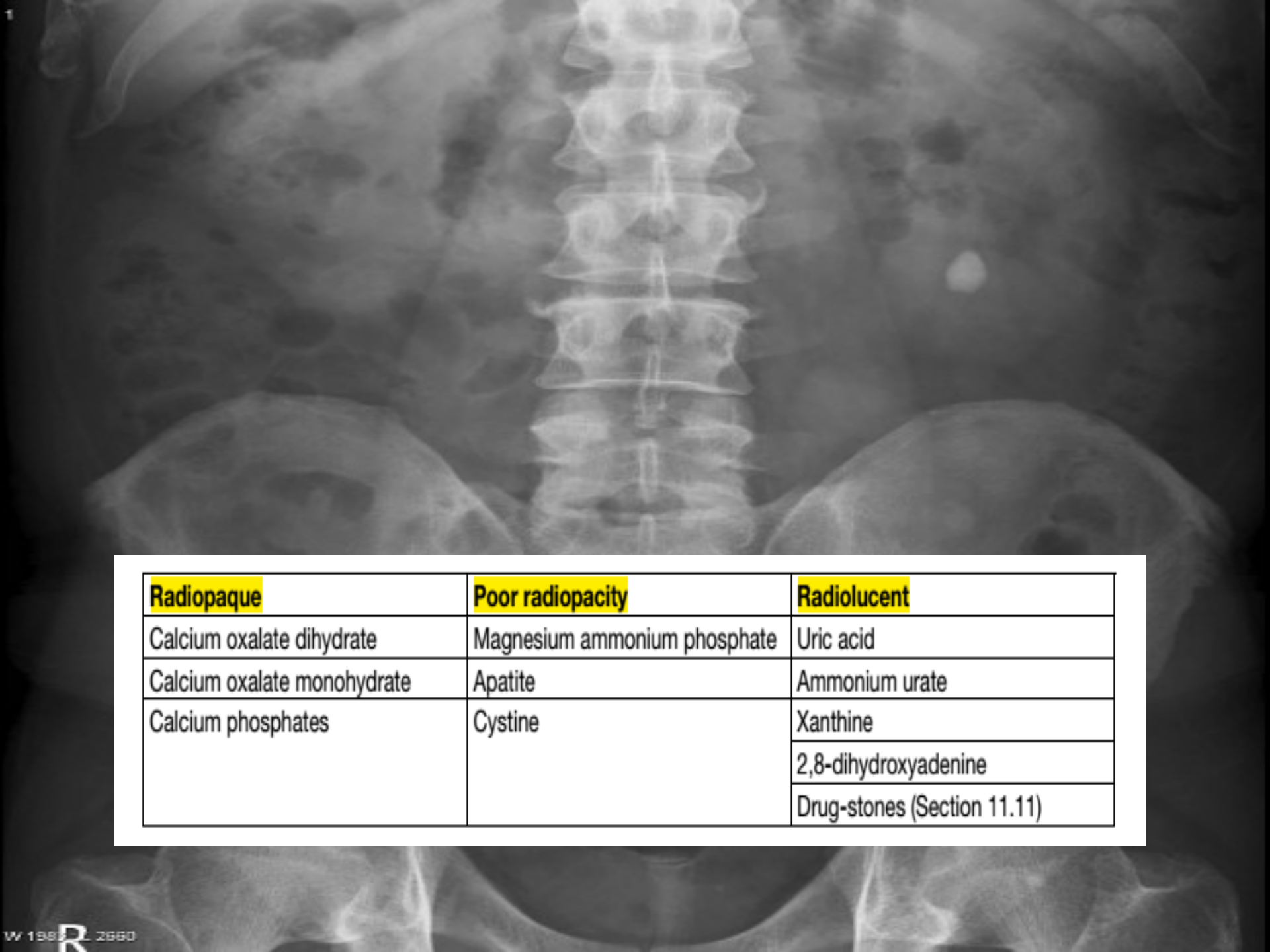
Chemical name	Mineral name	Chemical formula
Calcium oxalate monohydrate	Whewellite	$\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$
Calcium oxalate dihydrate	Wheddelite	$\text{CaC}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$
Basic calcium phosphate	Apatite	$\text{Ca}_{10}(\text{PO}_4)_6 \cdot (\text{OH})_2$
Calcium hydroxyl phosphate	Hydroxylapatite	$\text{Ca}_5(\text{PO}_3)_3(\text{OH})$
b-tricalcium phosphate	Whitlockite	$\text{Ca}_3(\text{PO}_4)_2$
Carbonate apatite phosphate	Dahllite	$\text{Ca}_5(\text{PO}_4)_3\text{OH}$
Calcium hydrogen phosphate	Brushite	$\text{CaHPO}_4 \cdot 2\text{H}_2\text{O}$
Calcium carbonate	Aragonite	CaCO_3
Octacalcium phosphate		$\text{Ca}_8\text{H}_2(\text{PO}_4)_6 \cdot 5\text{H}_2\text{O}$
Uric acid dihydrate	Uricite	$\text{C}_5\text{H}_4\text{N}_4\text{O}_3$
Ammonium urate		$\text{NH}_4\text{C}_5\text{H}_3\text{N}_4\text{O}_3$
Sodium acid urate monohydrate		$\text{NaC}_5\text{H}_3\text{N}_4\text{O}_3 \cdot \text{H}_2\text{O}$
Magnesium ammonium phosphate	Struvite	$\text{MgNH}_4\text{PO}_4 \cdot 6\text{H}_2\text{O}$
Magnesium acid phosphate trihydrate	Newberyite	$\text{MgHPO}_4 \cdot 3\text{H}_2\text{O}$
Magnesium ammonium phosphate monohydrate	Dittmarite	$\text{MgNH}_4(\text{PO}_4) \cdot 1\text{H}_2\text{O}$
Cystine		$[\text{SCH}_2\text{CH}(\text{NH}_2)\text{COOH}]_2$
Gypsum	Calcium sulphate dihydrate Zinc phosphate tetrahydrate	$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ $\text{Zn}_3(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}$
Xanthine		
2,8-dihydroxyadenine		
Proteins		
Cholesterol		
Calcite		
Potassium urate		
Trimagnesium phosphate		
Melamine		
Matrix		
Drug stones	<ul style="list-style-type: none"> • Active compounds crystallising in urine • Substances impairing urine composition (Ch. 11.11) 	
Foreign body calculi		



Γιατί πρέπει να γνωρίζουμε τη σύσταση των λίθων;







Radiopaque	Poor radiopacity	Radiolucent
Calcium oxalate dihydrate	Magnesium ammonium phosphate	Uric acid
Calcium oxalate monohydrate	Apatite	Ammonium urate
Calcium phosphates	Cystine	Xanthine
		2,8-dihydroxyadenine
		Drug-stones (Section 11.11)





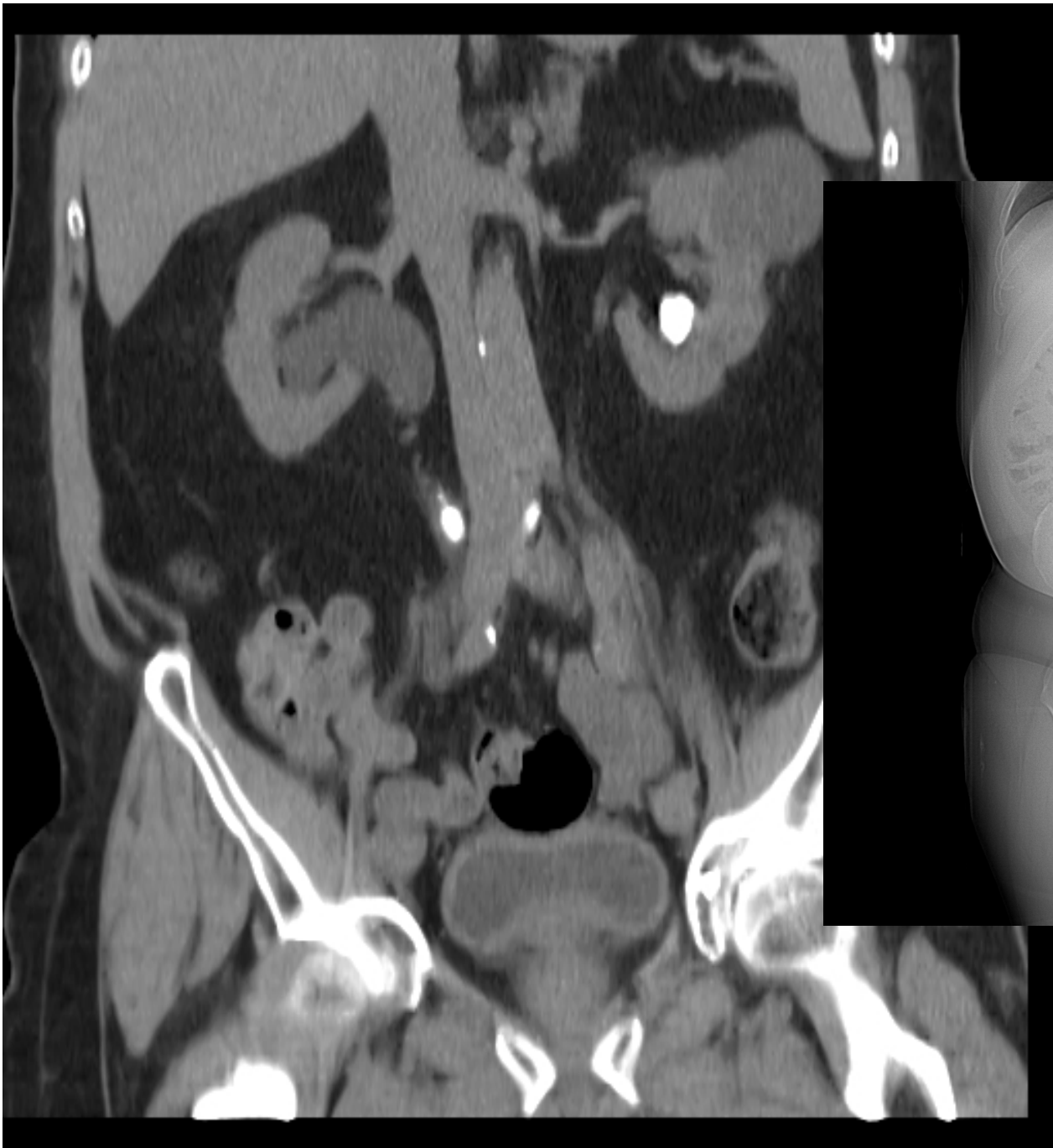


Table 4 Review of studies

	Mitcheson et al. [7], in vitro	Newhouse et al. [5], in vitro	Hillman et al. [12], in vitro	Mostafavi et al. [8], in vitro	Nakada et al. [11], in vivo	Motley et al. [9], in vivo	Present study, in vitro
CT scanner	Siemens somatom-2	EMI 7070	GE 8800	GE Hispeed	GE Hispeed	GE Hispeed	GE Light speed
Energy settings	460 mA at 125 kV, 747 mA at 77 kV	90 mA at 120 kV	100 mA at 120 kV	240 mA at 80, 120 kV	200 mA at 120 kV	200 mA at 120 kV	240 mA at 100, 120 kV
Collimation	2	2	5	1	3-5	5	1.25
Surrounding media	Water	Water	Water	Air	In patients	In patients	Water
Absolute HU values							Tissue window: Bone window
Uric acid	540 ± 107	426 ± 51	448 ± 108	409 ± 118	344 ± 152	270 ± 134	548 ± 348 695 ± 376
Struvite	651 ± 108	725 ± 118	943 ± 259	666 ± 87	NA	401 ± 198	804 ± 364 1,008 ± 381
Calcium oxalate	> 1,023	948 ± 67	1,273 ± 193	1,620 ± 232	652 ± 490	440 ± 262	809 ± 288 1,130 ± 413

Sheir et al. Urol Res 2005

TABLE 4. Comparisons of the mean absolute CT values

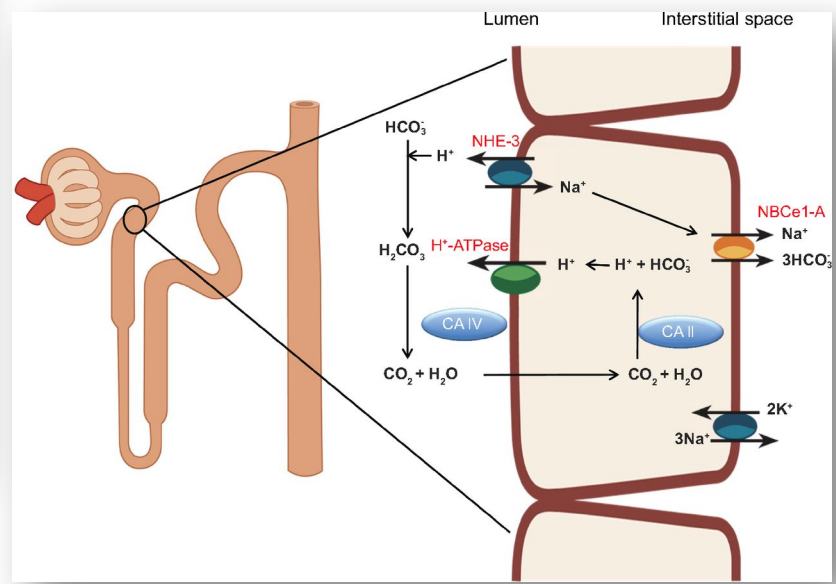
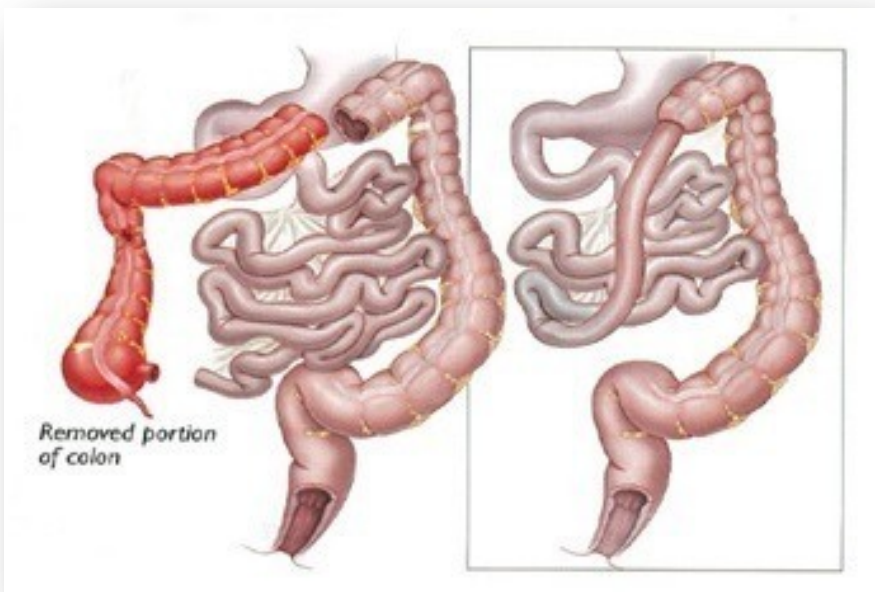
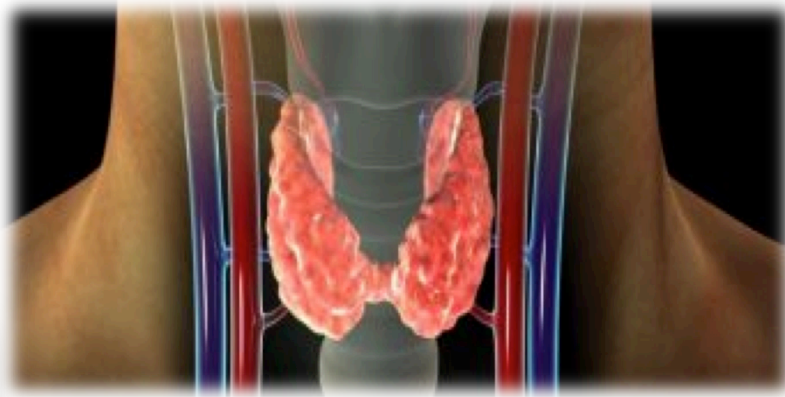
Stone Type	Mitcheson et al ¹⁴	Hillman et al ¹⁵	Newhouse et al ¹⁶	Present Study
Brushite	Greater than 1,023	Not available	1,211 ± 195	1,703 ± 161
Calcium oxalate	Greater than 1,023	1,273 ± 193	948 ± 67	1,620 ± 232
Cystine	703 ± 69	625 ± 247	540 ± 49	711 ± 228
Struvite	651 ± 108	943 ± 259	725 ± 118	666 ± 87
Uric acid	540 ± 107	448 ± 108	426 ± 51	409 ± 118

Mohammad et al. J Urol 1998



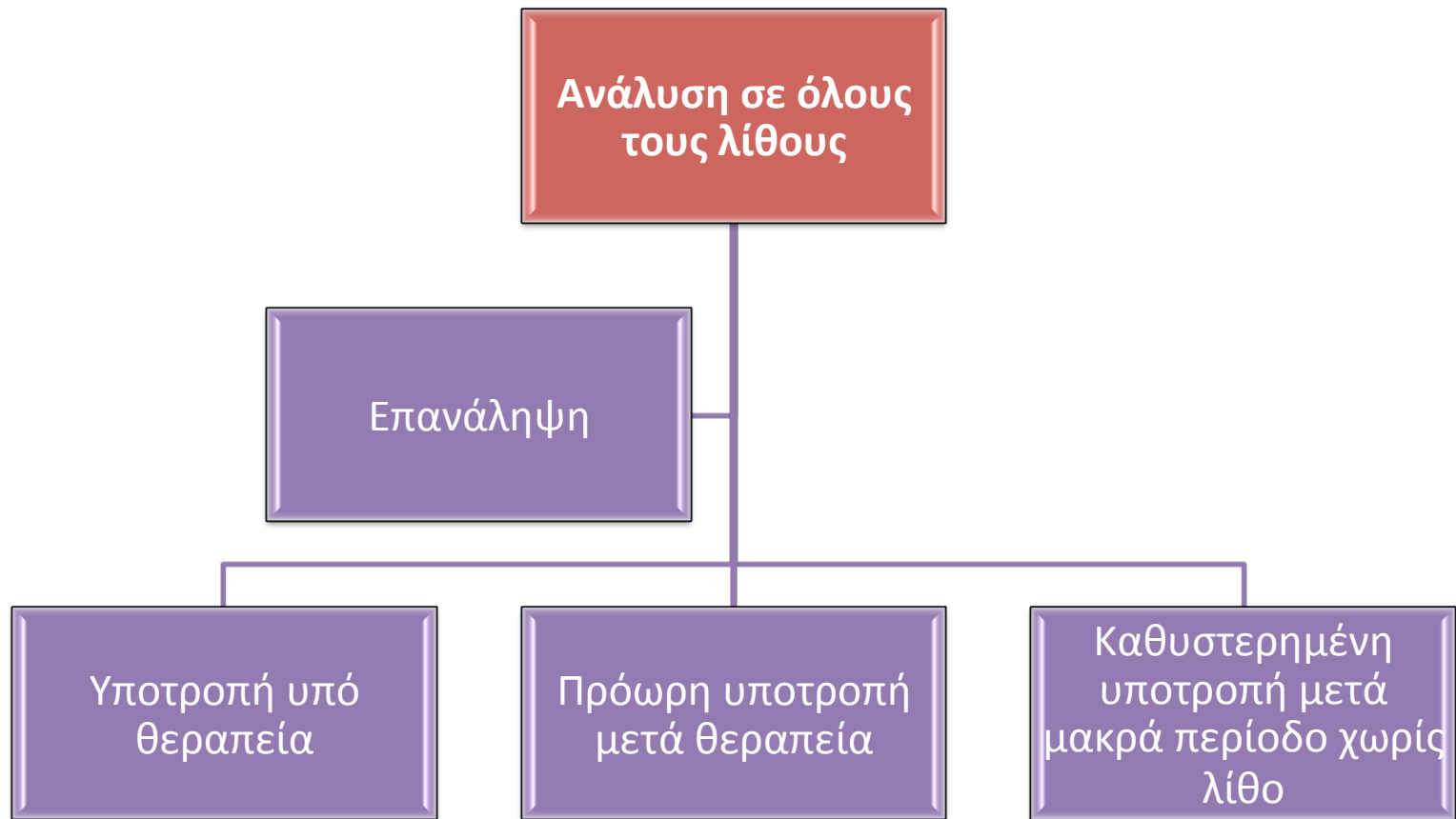
- Uric acid 1.0
- Struvite 1.0
- CaOx dehydrate 1.0
- Hydroxyapatite 1.1
- Carbonate apatite 1.3
- CaOx monohydrate 1.3
- Brushite 2.2
- Cystine 2.4





**Σε ποιους ασθενείς πρέπει να
κάνουμε ανάλυση λίθου;**





3.2.2 *Analysis of stone composition*

Stone analysis should be performed in all first-time stone formers.

In clinical practice, repeat stone analysis is needed in case of:

- recurrence under pharmacological prevention;
- early recurrence after interventional therapy with complete stone clearance;
- late recurrence after a prolonged stone-free period (6).



Μέθοδοι ανάλυσης λίθων

- Wet chemical analysis
- Optical crystallography
- Thermogravimetric analysis
- Scanning electron microscopy
- X-ray diffraction
- IR spectroscopy



ΑΠΟΤΕΛΕΣΜΑΤΑ

ΣΥΣΤΑΣΗ ΕΠΙΦΑΝΕΙΑΣ (CRUST)

ΧΗΜΙΚΗ ΟΝΟΜΑΣΙΑ	ΧΗΜΙΚΟΣ ΤΥΠΟΣ	ΠΟΣΟΣΤΟ
CALCIUM OXALATE MONOHYDRATE (WHEWELLITE)	CaC₂O₄.H₂O	78 %
URIC ACID	C₅H₄N₄O₃	15 %
CALCIUM OXALATE DEHYDRATE (WEDDELLITE)	CaC₂O₄.2H₂O	4 %
MATRIX (unknown matter, usually protein)	-	3 %

ΣΥΣΤΑΣΗ ΠΥΡΗΝΑ (NIDUS)

ΧΗΜΙΚΗ ΟΝΟΜΑΣΙΑ	ΧΗΜΙΚΟΣ ΤΥΠΟΣ	ΠΟΣΟΣΤΟ
CALCIUM OXALATE MONOHYDRATE (WHEWELLITE)	CaC₂O₄.H₂O	84 %
CALCIUM OXALATE DEHYDRATE (WEDDELLITE)	CaC₂O₄.2H₂O	12 %
MATRIX (unknown matter, usually protein)	-	4 %

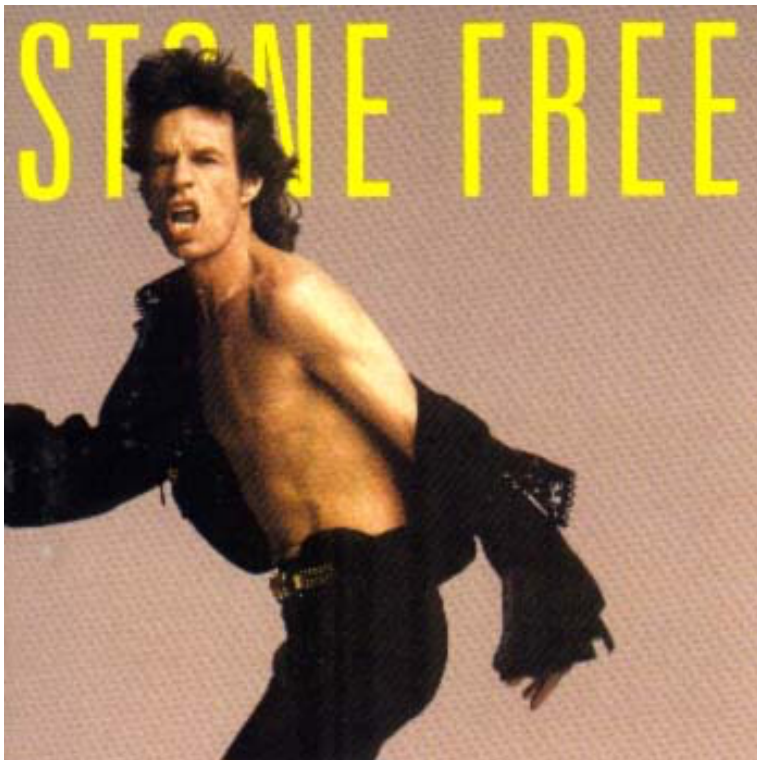
ΟΛΙΚΗ ΣΥΣΤΑΣΗ ΟΥΡΟΛΙΘΟΥ (MIX)

ΧΗΜΙΚΗ ΟΝΟΜΑΣΙΑ	ΧΗΜΙΚΟΣ ΤΥΠΟΣ	ΠΟΣΟΣΤΟ
CALCIUM OXALATE MONOHYDRATE (WHEWELLITE)	CaC₂O₄.H₂O	80 %
URIC ACID	C₅H₄N₄O₃	8 %
CALCIUM OXALATE DEHYDRATE (WEDDELLITE)	CaC₂O₄.2H₂O	9 %
MATRIX (unknown matter, usually protein)	-	3 %

Η ανάλυση του ουρόλιθου έγινε με τις παρακάτω μεθόδους : Optical microscopy, Polarization microscopy, Chemical tests, Ultraviolet / Visible spectroscopy και Infrared (IR) spectroscopy.

Pure: >80%





Παρακολούθηση



ARTICLE

W. G. Robertson

Is prevention of stone recurrence financially worthwhile?

have “solved the stone problem”. At UCLH in London where such a comprehensive scheme has been in place for the past 8 years, **savings of up to £250,000 per year** can be made by identifying the particular lifestyle as well as the epidemiological, metabolic and nutritional risk factors involved in a given patient and then instituting appropriate measures to prevent further stones.



ΟΔΗΓΙΕΣ ΣΤΟΥΣ ΑΣΘΕΝΕΙΣ

- Διαιτητικές οδηγίες
 - αύξηση της διούρησης
 - μείωση σωματικού βάρους
 - αποφυγή άλατος
 - αποφυγή ζωικών λιπών
- Μεταβολικός έλεγχος
 - ούρα 24h
 - βιοχημικό έλεγχο (Cr, Ca, UrAc, PTH)
 - κ/α ούρων

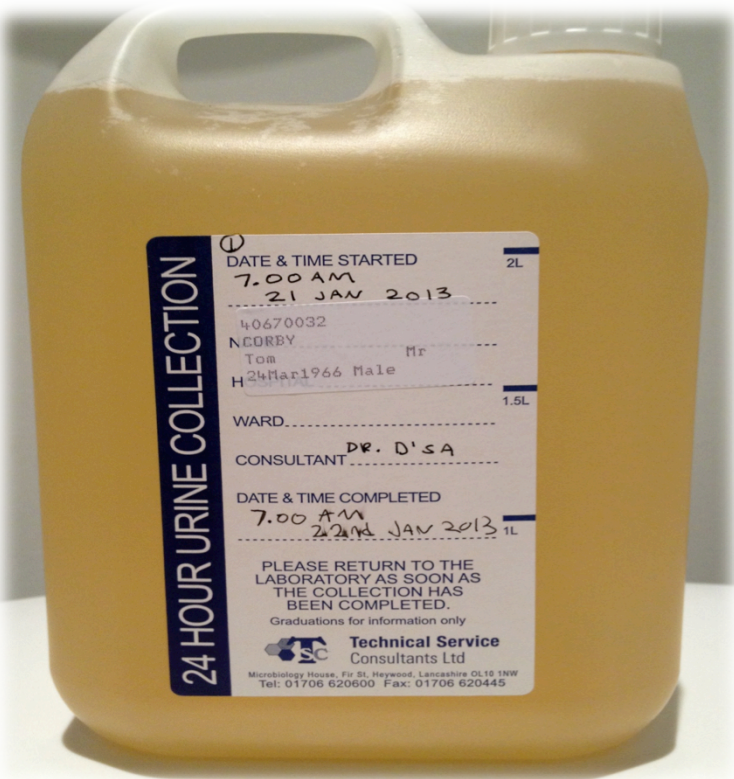
DIET AND KIDNEY STONES



Table 2.4: High-risk stone formers (7-13)

General factors
Early onset of urolithiasis (especially children and teenagers)
Familial stone formation
Brushite-containing stones ($\text{CaHPO}_4 \cdot 2\text{H}_2\text{O}$)
Uric acid and urate-containing stones
Infection stones
Solitary kidney (the kidney itself does not particularly increase risk of stone formation, but prevention of stone recurrence is of more importance)
Diseases associated with stone formation
Hyperparathyroidism
Nephrocalcinosis
Gastrointestinal diseases (i.e., jejunio-ileal bypass, intestinal resection, Crohn's disease, malabsorptive conditions, enteric hyperoxaluria after urinary diversion) and bariatric surgery
Sarcoidosis
Genetically determined stone formation
Cystinuria (type A, B and AB)
Primary hyperoxaluria (PH)
Renal tubular acidosis (RTA) type I
2,8-dihydroxyadenine
Xanthinuria
Lesch-Nyhan syndrome
Cystic fibrosis
Drugs associated with stone formation
Anatomical abnormalities associated with stone formation
Medullary sponge kidney (tubular ectasia)
Ureteropelvic junction (UPJ) obstruction
Calyceal diverticulum, calyceal cyst
Ureteral stricture
Vesico-uretero-renal reflux
Horseshoe kidney
Ureterocele

ΟΥΡΑ 24ωρου

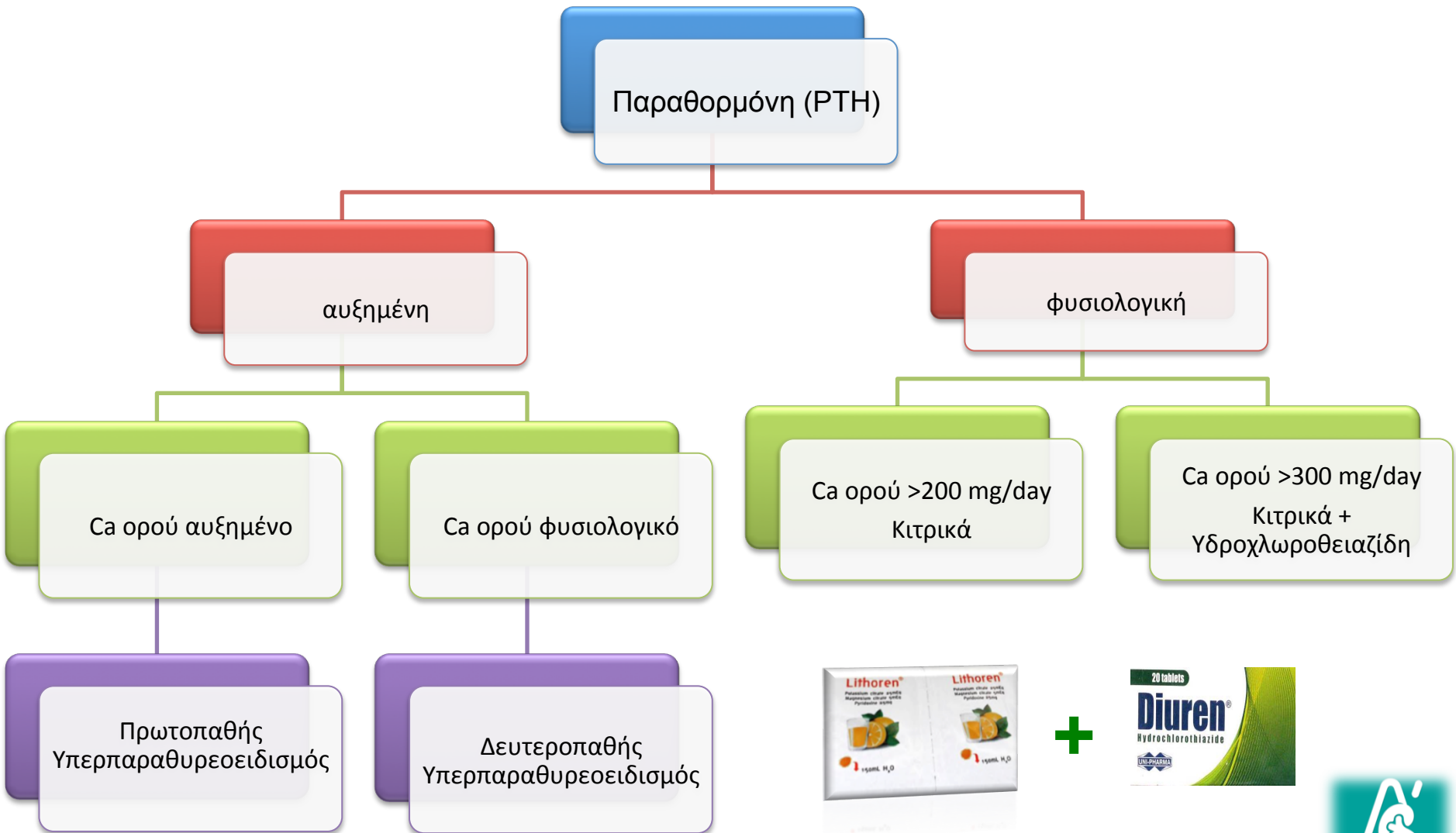


- Volume
- pH
- Ca
- Oxalate
- Citrate
- Mg
- Uric Acid
- Cystine

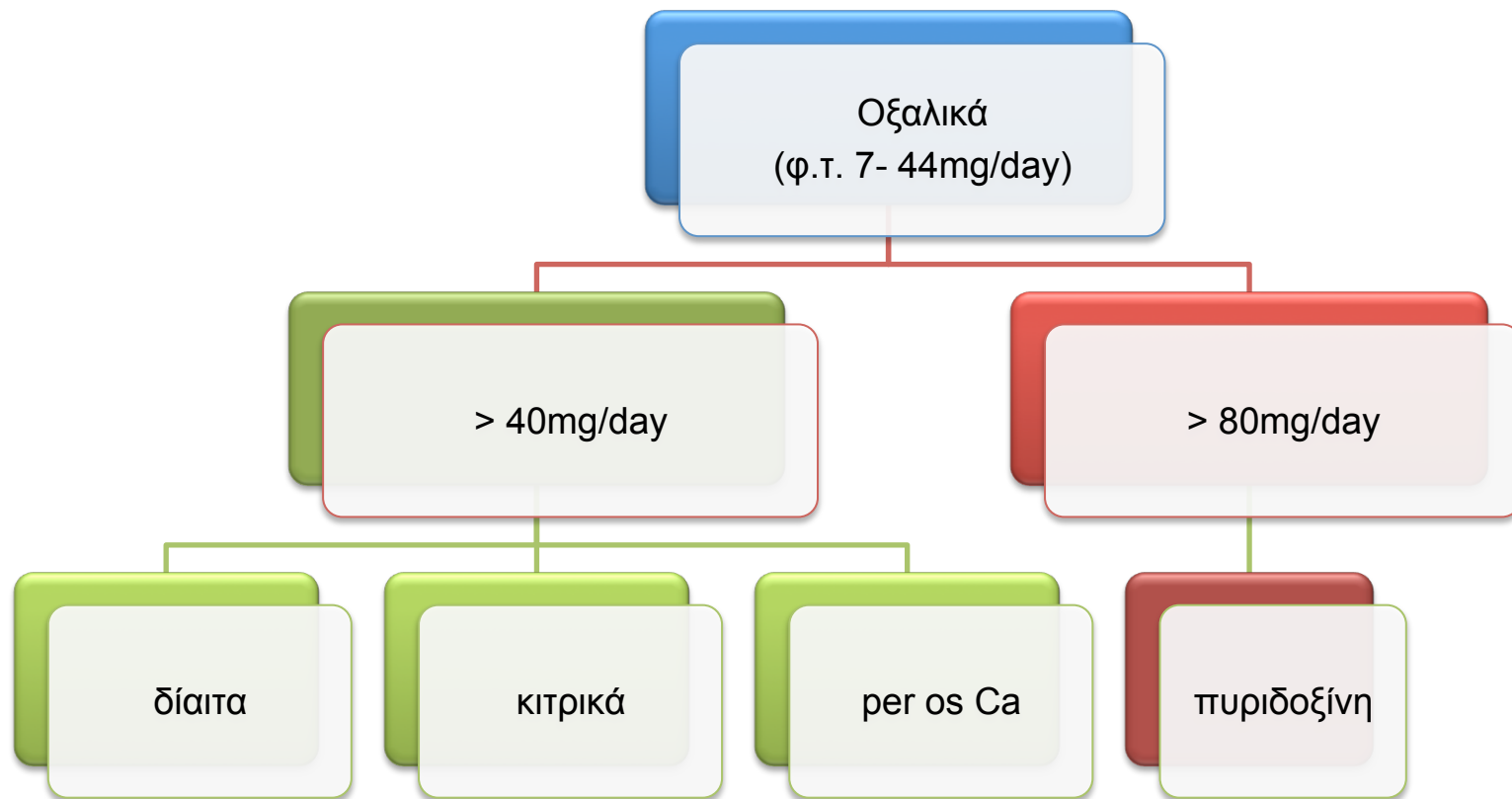
- ◆ 3-4 εβδομάδες μετά την αυτόματη αποβολή ή αφαίρεση του λίθου
- ◆ 3 μήνες μετά την έναρξη της αγωγής, νέο δείγμα ούρων (προσαρμογή θεραπείας).



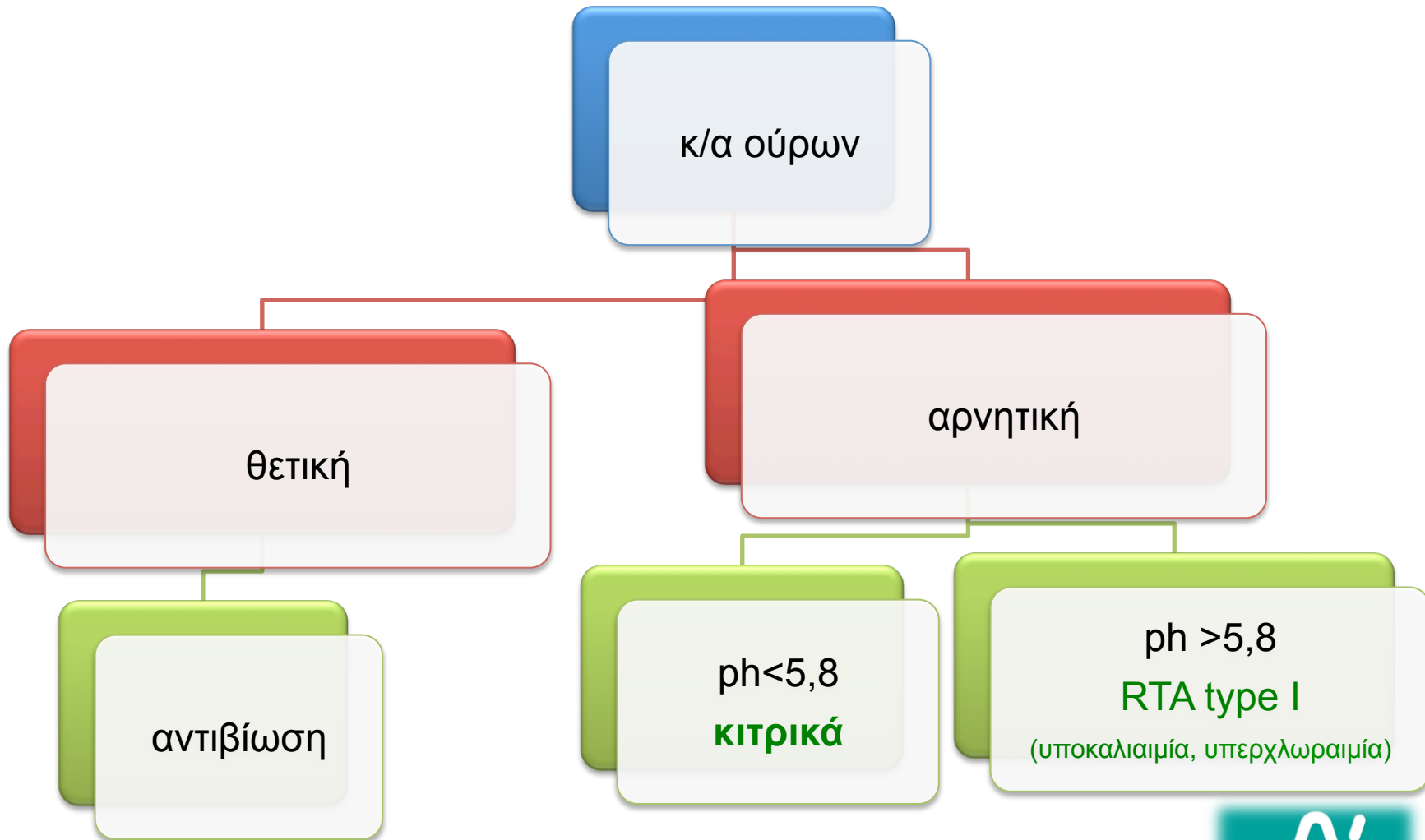
Υπερασβεστιουρία (>200 mg/day)



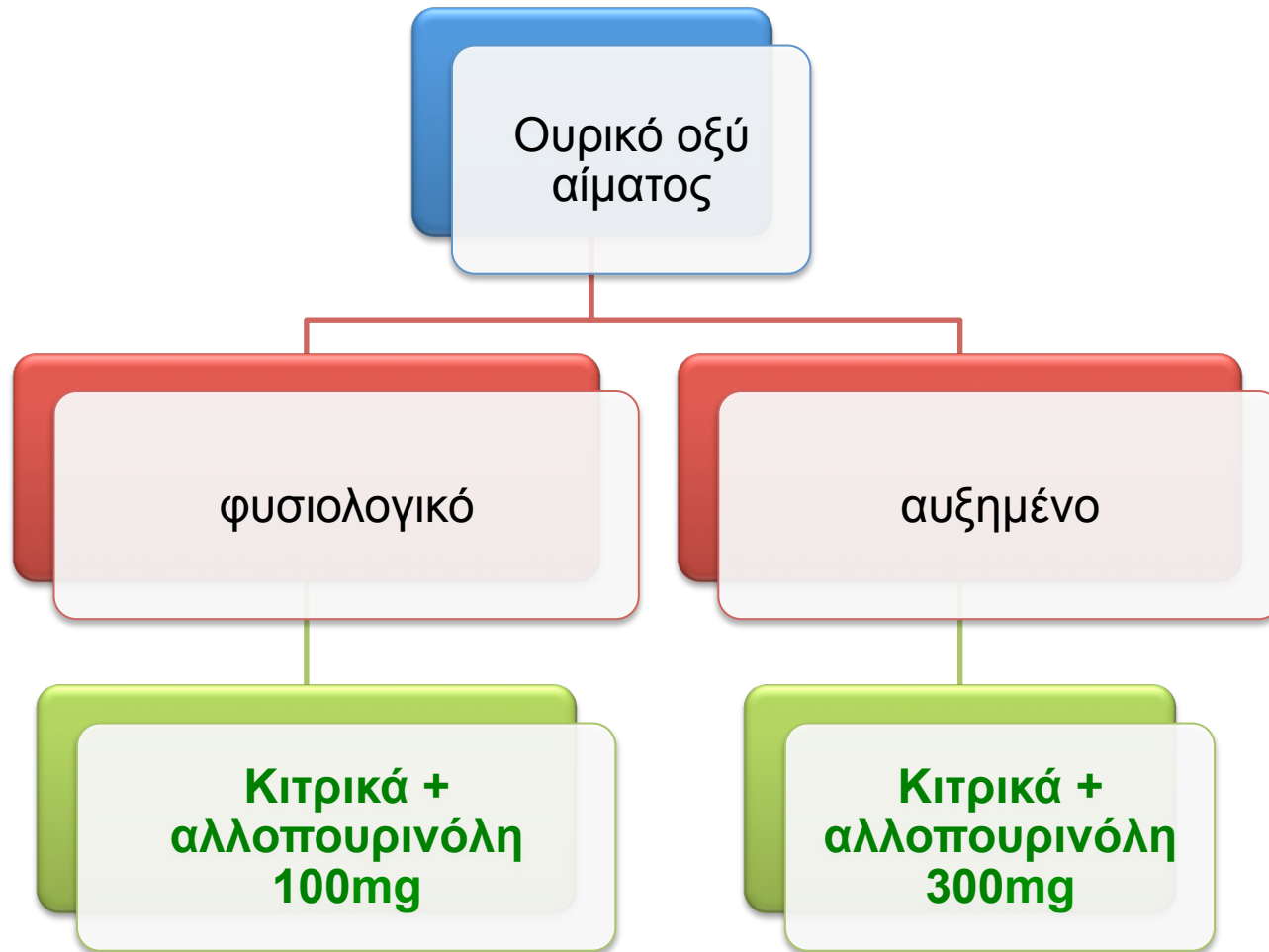
Υπεροξαλουρία (>40 mg/day)



Υποκιτρικουρία (<500 mg/day)



Υπερουρικοζουρία (>750 mg/day)



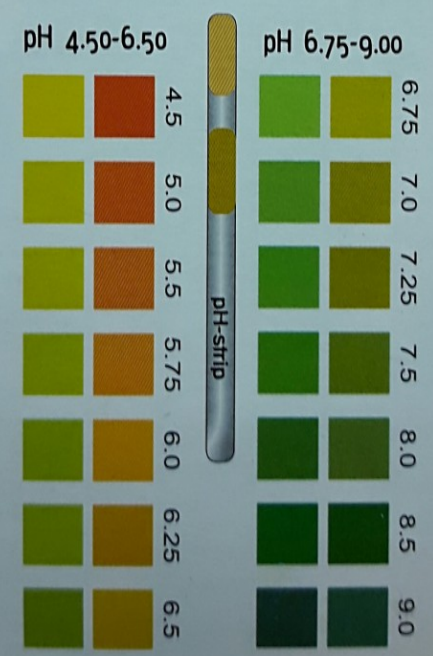
+


Zyloric
Zylapour
Soluric
Stradumel





Περιλαμβάνονται:
14 pH-μετρικές λωρίδες,
εύρους pH 4.50-9.00

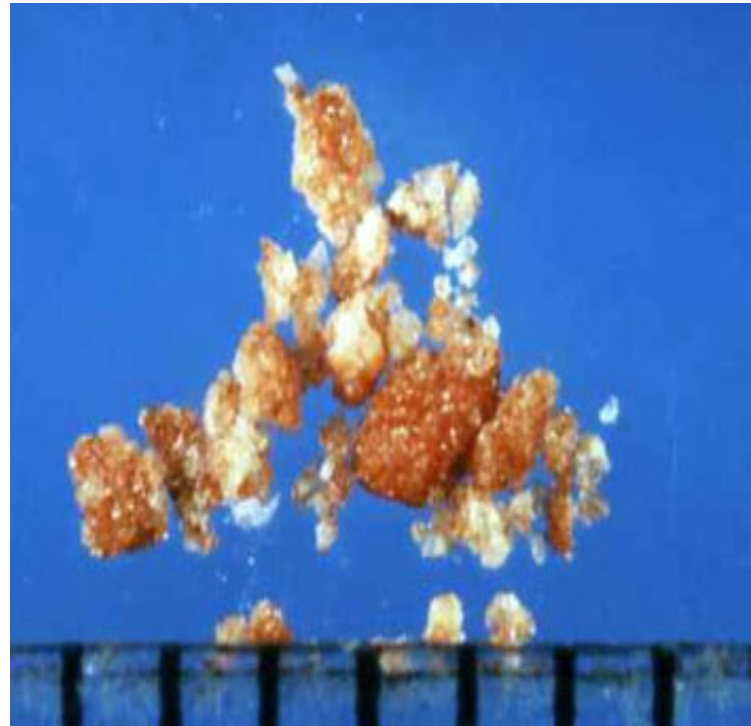


 Λι-θο-ρέν





Στρουβίτης



Στρουβίτης - Αντιμετώπιση

- Αφαίρεση ξένων σωμάτων
- Αυξημένη διούρηση
- Χημειοπροφύλαξη
- pH 5.8-6.2



pH (5.8-6.2)



- UrAc <5.5
- CaOx <5.8
- Brushite 6.5-6.8
- Apatite >6.8
- Struvite >7.2

Προφύλαξη

- Λίθους στρουβίτη, CaOx, CaPO₄ 5.8-6.2
- Λίθους ουρικού οξεός 6.2-6.8
- Λίθοι κυστίνης >7.5





STONE ANALYSIS SET

Chemical qualitative method



Ευχαριστώ!

