



Adding Value to Feathers

Goldmehl®: A new potential
for the Petfood industry

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A key component in both canine and feline diets is the protein source used. Protein contains essential and non-essential amino acids (AA) used for energy, muscle deposition and metabolic functions. The quantity of protein required by pets depends on their lifestyle and life stage (AAFCO 2003).

Today's pet food industry is growing rapidly with pet owners demanding high-quality diets for their pets. This demand creates a search for alternative protein sources that may be included into diets to meet the AA requirements of the pets.

As costs for animal proteins increases and availability decreases, processed by-products have become an important primary protein source for the industry. Petfood manufacturers are forced to increase the usage of alternative, more economical feed ingredients.

Traditionally, the pet food industry has been using a range of protein sources, inclu-

ding different processed poultry-byproducts. Although, alternative protein sources have been tested and proven in livestock and other animal species (minks, fish and crustaceans), potential alternatives / raws are used only to a limited extent in companion animals (Dust et al., 2005).

Hydrolyzed, poultry-based proteins - eg hydrolyzed Feather Meal - are economically interesting protein sources used in specific areas of the feed business - like aquaculture. Usage of hydrolyzed Feather Meal in salmon feed is a case in point. These proteins are **economically interesting** and free of anti-nutritional factors. However, the use of (processed) Feather Meal in Petfood has been limited for reasons such as poor digestibility and issues related to marketing (**ingredients declaration**).

Unprocessed feathers are high in crude protein (90 percent), but highly indigestible due to the keratin structure, which contains high amounts of cross linked - disulphite bondings - cystine.

In order to open the S-S bonds and to make the crude feathers available for digestive systems, feathers have to be processed.

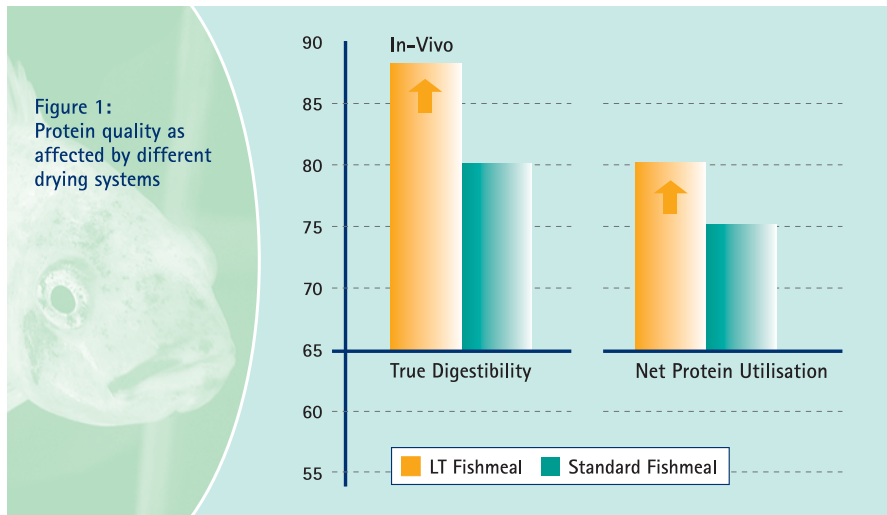
Drying Dictates Quality

Several factors are known to modify digestibility of protein and amino acids. Among the process conditions the drying conditions in particular, seem to play a major role in respect to digestibility and nutritional quality of hydrolyzed Feather Meal.

Hot air

Hot air dryers have already started to attract the interest of the fishmeal producers; the principle of a hot air drying is applied in the low temperature (LT) fishmeal technology. It is a two-step hot air drying characterized by short-term retention and moderate temperatures ensuring that protein quality retains at high levels. In the fishmeal manufacturing this drying process is considered as the most critical unit operation affecting the quality and the nutritional value of fishmeal.

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In contrast to the fishmeal industry (producing LT fishmeal) indirect drying systems such as rotary disc dryer are still common practice in the poultry by-product rendering operation. The main effect due to excess of heat application is the disruption of the hydrogen bonds in protein structures leading to protein denaturation. In this case denatured amino acids cannot be recognised physiologically as amino acids and are utilised, after deamination, as a very expensive source for energy only, thus leaving their fullest potential unexploited.

The LT fishmeal technology imparts minimal denaturing effects on proteins, thus preserving inherent digestibility and biological value. A comparison regarding specific quality aspects is shown in **Figure 1**.

Superior to disc drying

LT fishmeal is superior to standard fishmeal originating from a drying process based on disc drying.

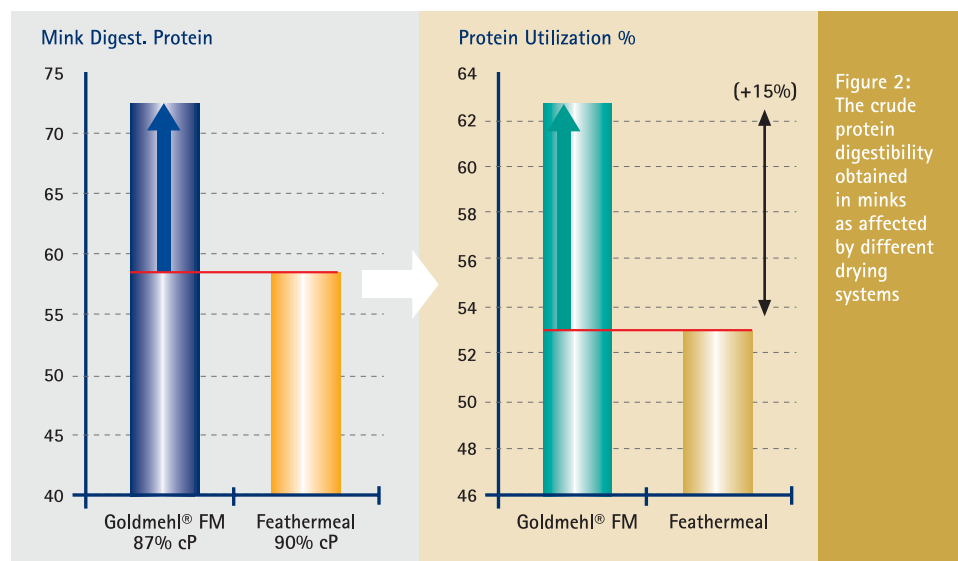
Realising the beneficial effects of a LT fishmeal drying system GePro Geflügel-Protein Vertriebsgesellschaft (Germany/ www.ge-pro.de) has recently launched a new product category of processed poultry by-product based on the LT fishmeal drying system.

Under the brand name GoldMehl[®], a special processed hydrolyzed protein of poultry feathers origin (GoldMehl[®] FM) has been developed, specifically for Petfood.

In several in-vivo trials, conducted at Nofima Ingredients (Fiskeriforskning Institute of Fisheries and Aquaculture Research) at Bergen (Norway) using minks as a model for fish and pet animals, the digestible protein of GoldMehl[®] FM has been assessed. The bioassay with minks served as the standard practice to evaluate bioavailable protein quality.

Not a Marketing Ploy, but Quality Enhancement

In comparison with regular Feather Meal (produced with a disc dryer) the mink digestible protein and the biological available protein of the hydrolyzed Feather Meal manufactured by LT fishmeal technology was clearly superior (see **Figure 2**).



A Potential Poultry Meal Substitute

In addition, the mink digestible protein of GoldMehl[®] FM was very similar to regular poultry meal (**Figure 3**) indicating good potential of GoldMehl[®] FM as a substitute for poultry meal.

Beside the cooking, the optimisation of the drying conditions is considered to be the main factor contributing to the high digestibility values now observed for poultry by-product meal (Miller, 1996).

The negative correlation between the drying conditions and protein quality could also demonstrated by Cho et al., 1982 in blood meal.

Feeding trials done with GoldMehl[®] FM in aquaculture have shown a significant impact as a fish meal replacer in fish and crustaceans, resulting in good growth performance and cost savings of the formulation (Rebafka and Kulshrestha, 2009).

In order to evaluate the value of GoldMehl[®] FM as a protein source in Petfood, a **digestibility trial was conducted in dogs**.

Materials & Methods

The trial has been done at Ideopet Pet Panel (Poland) with 19 adult dogs, different in body weight and age.

Diets tested were based on wheat, corn, sugar beet pulp, tallow, vitamins and minerals. They were designed to be iso-nutritious and iso-energetic. The predicted metabolisable energy (PME) was calculated to reach values

of 351 to 365 kcal/100g. The level of crude protein was set to relatively high levels (28% cp) in order to get clear effects due to different protein sources.

The main difference in the formulation was the percentage addition of regular poultry meal and/or GoldMehl® FM, used as a substitute for poultry meal.

Details of the exchange ratio between poultry meal and GoldMehl® FM are shown in **Table 1**).

The nutritional facts of the test materials (regular poultry meal / GoldMehl® FM) are given in **Table 2**.

Dogs were fed once per day; food intake was measured daily, water was provided ad libitum throughout the study.

Dogs participated in a **7 days** test periode. Within **7 days** of test phase dogs had a 2 days diet adaptation phase followed by a 5 days test periode; during the test phase feces were collected for feces scoring and digestibility measurement. Additionally, the number of defecations and the amount of wet feces were recorded.

Feces were scored between 1= hard to 5 = watery, liquid stool (diarrhea).

Data on feces scoring were transformed into a system of "% of ideal feces".

Results

No food refusals during the trial was recorded.

All diets reached high **dry matter digestibility** above 85% comparable to "premium" dry Petfood.

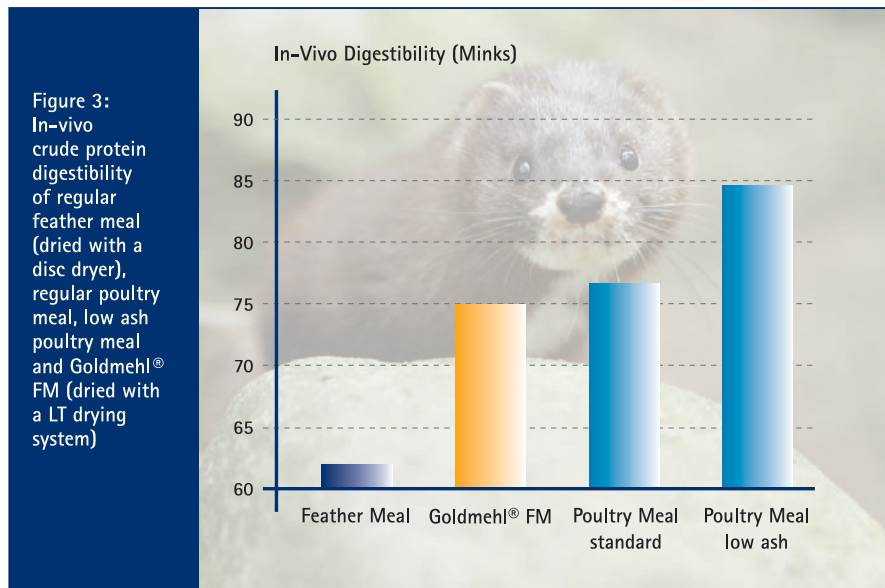
The performance of GoldMehl® FM in terms of the apparent crude protein digestibility was comparable to regular poultry meal, which is inline with results obtained in minks (**Figure 3**).

Even an exchange of 50% up to 100% of poultry meal by GoldMehl® FM (in absolute terms: an addition of 9% to 14% Goldmehl® FM) to the diet did not negatively affect the crude protein digestibility (**Figure 4**).

As expected, high inclusions of GoldMehl® FM negatively affected feces quality, resulting in lower feces scoring. Feces moisture was highest in diet with an inclusion of 14% GoldMehl® FM.

However, feces obtained in diet with a mix of 9% poultry meal and 9% GoldMehl® FM feces were still acceptable.

Even with 14% GoldMehl® FM no diarrhea was observed.



By using regular feather meal instead of GoldMehl® FM to the diet severe digestive disorders should most probably to be expected.

Conclusions

In dogs GoldMehl® FM has feeding values similar to that of poultry meal, and in minks significantly better properties than regular Feather Meal.

Although the raw material is technically poultry feather, the superiority of GoldMehl® FM is attributed to its special process which is very similar to the production conditions of high valuable LT fishmeal.

GoldMehl® FM has the potential to partly substitute poultry meal and help to reduce

formulation costs, particularly in basic to standard Petfood.

There might be a maximum level of GoldMehl® FM which should not exceed to avoid feces problems. Several recipe components such as specific types of fibres, good quality fats and well gelatinized carbohydrates can help to accept higher levels of GoldMehl® FM.

Applying a state-of-the art drying process to the production of Feather Meal creates an added value to feathers. The recycling of feathers is environmental friendly and is able to partly release pressure on traditional raws. Further, it can be regarded as sustainable protein production in the wake of increasing poultry production in all the parts of the world.

The industry should overcome its general issue of feather meal with labeling and education to pet owners. Nevertheless the concept "GoldMehl®" has a serious future potential.

Table 1: The inclusion rates (in %) of poultry meal and Goldmehl® FM (as absolute figures) in the trial recipes

% in the recipe	Control	Recipe 50:50	Recipe 0:100
Regular poultry meal	18	9	0
Goldmehl® FM	0	9	14
Ratio	100:0	50:50	0:100
Poultry Meal: Goldmehl® FM			

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Table 2: Proximate analysis and crude protein (cp) digestibility of regular pulty meal and Goldmehl® FM used

	Crude protein (%)	Crude fat (%)	Crude ash (%)	In-vitro cp digestibility (0.02% pepsine)	In-vivo cp digestibility (Minks)
Poultry meal	62	12	16	85	75
Goldmehl® FM	87	7	2	75	73

References

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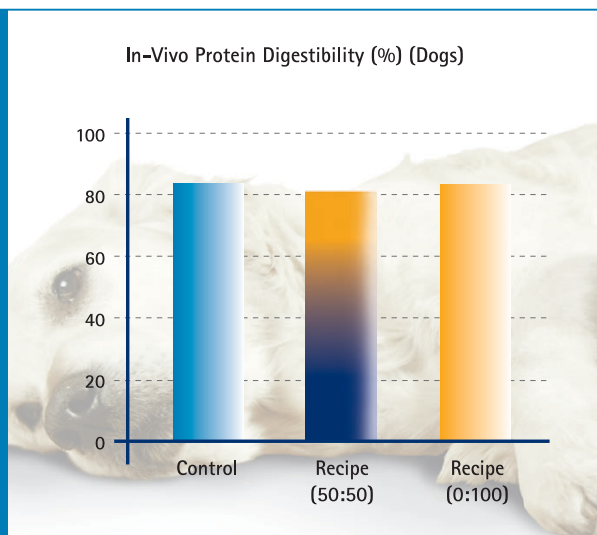
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Figure 4: The apparent crude protein digestibility of Petfood manufactured with regular poultry meal (Control), a mix of regular poultry meal and GoldMehl® FM at a ratio of 50:50 (Recipe 50:50) and Goldmehl® FM only (Recipe 0:100).

The in-vivo test has been conducted with adult dogs. SE (Standard Error) is calculated for "Control": 0.7; Recipe (50:50): 1.7 and Recipe (0:100): 0.7.



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Table 3: Wet feces output and feces scoring from recipe tested

	Control	Recipe 50:50	Recipe 0:100
Wet feces output (g/1000 kcal)	143	166	160
Feces moisture (%)	68.5	73	74
Feces score (1 to 5)	2.2	2.3	2.8
Feces (% ideal)	87.5	81.9	49.3