Bundesministerium
für Ernährung
und Landwirtschaft

Report on the technical discussion “Methods of detection of bullet fragments and measurement methods for the description of a reliable killing effect in simulants”

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Amending of the Federal Hunting Act

Federal Institute for Risk Assessment (BfR) has dealt with scientific principles that enable an assessment of the introduction of bullet fragments into game meat.

Until now, neither standardized terms nor definitions nor standardized procedures for quantifying the effects of the introduction of corpuscular bullet fragments were available for a health assessment.

Background

Intentional entry of substances into feed or food along the food chain takes place with different purposes, e.g. plant protection products, veterinary drugs, or food or feed additives.

A large number of these substances undergo authorization procedures.

Main objectives is to ensure the safety of the substances for the user, the consumer, and the animal by means of prescribed, standardized test procedures and to verify the efficacy of the use or discharge.

Background

Standardized analytical methods usually allow the detection of the substances or their residues in or on the food.

Until now, neither standardized terms nor definitions nor standardized procedures for quantifying the effects of
the introduction of corpuscular bullet fragments were available for a health assessment.

European or worldwide approved test or analysis procedures ensure the reproducibility and scientific acceptance of the test results.

Scientific Working Group

On the initiative of the BfR, national and international scientists from federal and state authorities, universities, research institutions and experts from associations held a series of expert discussions on the definition and interpretation of key terms introduced during the discussions on the amendment of the Federal Hunting Act and also drew up corresponding guidelines describing test procedures for testing the effectiveness of hunting rifle bullets.

The aim of the expert discussions was to develop knowledge-based transparent procedures in order to achieve reproducibility in the test procedures and to provide the hunter with appropriate information for the choice of ammunition.

Aim of the Working Group

In order to make the effectiveness potential of bullets “measurable” and, if necessary, “reproducible”, qualitative and quantitative parameters must be defined.

For evaluation, it must be possible to simulate and reproduce these parameters in “test simulants/test media”.

The core statements agreed upon by the expert panel were summarized and recorded as a respective “conclusion”:

Conclusion of the technical discussions

Conclusion I: Killing cannot be simulated.

Conclusion II: The effectiveness potential of bullets can be described on the basis of parameters.

Conclusion III: The effectiveness potential of a bullet can be simulated in test simulants/test media, mapped, and evaluated.

Conclusion IV: The expert panel proposes to refer to test simulant/test medium as “tissue simulant” in the future.

The effectiveness potential of bullets

- Effect of the bullet on the biological tissue
- Optimum effect of the bullet with an ethical hunting shot
- Effect of the bullet on the hunted game with suitable point of impact
- **Physical effectiveness potential**

Physical effectiveness potential (I)

The physical effectiveness potential comprises the physical and design properties of the bullet. It can be determined after firing at a test simulant/medium.

“Measurable” is the effectiveness potential of bullets when the effectiveness potential can be adequately described by specific parameters.

In summary, the effectiveness potential is the ability of a bullet to perform a certain amount of deformation work (tissue destruction) in the game body or the test simulant/medium.

Physical effectiveness potential (II)

The expert panel defined in more detail the effectiveness potential of a bullet depend on/of:

- the energy of the bullet before the target (included are: bullet mass and bullet velocity before the target),
- energy conversion in the target (included are: deformation readiness of the bullet, type of change in cross-sectional loading, fragmentation, qualitative and quantitative characteristics of the basic geometry of the cavern),
- the exit energy as a function of the process (included are: bullet residual mass and bullet velocity after the target).

Physical effectiveness potential (III)

Proof of the effectiveness potential is provided by determining characteristic data and measurable parameters of the cavity in a ballistic test simulant/test medium:

- Indication of the type of test medium,
- Parameters of the cavity (measurable).

Measurable are:

- Cavity length,
- Maximum expansion of the cavity,
- Location of the maximum extension,
- Penetration depth of the bullet,
- Volume of the cavity in the test medium soap

Physical effectiveness potential (IV)

From the characteristic data and parameters of the cavity the following can be derived/ determined by calculation or measurement:

- Volume of the cavity—e.g., calculated via image evaluation for the test medium soap,
- Volume of the temporary cavity—e.g., via image evaluation in the test medium gelatin,
- Crack surfaces of the cavity in the test medium gelatin (segmented),
- Crack lengths in the test medium gelatin (segmented).

From the parameters of the cavity, it may be possible in the future to derive the energy output per path.

Conclusion III:

The effectiveness potential of a bullet can be simulated in test simulants/test media, mapped, and evaluated.

The term “effectiveness potential of bullets” alone does not carry the day but must be further defined in terms of its specific physical property by quantitative and qualitative parameters.

Further work of theWorking group
Definitions and terms (I)

Definition of the effect of a bullet,
Definition of effectiveness potential,
Definition of minimum impact energy/minimum impact speed,
Definition of the impact energy above which a change in bullet behavior becomes apparent,
Definition of game classes,
Definition of deformation bullet,
Definition of fragmentation classes (quantitative),
Designation of the product profile

Definitions and terms (II)

Definition of fragmentation classes (quantitative)

Fragmentation class	Delivery bullet material to the game	material	Projectile name.
I	0 % bis 20 %	leaded deformation bullets	mass-stable deformation projectiles
II	21 % bis 40 %	lead fragments	Partial disintegrator: with defined residual body (depending on bullet design and impact velocity)
III	41 % bis 60 %	lead fragments	Partial disintegrator: with defined lower residual body (depending on bullet design and impact velocity)
IV	mehr als 60 %	lead fragments	Full or partial decomposer: without defined residual body

Specific information on fragmentation classes was added following a member survey conducted by the Association of Manufacturers of Hunting, Sporting and Ammunition Weapons (JSM) and Fachverband Groß- und Außenhandel mit Jagd und Sportwaffen e.V

Proposal for the Product profile

This tabular product specification for hunting rifle bullets for killing food-producing game species is divided into:

1. General information on the bullet

   (e.g. bullet manufacturer, - designation, - type,-mass, -materials, …….

2. Physical profile of the test method (Annex 1-4)

   (e.g. minimum impact energy, impact energy, residual mass of projectile, maximum penetration depth …..

3. Chemical profile of the test method.

   (e.g. bullet material jacket, initial mass, rest mass, bullet material core…mass- and depth-dependent distribution of fragments in the test medium)

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