CLAIMS

1. Method for producing highly digestible, partly hydrolyzed keratinaceous material, preferably from feathers, hair, wool, hooves or nails, comprising the steps of:
   (1) hydrolyzing keratinaceous material in the presence of water, in a hydrolyzer with heat and at a pressure between 2 bar and 100 bar to obtain a partly hydrolyzed keratinaceous material;
   (2) pre-drying the partly hydrolyzed keratinaceous material of step (1) using a conventional dryer to obtain a semi-dried partly hydrolyzed keratinaceous material having a solids content of 60wt% or higher, preferably between 60-85wt%; and
   (3) concurrently drying and grinding the semi-dried partly hydrolyzed keratinaceous material of step (2) in an air turbulence mill, at atmospheric pressure to obtain dried partly hydrolyzed keratinaceous material;

   wherein preferably steps (2) and (3) are carried out such that the drop in pepsin and/or ileal digestibility caused by steps (2) and (3) is less than 10%, and/or the pepsin and ileal digestibility of the dried partly hydrolyzed keratinaceous material is higher than respectively 75% and 80%;
   wherein the resultant dried partly hydrolyzed keratinaceous material comprises at least partly insoluble material, and wherein the average particle size of the dried partly hydrolyzed keratinaceous material (d50) leaving the air turbulence mill is between 20 µm and 0.7 mm and the d90 is below 1 mm as measured with laser diffraction using a dry powder Beckman Coulter particle size analyzer.

2. The method according to claim 1 wherein concurrently drying and grinding the semi-dried partly hydrolyzed keratinaceous material of step (3) in an air turbulence mill is performed at a temperature such that the keratinaceous material remains at a temperature below 90 °C, preferably below 80 °C.

3. The method according to any one of the preceding claims, wherein the conventional dryer of step (2) comprises conventional drying equipment, including surface contact dryers also referred to as agitated contact dryers such as rotary disc dryers, rotary paddle dryers, rotary tube bundle dryers, drum dryers, agitated pan dryers and operated at atmospheric conditions or under vacuum , or a hot air dryer such as a fluidized bed dryer, a ring type dryer, a rotating drum dryer, and/or a belt dryer, preferably a disc dryer operating at atmospheric conditions or under vacuum.

4. The method according to any one of the preceding claims, wherein the air turbulence mill of step (3) comprises a chamber with appropriate inlets and outlets for product and stream(s) of gas in which a rotating member is mounted with stacks of impacting devices which rotating member

can rotate at high speed, and wherein preferably the inner walls of the stator are lined with impacting members, wherein the rotating member rotates at a tip speed between 20-150 m/s.

5. The method according to any one of the preceding claims, wherein the dried partly hydrolyzed keratinaceous material has a homogeneous creamy light color as measured using the CIE L*a*b color space, wherein the (L) value of the keratinaceous material is 50 or higher, preferably 54 or higher, and more preferably 60 or higher, and/or wherein the (b) value is 10 or higher, preferably 12 or higher, and more preferably 14 or higher**.**

6. The method according to any one of the preceding claims, wherein the dried partly hydrolyzed keratinaceous material has an average particle size (d50) of between 20 µm and 0.5 mm measured by laser diffraction using a dry powder Beckman Coulter particle size analyzer, preferably of between about 50 µm and 300 µm.

7. The method according to any one of the preceding claims, wherein the dried and ground digestible keratinaceous material has a d90 divided by d10 of 20 or less, preferably of 15 or less.

8. The method according to any one of the preceding claims, wherein the dried and ground digestible keratinaceous material leaving the air turbulence mill has a poured density of 0.2 g/cm^3 or higher, preferably of 0.25 g/cm^3 or higher.

9. The method according to any one of the preceding claims, wherein the dried and ground digestible keratinaceous material as leaving the air turbulence mill has a tapped bulk density of 0.25 g/cm^3 or higher, preferably of 0.3 g/cm^3 or higher, even more preferably 0.35 g/cm^3 or higher.

10. The method according to any one of the preceding claims wherein a blood product, such as whole blood, clotted blood (e.g. steam coagulated blood), dried blood meal, semi-dried blood meal or other blood fractions, is fed into the conventional drying equipment of step (2) together with the partly hydrolyzed keratinaceous material obtained in step (1), wherein the relative amount of blood and keratinaceous material based on dry weight is between 10-50 wt% blood and 50-90% keratinaceous material.

11. The method according to any one of the preceding claims wherein a blood product, such as whole blood, clotted blood (e.g. steam coagulated blood), dried blood meal, semi-dried blood meal or other blood fractions, is fed into the air turbulence mill of step (3) together with the semi-dried

partly hydrolyzed keratinaceous material obtained in step (2), wherein the relative amount of blood and keratinaceous material based on dry weight is between 10-50 wt% blood and 50-90% keratinaceous material.

12. The method according to any one of the preceding claims wherein the resultant dried keratinaceous material with or without blood has a pepsin and/or ileal digestibility higher than respectively 80% and 90%, more preferably higher than respectively 82% and 92%.

13. A method of retrofitting a keratinaceous material processing line, such as a feather meal processing line, by adding to its existing conventional drying equipment an air turbulence mill with its ancillary equipment, preferably wherein said keratinaceous material processing line comprises a hydrolyzer.

14. A keratinaceous material processing line, such as a feather meal processing line comprising:
    (i) a hydrolyzer;
    (ii) a conventional dryer; and
    (iii) an air turbulence mill;

    wherein the hydrolyzer and the conventional dryer are arranged such that at least part of, preferably all of, the output of the hydrolyzer can be fed to the conventional dryer, and wherein the conventional dryer and the air turbulence mill are arranged such that at least part of, preferably all of, the output of the conventional dryer can be fed to the air turbulence mill.