# COMPARATIVE STUDY OF HEAVY METALS AND TRACE ELEMENT CONCENTRATIONS IN MILK SAMPLE

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**ABSTRACT:**

MILK IS CONSIDERING UNIQUE SOURCE FOR CHILDREN'S AND EVEN ADULT'S NUTRITION. IN THIS STUDY, EIGHT SAMPLES OF DIFFERENT BRANDS OF MILK WERE SELECTED FROM IRAQI MARKETS TO MEASURE THE CONCENTRATIONS OF MAJOR AND TRACE ELEMENTS USING X-RAY FLUORESCENCE (XRF) TECHNIQUE. . NEUTRON ACTIVATION ANALYSIS TECHNIQUE (NAA) AND THE CHEMICAL ANALYSES KJELDAHL TECHNIQUE WERE EMPLOYED TO MEASURE THE CONCENTRATIONS OF NITROGEN . TO VALIDATION THE RESULTS, ATOMIC ABSORPTION ANALYSIS TECHNIQUE WAS EMPLOYED TO MEASURE THE CONCENTRATION OF THE TRACE ELEMENTS . FINALLY, THE RESULT COMPARED WITH AUTHORIZED LIMIT BY FAO/WHO STANDARDS

## expermental work

**X-Ray Florescence technique** :In this work EDXRF spectrometry (Spectro Xepos, SPECTRO Analytical Instruments) unit was employed to measure the trace elements of the milk samples. Precision and accuracy were tested by normal standard reference analysis in XRF unit. The results is implies that the unit XRF credible for such measurements.

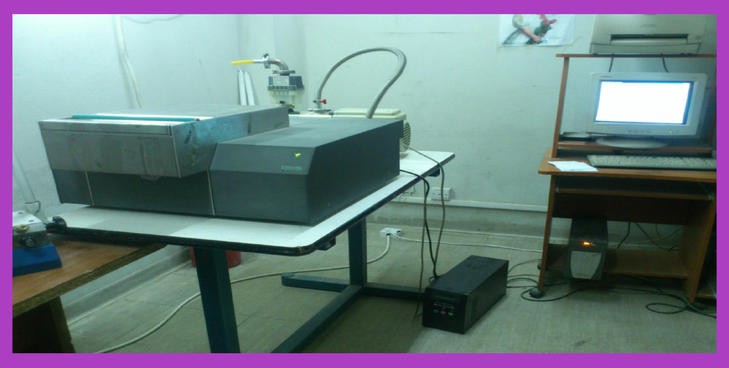
**Atomic Absorption Spectrometry (AAS**) :This technique is best to measured trace elements the detection limit of measured less than part per billion (ppb). Is an analytic technique widely used in research studies which aims to determine inorganic ions in solution. The determination is both qualitative and quantitative.

**Neutron activation analyses (NAA):**This technique is used to determine the concentration of nitrogen. The samples irradiated with the standard reference material by neutron source with the flux 4x104 n/cm2.s with time irradiation 1 min.

**Kjeldahl method** :Milk is digested with a strong acid so that it releases nitrogen which can be determined by a suitable titration technique,to measure the protein content directly a conversion factor (F) is needed to convert the measured nitrogen concentration to a protein concentration

Table shows the comparison of results between experimental data and the results published in certificate data

| No. | A.N | E.S | Con* | Con** | Error % | No. | A. N. | E.S. | Con*. | Con**. | Error % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 11 | Na | 0.34 | 0.36 | 5.55 | 10 | 25 | Mn | 0.517 | 0.5 | 3.4 |
| 2 | 12 | Mg | 28.80 | 26.19 | 9.96 | 11 | 26 | Fe | 1.804 | 1.25 | 44.32 |
| 3 | 13 | Al | 0.32 | 0.35 | 8.57 | 12 | 27 | Co | 0.0066 | 0.0062 | 6.4 |
| 4 | 14 | Si | 20.69 | 19.48 | 6.21 | 13 | 28 | Ni | 0.349 | 0.372 | 5.94 |
| 5 | 15 | p | 0.38 | 0.40 | 5.00 | 14 | 29 | Cu | 0.0001 | 0.0001 | 0.0 |
| 5 | 16 | S | 0.145 | 0.244 | 26.64 | 15 | 30 | Zn | 1.64 | 1.87 | 12.42 |
| 6 | 17 | Cl | 0.761 | 0.875 | 13.03 | 16 | 34 | Se | 0.002 | 0.0031 | 35.48 |
| 7 | 19 | K | 8.012 | 10.00 | 19.88 | 17 | 42 | Mo | 0.004 | 0.0031 | 29 |
| 8 | 20 | Ca | 0.22 | 0.272 | 26.47 | 18 | 80 | Hg | 0.0013 | 0.0013 | 0.0 |
| 9 | 24 | Cr | 0.021 | 0.031 | 32.25 | 19 | 82 | Pb | 0.0001 | 0.0001 | 0.0 |



## Results and discussions

These results demonstrate the ability of X-ray fluorescence technique to analyze a diverse collection of real samples with good precision , easily covering the vast range of elements and determined concentrations major and trace element .

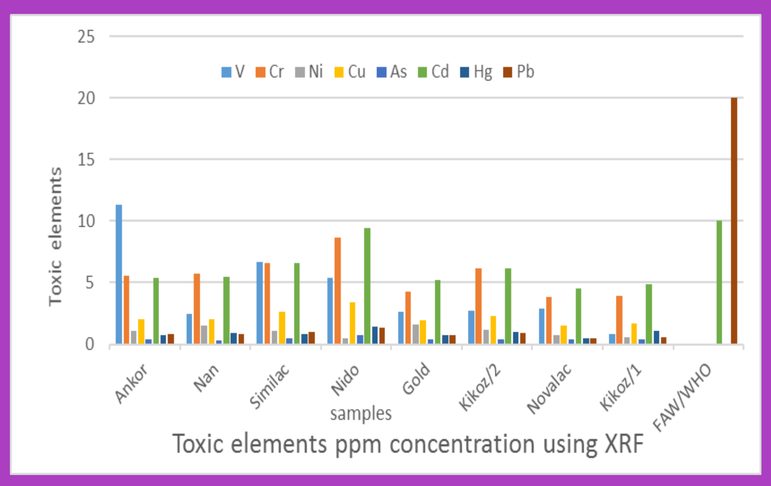
The proteins milk are unique , not found in any other tissue. Milk proteins are important in the formation of amino acids for growth and development.

The results show :

Major concentration elements (Na,P,S,Cl,K,Ca,Mg)

Trace concentration elements (Al,Si,Fe,Zn,Br,Rb,Mo,I,Ba, Ti,Mn,Co)

Toxic elements (V,Cr,Ni,Cu,As,Cd,Hg,Pb)




## CONCLUSIONS

There are strong and significant correlations between minerals.In particular between Ca, P and Mg These three elements were also significantly correlated with milk quality traits. Many methods are used to analyze milk minerals and some of them are specific for particular elements. Necessary to evaluate the contents of ''essential'' and ''toxic'' heavy metals on a greater number of milk samples from various supplies and confirm the absence of possible toxicological risks

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