

ЕВРОПЕЙСКИЙ КОНГРЕСС РАБОТНИКОВ
И И И МЯСНОЙ ПРОМЫШЛЕННОСТИ

th EUROPEAN CONGRESS
OF MEAT RESEARCH INSTITUTES

ter EUROPÄISCHER KONGREß
DER FLEISCHFORSCHUNGSINSTITUTE

ème CONGRES EUROPEEN
DES INSTITUTS DE RECHERCHES
SUR LES VIANDES

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ONE OF THE REGULARITIES
OF THE PHYSICO-CHEMICAL
TECHNOLOGY OF BLOOD

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МОСКВА 1962г.

237

ONE OF THE REGULARITIES OF THE
PHYSICO-CHEMICAL TECHNOLOGY OF BLOOD

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Regularity in separation of animal blood

When starting the first mechanized blood-albumin plant in Kostov-on-Don, it has turned out that the separation of defibrinated blood in Swedish blood separators with a capacity of 500 l/hr provides a scarlet-coloured blood serum. It was clear that, when separating the blood at 6000-8000 r.p.m. of the separator drum, there was haemolysis of the defibrinated blood. This serum is useful for technical purposes and we have prepared light-coloured technical albumin from it in the form of a pale-yellow powder.

In 1931-1932 the All-Union Meat Research Institute set up the problem of optimum separation of animal blood, which was to be solved by a group of researchers of this Institute who dealt with the investigation of blood.

De Lavall separated milk in a pear-like apparatus designed for separation (see circuit).

Following De Lavall, we have made a pear-like apparatus for separation with a maximum diameter of 300 mm and a height of 400 mm. We have altered the r.p.m. of the pear, its capacity, temperature of separation and other specifications. The circumferential speed (W) was calculated, as usually, by the r.p.m. of the pear.

$$W = \frac{2\pi R_n}{60} \quad \text{m/sec} \quad (1)$$

ry technical data. The temperature of the blood directly before separation ranged from 15 to 20°. The blood was taken fresh, not later than 20 min. to 1 hr after killing the animal.

23⁸

Name of separator type	Capacity, l/hr	Diameter of separator drum, cm	Separator drum, r.p.m.	Centrifugal force, kg/cm ²	Circumference, m	Colour of blood in test glass
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Small Ural separator	15	60	10	13000	17.32	70.6 Good
Imported "Zenith"	25	-	10	10000	17.30	52.3 Good
Chem. Ind. serum separator	25	-	13.5	10000	17.0	71.10 Good
Ural separator "Zvezda"	150	6000	17.0	7600	15.35	67.60 Good
Imported Lavall A-V-6	300	-	22.0	5100	15.20	70.0 Good
Ditto	300	-	22.0	7000	47.0	96.0 Scarlet
Imported Lavall A-V-8	500	2000	30.0	4172	15.1	65.6 Good
Ditto	500	2000	30.0	7800	41.7	110.0 Scarlet

R - maximum radius of pear, cm (I.D.), n - r.p.m.

The pressure on the drum wall at the maximum diameter was determined according to the following formula:

$$P = \frac{4\pi^2 n^2 \gamma h.B (R^3 - r^3)}{3600 \cdot g \cdot R} \quad (2)$$

n - r.p.m.,

γ - specific weight of defibrinated blood, kg/m³,

h - height of ring equal to 1 cm,

b - thickness of ring equal to 1 cm,

g - 981 cm/sec².

Brightshedel (2) simplified the formula for determining the pressure, kg/cm².

$$P = \frac{0.0003784 \cdot n^2 (R^3 - r^3)}{R} \text{ kg/cm}^2 \quad (3)$$

n - r.p.m.,

R - maximum internal radius of pear, cm,

r - mean radius of blood ring, cm.

Our experiments have made it clear that at P equal to 42-47 kg/cm² a light scarlet-coloured albuminous serum is provided. By reducing the r.p.m. we have attained P = 15-16 kg/cm² in which case the serum was of a light-lemon-pale colour that quite satisfied us. After this series of experiments we have turned to experiments on separating blood in small models of milk separators, adapting them for the process of separating defibrinated blood. A summary table of separating blood in such most different separators follows herein with indication of necessary

Note: The colour is marked good if it is light-lemon-pale in a 25 cm^3 test glass.

On the basis of the mentioned investigations we have drawn the regularity of non-haemolytic separation of defibrinated blood of horned cattle (cows), which is graphically expressed as follows (Fig.2).

The regularity of non-haemolytic separation of defibrinated blood is formulated by us as follows.

In order to provide light colours of non-haemolytic serum in a special blood separator, it is necessary to filter the blood to be separated very carefully. Sterile filters of a double layer of gauze have turned to be of high quality. The blood should be uniformly supplied for separation; its temperature should be $15 - 20^\circ$. The supply of defibrinated blood should be adjusted according to the capacity of the separator. The separator drum r.p.m. should correspond to the diagram of blood separation so that the centrifugal force, developed during separation, should be within the range of $15-17\text{ kg/cm}^2$.

The following is required for altering a milk separator into a blood one;

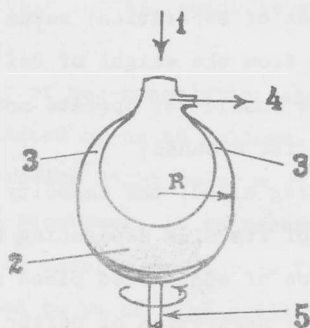
- 1) alter the r.p.m. so that the centrifugal force at the maximum inside diameter should be within the range of $15-17\text{ kg/cm}^2$. This is easily determined by the diagram (for instance, at $d = 23\text{ cm}$, $n = 4500\text{ r.p.m.}$ that corresponds to $P = 15\text{ kg/cm}^2$);
- 2) lengthen the path of blood separation by altering the location of the holes in the plates of the separator (approximately 2 cm lower by the vertical).

The process of blood separation should be effected following the rules given herein;

- 1) filter the blood as given earlier;
- 2) maintain the temperature of separation at $15-20^{\circ}$;
- 3) product output of separation: serum - $60-65\%$; blood elements - $40-35\%$ from the weight of defibrinated blood;
- 4) the separator should not operate more than 4 hours running, after which it is cleaned;
- 5) when separating blood, the capacity of the apparatus is approximately 20% of its milk separating capacity;
- 6) the separation of stabilized blood provides a somewhat better effect than the separation of defibrinated blood.

The amount of produced separator serum is 2.6 - fold that of so-called settled serum.

Separator serum is used with success in the sausage and confectionery industries in lieu of egg whites, as well as in catering in a great number of dishes in lieu of eggs.



Captions to figures

Fig. 1. Circuit of pear-like milk separating apparatus according to De Lavall: 1 - whole milk inlet, 2 - zone of milk centrifuging, 3 - rising flow of cream, 4 - cream outlet, 5 - axis of pear-like separator.

248

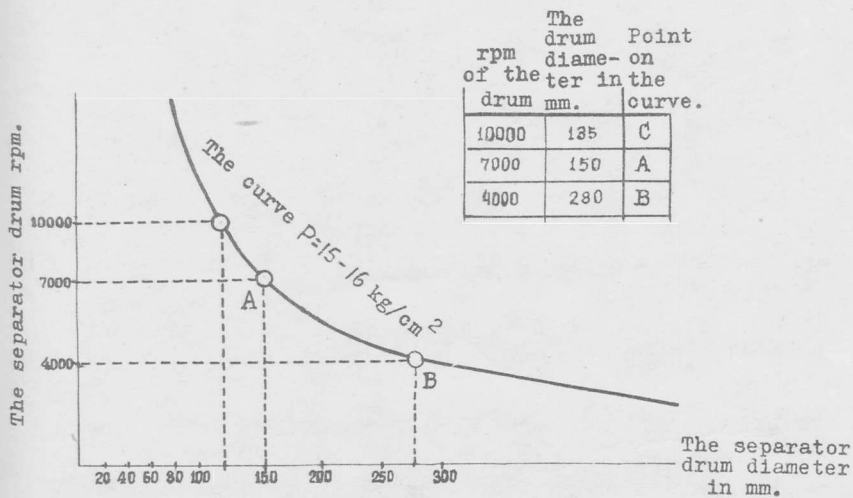


Fig. 2. Diagram of defibrinated blood separation

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