

Rapid On-Site Tests for Ensuring Freshness and Safety of Meat and Meat Products

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ABSTRACT

Ensuring the quality and safety of meat and meat products is a critical responsibility in public health and food inspection systems. Rapid “platform tests” performed at slaughterhouses and meat processing units help inspectors assess freshness, detect spoilage, and prevent unsafe meat from entering the food chain. These tests are simple, economical, and provide immediate results without requiring advanced laboratory equipment. The present article highlights commonly used physical and chemical platform tests used for evaluating meat quality, explains their scientific basis in simple language, and emphasizes their importance in protecting consumer health and economic interests.

INTRODUCTION

Meat is a highly nutritious food rich in proteins, vitamins, and essential minerals. However, because of its high moisture and nutrient content, it is also highly susceptible to microbial spoilage and biochemical deterioration (Lawrie and Ledward, 2014). Therefore, assessing meat quality at the earliest stage after slaughter is

essential to ensure that only wholesome meat reaches consumers.

In slaughterhouses and retail meat shops, inspectors cannot always rely on sophisticated laboratory techniques. Instead, they use rapid screening methods known as platform tests. These tests help in immediate decision-making from three important perspectives:

1. **Quality control** – to detect early spoilage
2. **Public health protection** – to prevent food-borne illness
3. **Economic benefit** – to avoid rejection of consignments and export losses

Platform tests act as the first line of defense in meat safety management systems.

Physical Platform Tests for Meat Quality Evaluation

Physical evaluation primarily involves sensory examination and simple instrumental measurements.

Fresh meat shows a characteristic species-specific colour. Goat and sheep meat appear light red, buffalo meat is dark red, and pork is pale light red. The fat should be firm and white to creamy in appearance. Texture should be elastic and firm, without sliminess or stickiness. A pleasant, species-specific odour indicates freshness, while sour or putrid smell suggests spoilage.

Among physical methods, pH measurement is scientifically significant. After slaughter, glycogen converts into lactic acid, lowering the pH of muscle tissue. Healthy meat normally reaches an ultimate pH between 5.2 and 5.8. Higher pH values indicate poor keeping quality and increased microbial activity (Aberle *et al.*, 2012). Another important test is Extract Release Volume (ERV), which measures the water-holding capacity of meat. Spoiled meat shows reduced extract release due to protein degradation.

The traditional boiling test also helps detect abnormal odours released upon cooking, which may not be evident in raw meat.

Table 1 - Physical Platform Tests for Meat Quality Evaluation

Test Name	Observation	Interpretation
Organoleptic Evaluation (Colour, Texture, Odour)	Normal species-specific red/light red colour; firm, elastic texture; pleasant meaty odour; no slime	Indicates fresh and wholesome meat
pH Measurement	5.2–5.8 normal; >6.7 elevated; ≥7 alkaline	Normal pH indicates good quality; high pH suggests spoilage or bacterial growth
Extract Release Volume (ERV)	Mutton ≈ 20 ml; Pork > 29 ml; reduced volume	Lower ERV indicates spoilage due to protein degradation
Boiling Test	Normal smell after cooking; absence of foul odour	Abnormal odour indicates decomposition and unfitness

Chemical Platform Tests for Meat Quality Evaluation

Chemical tests provide additional confirmation of meat freshness and physiological conditions. The Nitrazine Yellow test determines acidity by colour change. A yellow colour indicates good keeping quality, whereas bluish violet suggests suspected or unfit meat. The Malachite Green test evaluates bleeding efficiency. Proper bleeding improves keeping quality, while imperfect bleeding accelerates spoilage. The Copper Sulphate test detects staleness by observing broth clarity. Clear broth indicates freshness, whereas turbidity suggests deterioration. The Rimmington and Fowrie test differentiate jaundice from harmless carotene pigmentation in fat. This prevents unnecessary condemnation of carcasses. The Peroxide test identifies oxidative changes associated with spoilage.

These rapid chemical reactions are particularly useful when immediate decisions must be made at abattoirs (Biswas and Sharma, 2010).

Table 2 - Chemical Platform Tests for Meat Quality Evaluation

Test Name	Observation	Interpretation
Nitrazine Yellow Test	Yellow (pH 6.0); Olive green (pH 6.4); Bluish violet (pH 6.8)	Yellow indicates good keeping quality; bluish violet indicates unfit meat
Malachite Green Test	Clear blue; Cloudy green; Cloudy olive green	Clear blue = proper bleeding; olive green = imperfect bleeding
Copper Sulphate Test	Clear broth; Turbid broth; Deep turbidity	Clear broth = fresh; deep turbidity = unfit
Rimmington and Fowrie Test	Yellowish-green lower layer; yellow upper layer	Lower green layer indicates jaundice; upper yellow indicates carotene
Peroxide Test	Brown turbidity; delayed bluish colour; no colour	Brown turbidity = fresh; no colour = unfit

Importance in Public Health and Food Safety

Although advanced microbiological and molecular techniques are available today, platform tests remain highly valuable due to their simplicity, low cost, and immediate results. They support food safety regulations and meat inspection standards recommended by food safety authorities (FSSAI, 2011).

These tests not only prevent spoiled meat from reaching consumers but also protect exporters

from economic losses. Thus, platform tests bridge traditional inspection practices and modern food safety systems.

CONCLUSION

Platform tests are rapid, reliable, and practical tools used in slaughterhouses and meat processing units to assess meat quality. By combining sensory evaluation with simple physical and chemical reactions, inspectors can quickly identify spoilage, improper bleeding, jaundice, and oxidative deterioration. While laboratory confirmation is essential for detailed microbial analysis, platform tests serve as the first safeguard in ensuring safe, wholesome, and marketable meat. Their continued use strengthens public health protection and supports sustainable meat production systems.

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