

DSM Press Release

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Amsterdam, 19 June 2003

Positive test results for new DSM recovery drink

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The new recovery drink for athletes developed by DSM produces better average performance levels than a normal, sugar-based sports drink. These are the findings of a study carried out by NUTRIM, the Food and Toxicology Research Institute of the University of Maastricht (Netherlands). The recovery drink should speed up the replenishment of fuel reserves in the muscles following high-intensity exercise. This enables athletes to reach their optimum performance level faster and to perform at this level for longer. DSM will discuss with its partner in sport NOC*NSF the best use of the recovery drink by Dutch athletes during their preparations for the Olympic Games.

Dr Hans Keizer of NUTRIM, who along with Dr Eric van Breda headed the research into the effectiveness of the drink, tells us: "Our studies have shown that DSM's recovery drink gives significantly higher total insulin production and a faster decrease of glucose levels in the blood. We also found a 5% better average performance level in athletes who had drunk the DSM recovery drink compared with those who had taken an ordinary, sugar-based sports drink."

DSM uses the protein casein (a natural protein found in cow's milk) in the production of the recovery drink. Casein contains components which have been shown in previous studies to reduce recovery time.

The new recovery drink is based on the addition of casein fragments to a sugar-containing drink. The uptake of the protein fragments stimulates insulin release in the body, as a result of which glucose is absorbed faster from the blood into the muscle cells. Once absorbed by the muscles, glucose is converted into glycogen, which acts as a muscle fuel. The faster this process takes place following high-intensity exercise, the faster athletes can perform again at their optimum level. Cutting the protein into fragments obviates the need for the protein to be digested; instead it is absorbed directly, and therefore quickly, into the body. Casein fragments have not previously been used because of their bitter taste. However, DSM has now developed an enzyme that can cleave casein proteins in such a way that the bitter taste is almost completely neutralized. So not only is the sports drink an extremely effective recovery drink, it is likely that athletes will also enjoy it for its taste.

DSM is currently working on the definitive formula for the recovery drink. DSM will also shortly discuss with its partner in sport NOC*NSF how best to use the recovery drink for athletes preparing for the Olympic Games.

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"We aim to have the drink available by October," says Sylvia de Jong, one of the DSM project managers for the recovery drink. Development of the recovery drink is taking place in Delft (Netherlands) at the DSM Food Specialties business group.

DSM

DSM is active worldwide in life science products, performance materials and industrial chemicals. The group has annual sales of close to EUR 5.6 billion and employs about 18,500 people at more than 200 sites across the world. DSM ranks among the global leaders in many of its fields. The company's strategic aim is to grow its sales – partly through acquisitions – to a level of approx. EUR 10 billion by 2005. By that time at least 80% of sales should be generated by specialties, i.e. advanced chemical and biotechnological products for the life science industry and performance materials. This strategy represents a continuation of the company's ongoing transformation and concentration on global leadership positions in high-added-value activities characterized by high growth and more stable profit levels. More information about DSM can be found at www.dsm.com.

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Backgrounder DSM recovery drink, 19 June 2003

DSM has for decades been active in the market for food ingredients, including ingredients with added nutritional value. Examples of these are probiotics that promote intestinal bacteria and poly-unsaturated fatty acids for baby food, essential for good brain development.

DSM has recently developed a unique protein preparation for use in sports drinks, the aim of which is to reduce athletes' recovery time following high-intensity exercise. DSM is currently developing a recovery drink that contains this unique protein preparation. This development is part of DSM's sponsorship of the Dutch Olympic Games Committee and is being carried out by the DSM Food Specialties business group in Delft (Netherlands).

Muscle fuel during and after exercise

During high-intensity exercise muscles use a sugar called glucose. This glucose is stored in the muscles in the form of glycogen, a long-chain glucose molecule. During high-intensity exercise glycogen reserves are depleted. Before an athlete can perform again, these glycogen reserves need to be replenished. Athletes need their glycogen reserves to be restored as quickly as possible after exercise so that they are able to perform again as soon as possible. So they take sugar-containing drinks as soon as possible after exercise in order to replenish the glucose in the muscle cells. Glucose uptake in the muscle cells and the conversion of glucose into glycogen are stimulated by insulin. A higher insulin level in the blood will bring about a faster uptake of glucose and conversion of glucose into glycogen in the muscles.

Use of proteins

We now know that the time required to replenish glycogen reserves can be significantly reduced by adding fragments of protein, a protein hydrolysate, to sugar-containing sports drinks. The protein is cut into pieces so that it does not need to be digested first but can be immediately absorbed by the body. Not all proteins have the same accelerating effect, as different proteins have different compositions. DSM has chosen a source of protein that contains amino acids shown by previous studies to bring about the most effective replenishment of glycogen reserves. Moreover, the content of these effective amino acids is relatively high. This protein is casein. Casein is the main protein in cow's milk. The advantage of cow's milk is that it is available in large quantities.

As stated above, the protein is cut into fragments so that it can be immediately absorbed by the body and will therefore work faster. You could say that the protein is pre-digested. However, the cleaving of the protein creates its own problems. Cleaving promotes absorption but it also gives the protein a bitter taste. In fact, the extremely effective protein casein is too bitter to drink, after cleaving. So the challenge facing DSM was to neutralize this bitter taste in order to enable use of this important protein - because taste is the most important criterion for consumers in their choice of food.

DSM had to find an enzyme, which would help solve this problem. There are different types of enzymes and the type of enzyme determines where cuts in the protein chain are made. This in turn has an effect on the degree of bitterness of the cut protein. The search for the desired enzyme was made easier by the Genomics project launched a few years ago. This project, which analyzed the genome structure of one of the organisms – *Aspergillus niger* – used at DSM, enabled DSM to develop a new enzyme that can cleave proteins in such a way that small fragments are produced without any bitter taste.

Thanks to this pioneering technological development, DSM can produce a non-bitter casein hydrolysate that is excellently suited for commercial application in a new generation of recovery drinks. Naturally DSM has applied for patents for the invention and its application.

DSM's recovery drink differs from other sports drinks in its use of this protein hydrolysate, which is not only highly effective but also has a neutral taste. The advantages for athletes are obvious. Faster replenishment of the muscle fuel reserves enables them to perform again at their optimum level much sooner.

Clinical trials

DSM commissioned an independent body to study the extent to which the casein hydrolysate produces better recovery performances. Several studies were carried out by NUTRIM, the food and toxicology research institute of the University of Maastricht. The studies were supervised by Dr Hans Keizer and Dr Eric van Breda. The first two studies looked at whether the recovery drink containing the unique casein hydrolysate produced a higher insulin level, and a lower glucose level in the blood of volunteers, compared with a control drink that did not contain proteins, and a control drink that contained a commercial protein hydrolysate. The results were positive. The effectiveness of other DSM protein preparations, either hydrolyzed or non-hydrolyzed, was also compared with that of the casein hydrolysate. On the basis of these results a third study compared the recovery effect of the recovery drink containing casein hydrolysate with that of a control drink. This study was carried out using top-class athletes, who were first of all required to undergo intensive exercise in order to exhaust the supply of glycogen in their muscles before they were given the recovery drink or the control drink. This study not only investigated the effect on insulin and glucose levels in the blood, but also at the glycogen reserves in the muscles, and at the athletes' ability to perform at the end of the (5-hour) rest period during which the drinks were consumed.

The results of this study showed that after intensive exercise the consumption of the DSM recovery drink resulted in significantly higher total insulin production compared with consumption of the control drink. Lower blood glucose levels support this. Although no differences in glycogen reserves in the muscles were found, the athletes showed on average a 5% better performance level in the time trial that was carried out at the end of the rest period.

New studies carried out at the University of Maastricht will provide greater insight into the effects and the required dosage of the recovery drink. This will enable DSM to provide sound advice to top-class Dutch Olympic athletes using the recovery drink.

DSM is currently working with a renowned company on the definitive recipe for the recovery drink. It is also working hard on improving the shelf-life of the product. Although the first supplies of the recovery drink are expected to be available at the end of the third quarter of this year, DSM will shortly discuss with its partner NOC*NSF how best to use this drink in the preparations of Dutch athletes for the Olympic Games in 2004.

DSM Press Release

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20 June 2003

DSM expands cheese coating capabilities

DSM has announced it is to acquire National Starch & Chemical's Plasticoat® food coating business with effect from July 1st, 2003. It will be integrated into DSM Food Specialties, a business group within the Life Sciences Products cluster. DSM intends to retain the Plasticoat® name and says the move will benefit customers by expanding its existing portfolio and offering a wider product selection.

The Plasticoat acquisition is designed to complement DSM's existing range of highly successful tailored coating systems such as Superdex® and Delvocoat® by providing a cost-effective coating which can be used in a wide range of applications. DSM has held the distribution rights for Plasticoat outside the Netherlands since 1997. Within the Netherlands, Plasticoat products are currently supplied through Centrale Aankoop FNZ. Plasticoat currently represents a yearly turnover of around EUR 10 million. Since DSM will take over the production in its own facilities only a few people will be involved in this transaction.

This acquisition represents a logical step in DSM's strategy to develop its activities in the field of life sciences: Plasticoat constitutes a perfect complement to the portfolio DSM currently offers to the food and dairy industries.

Plasticoat is an invention of the Dutch cheese-making industry and its acquisition by DSM will bring together more than three decades of experience in the Dutch cheese-making industry and more than thirty years' knowledge of the dairy industry throughout the rest of Europe. Customers will enjoy unrivalled expertise and a solid basis for innovation and new applications.

DSM currently produces a wide range of dairy cultures as well as coagulants and other enzymes, preservation systems, colours and antibiotic residue tests. With over 30 years' experience, DSM contributes to every aspect of the dairy industry from the farm to the final consumer and is well equipped to offer applications assistance and technical support. DSM also has a strong heritage within the coatings and preservation industry and has been at the forefront of many innovations in the sector. These include the introduction of the natamycin-based antimycotic Delvovid® which is already fully integrated into cheese-making processes throughout the world and vastly extends shelf life.

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DSM ranks among the global leaders in many of its fields. The company's strategic aim is to grow its sales – partly through acquisitions – to a level of approx. EUR 10 billion by 2005. By that time at least 80% of sales should be generated by specialties, i.e. advanced chemical and biotechnological products for the life science industry and performance materials. This strategy represents a continuation of the company's ongoing transformation and concentration on global leadership positions in high-added-value activities characterized by high growth and more stable profit levels. More information about DSM can be found at www.dsm.com.

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