FATS AND PROTEINS RESEARCH FOUNDATION, INC.

Director's Digest

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ENERGY-EFFICIENT CHEMICAL REMOVAL OF PROTEIN FROM ANIMAL BLOOD

Professor Vaughn Vandegrift of Murray State University, with FPRF grant support, is developing new methods for the removal of protein from animal blood by chemical means. This study has two purposes. Blood protein in the form of dried blood meal has high nutritive value as an animal feed supplement. Furthermore, blood and blood protein have a high BOD (Biochemical Oxygen Demand) and, if sewered, can be the cause of unnecessarily high municipal BOD charges. It is, therefore, in the processor's best interest to remove blood protein for its intrinsic value as well as for pollution prevention.

Chemical precipitation of blood protein could be very competitive with and have advantages over the conventional steam coagulation method because it requires a very minimal use of energy. The criteria for a chemical precipitant, in addition to effectiveness, are low cost, ready availability and permitted use in animal feeds. If possible, the agent should add nutritional value to the protein product. Any procedures developed must extend over a range of conditions attainable by a renderer. Also, initial capital requirements should be minimal.

Mindful of these necessary qualifications, Dr. Vandegrift investigated the use of the non-toxic precipitants sodium polyphosphate, sodium lignosulfonate, lignin, ferric chloride, aluminum sulfate, zinc sulfate, methanol, and acetone. Some of these chemicals are used in quantitative clinical chemistry and others for the removal of protein from wastewaters of cheese, fish and meat processing plants.

All of these agents save sodium lignosulfonate and acetone are effective in removing in excess of 98 per cent of protein from fresh whole blood. The use of the organic solvents would require a closed fireproof solvent recovery system and capital requirements for such a system could be too high for practical consideration.

Each of these agents requires an optimum pH and dilution of the blood to which it is added to be effective at the 98 plus per cent level. In both the steam and chemical methods the precipitate contains an undesirable amount of water. Dr. Vandegrift is therefore investigating low energy methods of decreasing this entrained water. Techniques being tried include improved centrifugation and mechanical pressure to expel physically trapped water. Also, the precipitants sodium polyphosphate,

zinc sulfate and a purified sodium lignosulfonate may show potential as better precipitants when applied in conjunction with dewatering agents.

Commercial drying procedures in use or available for the processing of animal blood are vat drying (prolonged cooking of whole blood to dryness) or some form of high temperature-short time processing such as flash drying (primarily ring drying, drum drying, or spray drying). Vat dried blood requires a high total energy input which, due to the excessive amount of heating involved, causes considerable loss of available lysine and other essential amino acids. Ring drying of blood produces a nutritionally valuable blood meal; however, it also uses an appreciable amount of thermal energy. The successful development of cold (chemical) blood processing technology will therefore be advantageous. It should be emphasized that good quality protein containing most of the essential amino acids necessary for growth and life maintenance is often in short supply. Properly processed blood meals made from swine, cattle, and sheep bloods are excellent sources of available protein rich in the essential amino acids methionine, cystine and especially lysine.

Indeed, in the light of ever-rising fuel costs, there is good reason to believe that cold blood processing by chemical precipitation holds promise as an eventual method for reducing steam energy used for the same purpose.

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