

9th International Congress on

Nutrition & Health

February 20-21, 2017 Berlin, Germany

Elucidating the origin of production of milk powder commercially distributed on the Chinese market using multi element stable isotope technique

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The economically motivated adulteration of milk powder in the Chinese market has increasingly become a major public concern. The study was done to ascertain the feasibility of utilizing $\delta^2\text{H}$, $\delta^{18}\text{O}$ and $\delta^{15}\text{N}$ stable isotope technique in elucidating the authenticity and origin of milk products on the Chinese market. Milk powder from North America, Oceania and China were analyzed. An elemental analyzer was connected to an isotope ratio mass spectrometer operated in the continuous flow mode was utilized. Statistical analysis was performed using descriptive statistics and one-way ANOVA. The study revealed that both $\delta^2\text{H}$ and $\delta^{18}\text{O}$ had a wide range of mean values: 13.86 to 22.25‰ and -82.86 to -28.5‰, respectively. There was a significant difference in the $\delta^2\text{H}$ and $\delta^{18}\text{O}$ composition of the milk samples of ($P<0.05$; $F=20880$) and ($P<0.05$; $F=1399.0$), respectively. Both the $\delta^2\text{H}$ and $\delta^{18}\text{O}$ isotopic technique could provide a clear distinction between all the specific regions-of-origins that were evaluated except between the northern part of China (mean=21.63) and New Zealand (mean=21.62), $\delta^{18}\text{O}$ isotopic could not discriminate. The feasibility of $\delta^2\text{H}$ and $\delta^{18}\text{O}$ is mainly based on the distinct isotopic signatures of water in different geographic localities. The range of the mean $\delta^{15}\text{N}$ values of the samples was very close, 3.06 to 5.61%. The nitrogen stable isotope could not provide a clear distinction for most of the milk products because $\delta^{15}\text{N}$ of an animal reflects that of the diet. Hence in cases of similar diet, it cannot provide a distinction between the animals using this technique.

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