IDENTIFICATION OF ANIMAL AND PLANT PROTEINS IN FOOD INGREDIENTS AND MEAT PRODUCTS

MERET* Valérie, GUIZARD* Cécile, LEDUC** Virginie, NGUYEN* Thi Daï, DA-RIZ* Véronique, DEMEULEMESTER* Claude

* CTSCCV (Centre Technique de la Salaison, de la Charcuterie et des Conserves de Viandes) - 7, avenue du Général De Gaulle - F94700 Maisons-Alfort - France; ** Allerbio, F-55270 Varennes en Argonne, France

1. INTRODUCTION

Background. Characterization of components in food ingredients and meat products is of great interest for public health and also for economic reasons. Chemical analyses are widely performed in food laboratories; histology and immunochemistry techniques are rarely used.

Objectives. Some results obtained by histology and immunochemistry techniques are shown in this report. These techniques give a complement of information on the composition of food products .

2. METHODS

Immunoprints after SDS-PAGE (Sodium Dodecyl Sulphate - PolyAcrylamide Gel Electrophoresis) were performed as previously described (Leduc *et al.*,1997). ELISA (Enzyme-Linked ImmunoSorbent Assay) were performed according to Berger *et al.* (1988) and to Demeulemester and Guizard (1996).

Histology was performed after the samples were embedded in paraffin as previously described (Barraud, 1963; AFNOR-CTSCCV, 1987), the original technique being automated and slightly modified (Bergeron *et al.*, 1993).

3. RESULTS AND DISCUSSIONS

The diversity of molecules contained in milk food ingredients was revealed by silver protein staining, by detection of antigens using rabbit antisera and by detection of allergens using human patients' sera (figure 1). Ingredient M2 (skim-milk powder) contains the five main groups of milk proteins: lactoferrin (Lf), bovine serum albumin (BSA), caseins (Cas), ß-lactoglobulin (ß-Lg) and α-lactalbumin (α-Lac). Ingredients M1 (whey) and M3 (whey) are rich in α-lactalbumin and ß-lactoglobulin and poor in caseins and lactoferrin. M4 (sodium caseinate) contains essentially caseins and lactoferrin and also few BSA and ß-lactoglobulin as revealed by rabbit anti-whey antiserum.

A list of immunochemical analysis to be performed on some meat products according to the order of the most frequently found anomalies is reported on table I. These analyses should be adjusted in function of the product labelling and the evolution of ingredient prices. Other analyses such as detection of pork or genetically modified organisms could be performed on products submitted to religious or ethical obligations.

Some anomalies detected by histology are shown on figures 2, 3, 4 and 5. Results are obtained after observation of specific images by trained people specialised in this field.

4. CONCLUSIONS

Immunoprint techniques allow to visualize the molecules present in food ingredients; they are not sensitive enough for sterilized products. ELISA techniques enable ingredients and animal species to be detected in raw, pasteurized and sterilized products. These techniques are cheaper than DNA techniques and give at the moment very satisfying results.

Histology allows the detection of animal organs (muscle, lung, spleen, heart, liver, skin, ganglions), animal ingredients (mechanically deboned meat, some proteic binders), cellular tissues (spices, vegetables, truffles) and plant ingredients (gluten, soya isolates, soya concentrates, soya texturates, peas, field-bean), native or modified starch, hydrocolloids (carrageenans, carob-bean, xanthane, alginates, guar). Histology is useful to study food ingredients and meat products such as pâtés, sausages,ham, 'ready-made' meals, meat stuffings (e.g. raviolis) and minced meat.

These techniques are not quantitative, but very low rates can be detected. They are a complement for chemical analysis to assess conformity of food products with labelling and practices (CTSCCV, 1997) and to warrant fairness in trades.

5. REFERENCES

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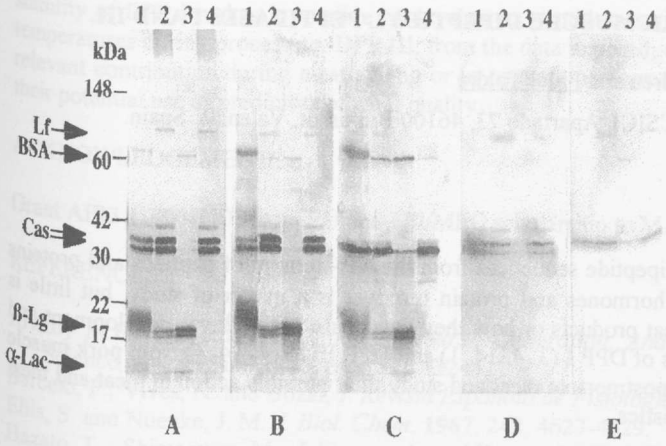

Figure 1. SDS-PAGE of milk ingredients.
A: silver staining;
B: antigens revealed by rabbit anti-milk antiserum;
C: antigens revealed by rabbit anti-whey antiserum;
D: allergens revealed by human serum H[15]xM;
E: allergens revealed by human serum H[17]xM;
1: whey (proteic binder);
2: skim-milk powder;
3: whey;
4: sodium caseinate;
Lf: lactoferrin;
BSA: bovine serum albumin;
Cas: caseins;
ß-Lg: ß-lactoglobulin;
α-Lac: α-lactalbumin.

Meat products	Immunochemical analysis *
Cooked sausage (depends on labelling)	(1) milk; (2) poultry; (3) beef; (4) mutton
Cooked ham (depends on labelling)	(1) milk; (2) beef; (3) poultry
Andouille (depends on labelling)	(1) egg white; (2) beef; (3) poultry; (4) milk
Pork rillettes (depends on labelling)	(1) milk; (2) poultry; (3) egg white; (4) beef
Corned beef (depends on labelling)	(1) milk; (2) pork; (3) poultry; (4) egg white
Francfurter type sausage (depends on labelling)	(1) milk; (2) poultry; (3) beef; (4) egg white
Merguez (labelling: beef, mutton)	(1) milk; (2) pork
Beef sausage (labelling: beef, starch, spices)	(1) poultry; (2) mutton; (3) milk; (4) egg white; (5) pork

Table I. Immunochemical analysis to perform on some types of meat products. * Sorting in order of the most frequently found anomalies.

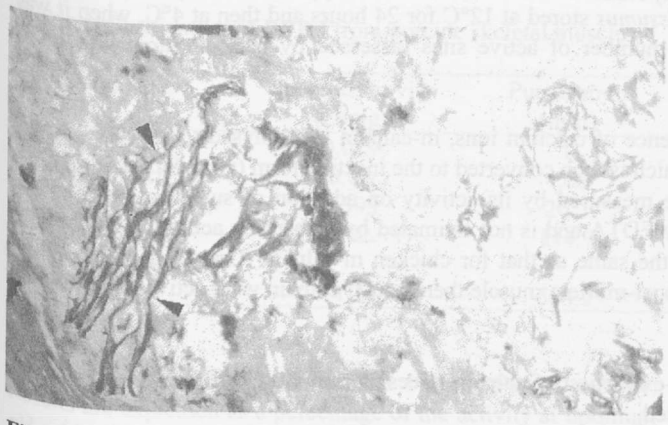

Figure 2. Soya texturate in steak (Gx100 - Calleja staining).

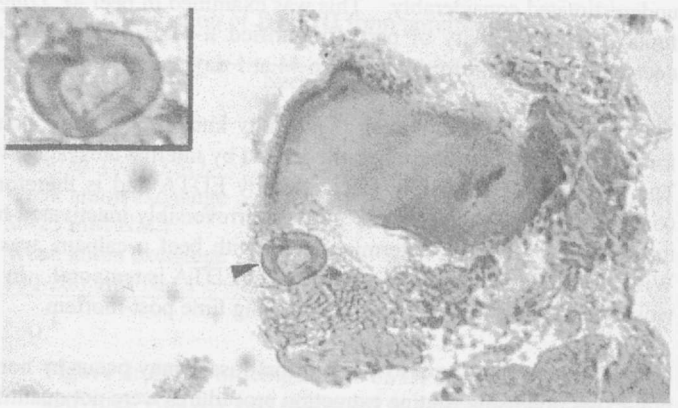

Figure 3. Plasma in ham (Gx400 - Calleja staining).

Figure 4. Starch in ham (Gx400 - Calleja staining).

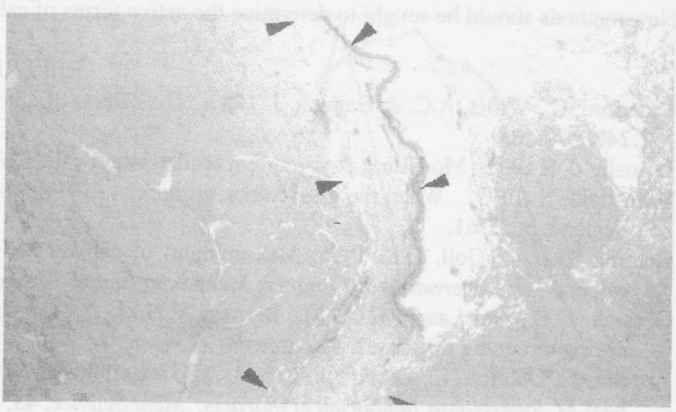

Figure 5. Poultry skin in pâté en croûte (Gx100 - Calleja staining).