This invention relates to a process for the production of a new and improved milk powder.

An object of this invention is to produce an improved milk powder which, when dissolved, will have an enhanced resistance to injurious bacteria as compared with the milk powders at present on the market.

A further object of this invention is to produce an improved milk powder, which will be suitable for household use in the preparation of foods, particularly in hot climates and will be a technically adequate milk substance in the manufacture of chocolate and sweetmeats.

With these objects in view the process of this invention comprises heating skimmed milk to a temperature above 100°C., cooling to about 35°C., treating with a pure culture of lactic acid bacteria, emulsifying while cooling to about 18° C., whereby the milk sugar is converted into lactic acid, discontinuing the operation before the proteins begin to separate, emulsifying another portion of either skimmed or full cream milk, adding thereto at about 25° C., milk sugar or raw sugar and eventually liquid vegetable fat, if skimmed milk is used, or milk sugar or raw sugar only, if full cream is used, spraying the two portions of milk either separately or together into a drying chamber, so that a greater quantity of the second mentioned milk is present, and drying at about 80° C., in an atmosphere which is placed under an electric tension, by an electric current, in order to charge the minute particles, which thus repel and attract each other.

The drying process may be effected by atomising the milk while heating by hot air circulation.

The milk may be atomised into the circulating air under the influence of a week atmospheric electrical discharge. This may be effected by the use of a rotating cylindrical diffuser connected to

an electrical circuit which charges the atomised particles and causes them to repel one another.

The following example illustrates how the process of the invention may be carried into effect.

The milk base consists partly of sterilised skimmed milk into which is introduced pure cultures of lactic acid bacteria and partly of either skimmed or full cream milk.

In order to obtain the best results the formation of lactic acid should be limited to one fifth of the milk to be dried, or less.

1000 litres of milk base may be prepared and dried in the following manner:-

200 litres of skimmed milk are heated to a temperature of about 120° C. and then cooled to about 35° C. at which temperature the milk is treated with pure cultures of lactic acid bacteria, for example B. Casei and Streptococcus lactious, and emulsified while cooling from 55° C to 18° C. During this operation the milk sugar is converted into lactic acid. The operation is discontinued before the proteins begin to separate.

800 litres of either skimmed or full cream milk are emulsified, and during the emulsification at about 20° C., not less than 5 kgms milk sugar or raw sugar and not less than 5 kgms of liquid vegetable fat are added if skimmed milk is used, and not less than 4 kgms of milk sugar or raw sugar without an addition of vegetable fat are added if full cream milk is used. The exact amount of additions depends upon the quality of milk powder to be produced.

The two portions of treated milk are dried simultaneously by spraying them either separately or together at 80°C. into a drying chamber in which they are atomised under heat in a current of circulating hot air, which may be under the influence of a weak atmospheric electrical discharge in a rotating cylindrical diffuser which is

connected to an electrical circuit whereby the particles become electrically charged.

An analysis of a skimmed milk powder produced according to this example is as follows:-

Water	5.89 %
Main constituents calculated on the dry substance:	
Ash	6.1 %
Fat	0.9 %
Casein	23.3 %
Direct reducing sugar (calculated as milk sugar)	44,- %
Reducing sugar after invertion (calculated as milk sugar)	16,- %

No starch was present.

Practical tests at a temperature of 24°C., have demonstrated the efficacy of the milk powder of this invention in resisting the effects of injurious bacteria on the dissolved milk powder, as compared with other milk products now on the market.

Further it has been found that the milk powder of this invention has a high concentration of lactiferous matter.

Storage tests carried out over a period of a year have shown that milk powder products produced according to this invention exhibit an improvement in quality over other milk powders on the market in that the product retains its light powder form and does not agglomerate into hard lumps or cakes. This is due to the employment of the above described drying process.

The smaller portion of sterilised milk instead of being treated for the formation of cultivated lactic acid, or in addition thereto, may possibly be treated with pure lactic acid, that is, such as is free from the bacterial culture by means of which it was produced, it having been shown that such pure lactic acid, technical or chemical, possesses on the whole parallel qualities to that containing bacteria.

When using lactose or cane sugar for the manufacture of so-called sweetened milk or condensed milk the sugar substance may first be dissolved in the smaller portion of milk treated with cultivated lactic acid cultures, after which lactic acid is added to the portion of milk, which is heated to a suitable temperature to convert the cane sugar into dextrose and levulose, and the lactose into dextrose and galactose. The smaller portion of milk thus treated is then subjected to the method of producing dry milk as hereinbefore described.

The following example illustrates the above described supplement to the process.

1,000 litres of milk: In order to obtain the special quality of dry milk required, it is necessary to proceed in accordance with the general description of the process, attention, however, being paid the following special treatment: the smaller portion of the quantity of milk, about 100 litres of the quantity of milk used in the manufacture and which has been inoculated with cultivated cultures of lactic acid bacteria at a temperature of about 35 C., is heated to about 60 C., when about 20 kgs. of cane sugar and about 200 grams of pure lactic acid are added and the portion of milk thus treated is left to invert at the above-mentioned temperature. The invert percentage is fixed here subject to the time. The manufacture is then carried on in accordance with the general description of the process.

In the event of cane sugar being added for the production of so-called sweetened dry milk the most suitable method may be first to dissolve the sugar in water or whey, after which lactic acid is added. When the solution is heated to a suitable temperature, the cane sugar is converted to dextrose and levulose and the lactose in the whey, is such is employed, converted to dextrose and galactose. Then the sugar solution is evaporated together with the milk to be manufactured into dry milk.

Pure (technical) lactic acid, that is, such as is free from the bacterial cultures by which it was produced, has been found to possess in the main the same qualities as that conveying the bacteria, and a suitable quantity of pure lactic acid may be added to the milk employed for instance during the process of boiling the milk. Also other organic acids such as tartaric acid, citric acid or other fruit acids, preferably such as are free from the bacterial culture by means of which they were produced, can be added to the milk and especially to that portion thereof, which is treated for the formation of cultivated lactic acid or which is treated with technically or chemically pure lactic acid in addition to or in lieu of the treatment for forming cultivated lactic acid.

The technical compositions of the substances and the weights and the temperatures to be used in the process are not restricted to the illustrative examples given above, the particulars of which may be altered in various ways.