



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(6): 1749-1750
Received: 10-09-2018
Accepted: 12-10-2018

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Bioinformatics advance in animal feeding & nutritional research

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Abstract

The advances of bioinformatics have allowed new information concerning the physiological effect of different dietary proteins, the effect of dietary methionine on breast-meat accretion, the toxicity of dioxin, protein composition of egg and poultry meat proteins and the safe use of transgenic crops in animal nutrition. Bioinformatics algorithm (bioinformatics tools) sequences could be analyzed to provide useful biological information on the sequenced material. The use of such algorithms in the animal feeding & nutritional research is discussed in this article.

Keywords: Bioinformatics, animal nutrition, animal feeding, proteomics

Introduction

Demand for livestock products is increasing because of the increasing human population, growth in income and urbanization [1]. Most food of animal origin consumed, is currently supplied by small-scale, often mixed crop-livestock family farms or by pastoral livestock keepers [2]. Shortage of animal feed and the increasing cost of feed ingredients need to improve feed utilization. This propelled the beginnings of using bioinformatics technology in animal nutrition.

Bioinformatics is one of the latest additions to scientific vocabulary which seems to suggest a bridge between the world of biology and that of information technology. The development of Bioinformatics studies has brought about a number of new research tools which are important in animal nutrition and food research. The advances of bioinformatics have allowed new information concerning the physiological effect of different dietary proteins, the effect of dietary methionine on breast-meat accretion, the toxicity of dioxin, protein composition of egg and poultry meat proteins and the safe use of transgenic crops in animal nutrition [3]. Therefore, supplementation of the diet as a means of improving nutritive value is becoming commonplace. The ultimate goal of using bioinformatics in animal nutrition is to improve the plane of nutrition through increasing availability of nutrients from feed and to reduce the wastage of the feed [4].

Bioinformatics can be said to be a theoretical discipline which attempt to make predictions about biological functions from sequence data. The exploitation of the vast amount of information in various genome sequence databases is dependent on the ability of the researcher to assign functions to the sequences. Now, using bioinformatics algorithm (bioinformatics tools) sequences could be analyzed to provide useful biological information on the sequenced material. The use of such algorithms in the animal feeding & nutritional research is discussed in this article.

Bioinformatics in improving feed utilization by the ruminants

Feed of low digestibility comprise the major proportion of feeds accessible to most ruminants under smallholder situations [5]. As the ruminants has micro flora to digest the feed in ruman. Bioinformatics helps the researchers to study the genetic organization, understanding of gene expression and function of different genes with the time saving and cost effective algorithms (bioinformatics tool). By the use of bioinformatics tool researchers identify the target gene in genome sequences of microorganisms. Through these finding they suggest the genetic modification in microorganisms to produce such enzymes has been proposed to obtain better ensiling and/or pre-digest the plant material in order to lead to better digestibility in the rumen. The developments of these biological was enhanced largely by genomics and proteomics studies using bioinformatics tool.

Bioinformatics in animal proteomics

In experiments on animals, the scope of the investigations is usually restricted to assessment of the influence of dietary components on the proteome.

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Proteome refers the whole protein content of organism. Arraying of proteins is more difficult than the arraying of DNA, because they have to maintain their correctly folded conformations. Bioinformatics offers a range of tools and different databases to advance analyzing protein expression profiles, monitoring protein-protein interactions, identifying protein posttranslational modifications, screening the substrates of protein kinases, examining the protein targets of small molecules, and proteomic analysis as a function of bioprocess cultivation conditions. Proteomic analysis was quite effective and useful to evaluate the effect of dietary methionine on breast-meat accretion and protein expression in skeletal muscle of broiler chickens [6]. The recent development of bioinformatics tools and the availability of the chicken genome sequence have already allowed the identification of hundreds on novel minor components of the egg [7].

Bioinformatics in animal metabolomics

Metabolomics represents the final step in understanding the function of genes and their proteins. The scope of metabolomic analysis is mainly restricted to the assessment of the influence of dietary components on the metabolome of selected organs or tissue in animal nutrition studies. Like the example of feed additive. Feed additives are materials that are administered to the animal to enhance the effectiveness of nutrients and exert their effects in the gut [8], like antibiotic, enzymes probiotics and prebiotics. Rumen micro-organisms can also be manipulated by adding antibiotics as feed additives, fats to eliminate or reduce rumen ciliate protozoa (defaunation), protein degradation protectors, methane inhibitors, buffer substances, bacteria or rumen content and/or branched chain volatile fatty acids [9]. Bioinformatics helps the investigators to detect the target region in genome Rumen micro-organisms and to predict the will the metabolomics of genes and their proteins. Thus the identification of changes in the biochemical profiles of plasma and urine of experimental animal can also do with the bioinformatics approaches.

Bioinformatics in animal productivity

Nutritional strategies are key tools for influencing ruminant production. Bioinformatics providing new tools that can be used to more clearly understand how nutritional management can be applied to address productivity in animals. Bioinformatics tools DAVID systematically extracting biological meaning from large gene/protein lists are ideal to help to identify the specific markers to manipulate gene expression through use of nutrients or their combinations so as to improve productive as well as overall animal performance. Finally by targeting the specific gene through nutritional manipulation, it may be possible to get the desired livestock performance in terms of health as well as production.

Conclusion

It can be concluded that Bioinformatics has several potential opportunities for improving the efficiency of ruminant digestion and possibilities for utilizing a wider range of feeds than is currently possible. Predictions of modification in rumen microbial population are one such opportunity. In the light of bioinformatics microarray technology has been extensively utilized in livestock species as nutrigenomics research tool to improve food production, quality and their safety in dairy and meat industries. Microarray offers the screening of large numbers of genes simultaneously; giving a

comprehensive picture of the variation of gene expression patterns and provides explanations for complex regulatory interactions. Additives to animal nutrition, are widely used improve the nutrient availability of feeds and the productivity of livestock. There are large numbers of applications of bioinformatics in the fields of microbial genome applications can be successfully manipulated microbial flora of the rumen. Using those researchers allow to reach made faster and more efficiently. Bioinformatics applications will allow biologists to extend expertise far more efficiently and effectively for data analysis and planning of experiments.

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