NUTRIGENOMICS TODAY: WHAT HAVE WE LEARNED THAT CAN BE APPLIED TOWARD BETTER DOG AND CAT FOOD DEVELOPMENT?

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In 2008, nutrigenomics consisted of a small set of molecular biology tools that explored how the genetics of an organism interacts with the food it consumes. The field was in its infancy and not well established, especially with respect to companion animals. Today nutrigenomics has evolved into several multifaceted approaches including genomics, transcriptomics, proteomics, and metabolomics, to name a few. As a result, the data cascade from these multiple data streams can be complex and difficult to analyze; a systems biology approach utilizing state of the art bioinformatics is necessary to interpret biological mechanisms and hypothesize potential nutritional interventions.

Nutrigenomics has been utilized to develop nutritional interventions to affect gene expression that results in a healthier state for the pet. For example, gene expression is altered as the pet ages, especially in metabolic pathways involving inflammation, oxidative stress, immune function and DNA repair. Knowing this, it is possible to screen ingredients and compounds via cell culture to discover those which would modify the pet's gene expression to mitigate the degeneration of these metabolic pathways. Furthermore, an *ex vivo* screening technique called TruCulture® can identify several bioactives that reduced inflammatory cytokines in the immune cells of dogs and cats. A food developed utilizing these approaches was fed to senior cats for six months and gene expression changed significantly to improve metabolic pathways affected in aging. Furthermore, in client-owned senior cats, there was significant outward improvement of signs of aging with respect to behaviors such as the ability to run, desire for family attention, and ability to play (1).

The foundation of nutritional invention has been to understand metabolism and physiology of a particular disease condition and then provide appropriate nutrition to support a more healthy state. Now that we have the tools of nutrigenomics, we can expand on that foundation to better inform on potential nutritional solutions. A powerful approach is the use of genome-wide association studies (GWAS) to better understand biological mechanisms and pathways to provide enhanced nutritional leads. Using this approach has led to potential nutritional solutions for reducing inflammation in senior dogs (2) and reduction of risk of developing kidney stones in cats (3). Furthermore, we now can identify pets that have a better chance of responding to a particular nutritional intervention based on their genotype. This is paving the way for more targeted or personalized nutrition solutions in the future.

References

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