EXPERIMENTAL WORK №4

A rapid Sr-90 determination in milk samples

Sr-90: nuclear properties and occurrence in nature

Sources of Sr-90

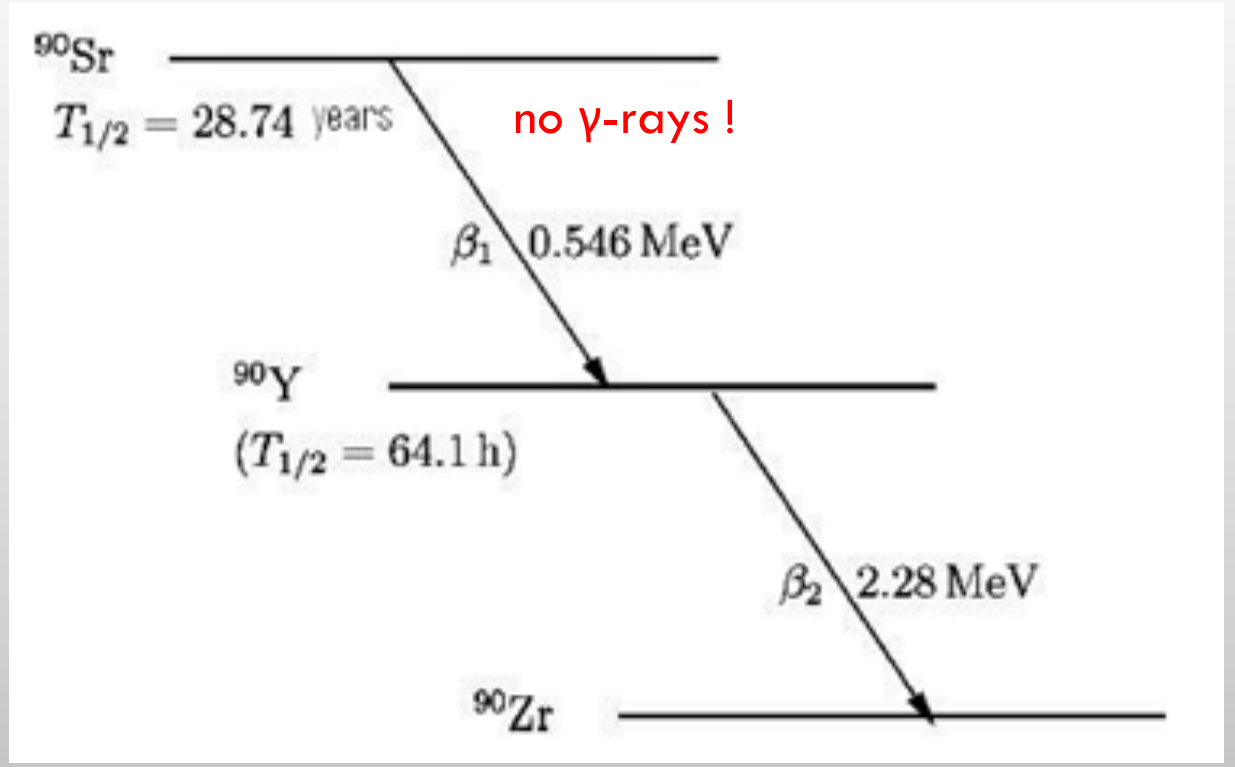
- Nuclear fission (atomic reactors, nuclear weapons)
- Industrial ionization sources

Soils

Water, grass

Cow's milk

Human



Goal of the practical work

Measurement of Sr-90 activity in Cow's milk using liquid scintillate counting (LSC) with the preliminary separation of Sr from matrix

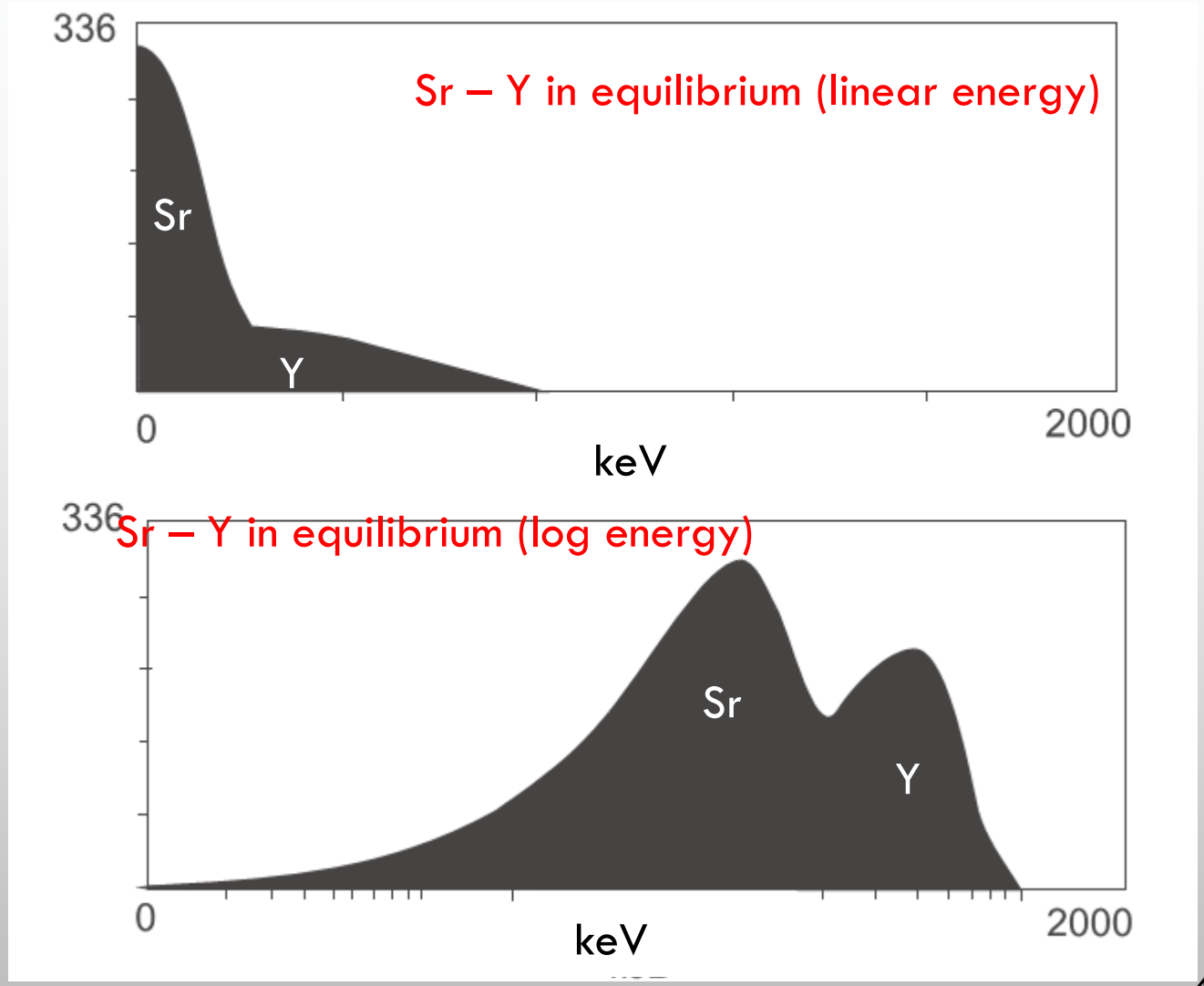
Sr-90: measurement and problems

How to measure Sr-90

- LSC (DL < 0.1 Bq/kg in 2 days)
- β-radiometry
- ICP-MS

Milk composition

Substance	* / 100g milk
Protein	3.2 g
Calcium	113.0 mg
Phosphorous	91.0 mg
Sodium	40.0 mg
Potassium (K-40 also)	143.0 mg



Sr-90: procedure of sample preparation and separation

Milk

↓

Evaporation to dryness

↓

Calcination

↓

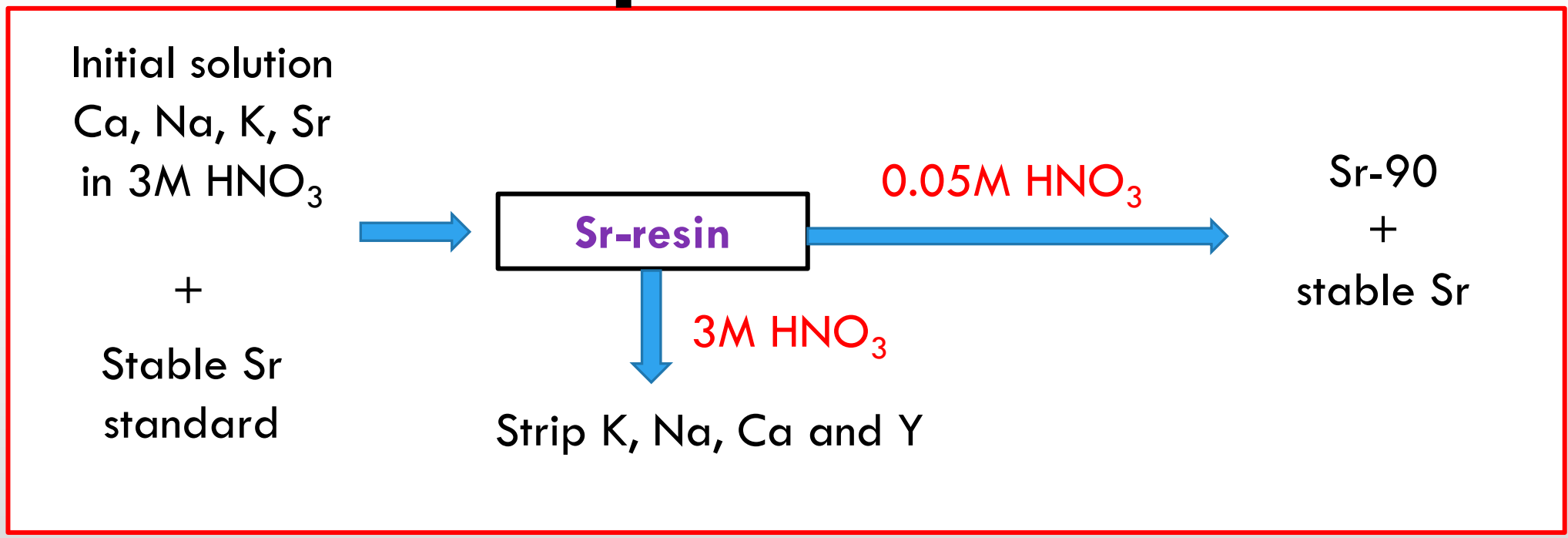
Dissolution of residue

↓

Separation of Sr on Sr-resin

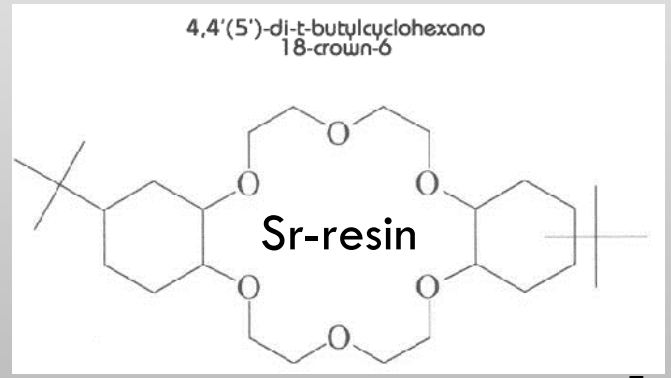
↓

Sr-90 LSC and Sr-tracer ICP-MS



Sr separation

- Liquid-liquid extraction
- Coprecipitation
- Ion exchange
- Extraction chromatography

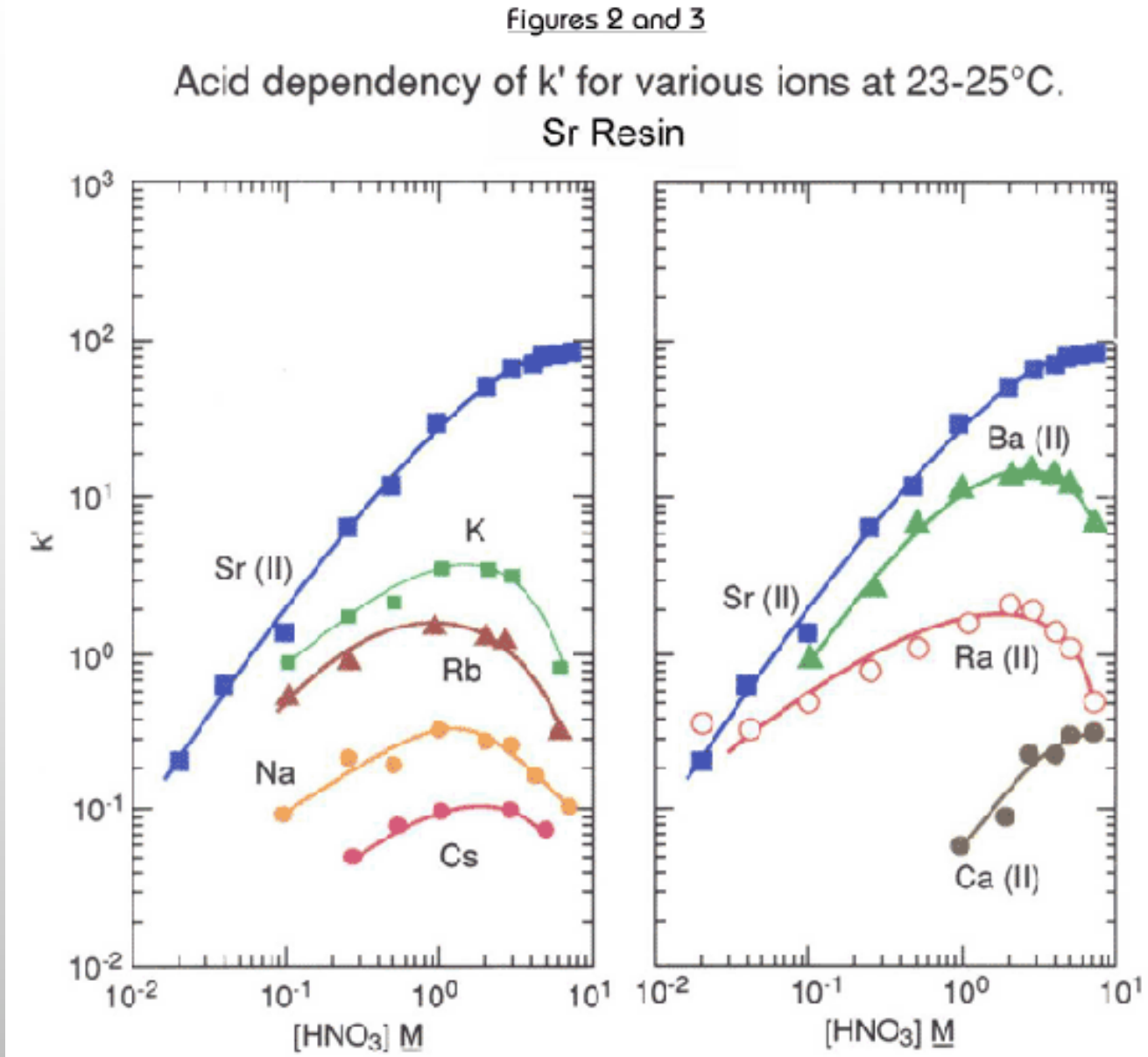


Results

- We measure the activity of Sr-90 in Cow's milk using liquid scintillate counting (LSC) with the preliminary separation of Sr from matrix using chromatography on Sr-resin.
- The volume activity of Sr-90 was (5.1 ± 0.2) Bq/L. The efficiency of the separation of Sr from matrix was ~70%.
- This activity is ten times more than maximum contaminant level 0.3 Bq/L for water by US EPA.

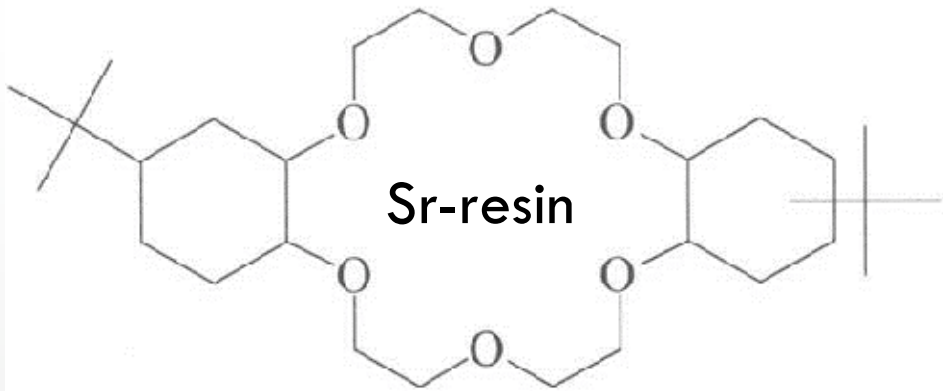
THANK YOU FOR ATTENTION

Kd for Sr-resin



Horwitz, et al., (HP292)

4,4'(5')-di-t-butylcyclohexano
18-crown-6



Sr-resin