

Fax From Indonesia

by Graham Bell

Jakarta is hot and dangerous. Unfinished buildings dot the landscape. Rusting girders and cancerous concrete tell of a great economic crisis and two years of agony. Now there is no going back, but everywhere there is frustration and resentment and people are spoiling for a fight.

Around the inner city, near the government buildings, the army has instant road blocks made out of huge triangular prisms of barbed wire that can be quickly dragged across the road. The Indonesian business-folk are nervous. Many have had their shops, offices and homes burnt and plundered. Will the mobs come again? Will business dry up again?

The currency crisis has left the Rupiah weak but not hopeless. One US dollar bought me 7500 Rupiahs - or about 5000 for an Australian dollar. Rice remains subsidised at about Rp1500 for a kilo. As usual, the visitor eats well. It's a buyer's market for the foreigner. You hear about bargains: five star hotels selling accommodation for US\$20 per night, including breakfast. As if by combining desperation with miracle, business goes on. The office now has only two "boys" instead of five. Where are the other three? Somewhere, awaiting an opportunity that is too long coming.

The noisy, smoke-belching bedjays (three wheeled "taxis") stand idle along the streets. Silent and sullen as cockroaches

in a nuclear winter, their battered black and orange frames sag against the broken gutters. The Kaki-lima (food barrow) and the warung (corner stall) still ply their trade in most things edible and inedible. It is said that the depression has actually increased tobacco sales. Chocolate- and coffee-flavoured cigarettes now vie with the traditional clove variety. The thought of smoke makes me shudder as we drive past another blackened shell.

Conversation in the air conditioned car suddenly stops. The voice on the radio is harsh. Demonstration ahead: no place for a combustible motor car. The driver swerves into a side street and accelerates away. Away to our meetings where friendship and hospitality reign, the talk is always optimistic and tomorrow is another day.



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ChemoSense

GENETICALLY MODIFIED FOOD - THE TASTE OF THINGS TO COME?

By Karyn Weitzner

Great scope exists for gene technology to improve the lives of people through functional foods, improved agricultural practices and less dramatically (but close to the hearts and stomachs of most of us), food that tastes or smells better. But how can the agri-food industry convince the general public to trust its motives and its methods, and that ultimately there will be an improved and safe food product for sale in supermarkets?

On March 31st, 1999, scientists, industry and consumer representatives came together in Sydney for a National Science and Industry Forum to discuss Gene Technology and Food.

Amongst the speakers was Carole Renouf from the Australian Consumer's Association, who presented the results of the Australian Consensus Conference on gene technology in the food chain. According to Ms Renouf, the lay panel saw gene technology making a positive contribution to the area of medical science, but they were rather suspicious of the motivation behind the application of the technology to food production.

cont. pg 4

Solid future for sensory analysis

"Taste and texture are key drivers, understand this better, understand the consumer better and you have the competitive edge."

A recent American survey of food and beverage companies found that most respondents had increased their use of sensory analysis in the last five years, and planned to continue to do so (see foodonline.com).

To identify trends in the Australian use of human sensory analysis, the Centre for ChemoSensory Research has conducted its own smaller survey. We sent a questionnaire to 100 Australian food and beverage companies of varying sizes, to determine how widespread the use of sensory analysis was in Australia and to identify common problems.

What we found

Of 35 respondents, 25 (71%) reported using human sensory analysis. Of these companies, 20 employed at least one in-house sensory specialist to make decisions about sensory analysis within the company. On average, these companies employed 2 to 3 specialists. In some cases, where large companies were involved, much larger permanent panels were used.

Ten out of the 25 companies used all three types of human judges - key people within the company, trained expert panels and large consumer panels.

cont. pg 2

CONTENTS

Sensory Analysis cont.	2
Electronic nose	3
Genetic foods cont.	4
Sensory Analysis and Genetic foods cont.	5
News from the CCR and Abroad	6-7
Subscriptions	8



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SENSORY ANALYSIS

The companies that did not employ sensory specialists, but who did use sensory analysis of some type, mostly used non-expert consumer panels of 20-100 people for sensory testing as well as 2 or 3 key non-expert individuals within the company.

Alternatives to sensory analysis

Of the ten companies who did not use any human sensory analysis, most said that they would not consider using any alternative analysis techniques either. Only two responded that they would consider using GCMS, and one that they would consider using antibody sensors.

Ten out of the 25 companies (40%) who reported using human sensory analysis claimed that they would not consider using any alternative to human panels. Of the 60% who would consider using analytical devices as an alternative, there was fairly even support for GCMS (66%) and sensor arrays like electronic noses (60%), with many respondents willing to consider more than a single alternative. Only two respondents (13%) nominated antibody sensors as an alternative they would consider. Most respondents saw analytical devices as being complementary to, not replacing, human judges.

Interestingly, the American survey found that only 3.5% of respondents felt that analytical devices will decrease the use of human sensory panels.

In-house sensory analysis or outsourcing?

We asked companies what proportion of their budget for sensory analysis is used for in-house or outsourced sensory work. Sixteen respondents answered this question. Only four companies spent exclusively on in-house sensory analysis, and 3 spent exclusively on outsourcing. The majority of companies spent on both in-house and outsourced sensory analysis, with this being reflected in the number that used a variety of types of panels (expert and non-expert).

Use of sensory analysis in specific areas

We asked the respondents to evaluate the importance of sensory analysis in ten different areas of application. Each application was given a score out of 10, where the higher the score was, the greater was the perceived importance of sensory analysis.

Respondents rated the applications in the following order:

1. tailoring products to consumer tastes (9/10)
2. quality control measures (8/10)
3. evaluating competitor products; concept development; identifying drivers of consumer behaviour (7/10)
4. evaluating process control analysis; identifying



attributes for line extension; developing a product for export (6/10)

5. product shelf-life; packaging performance (5/10)

On average, sensory analysis was seen to be at least of moderate importance in all of the areas suggested, with no category averaging a score lower than 5 out of ten.

By contrast, American companies viewed sensory analysis as being "not important" when it came to evaluating process control analysis and packaging performance. They also rated product shelf-life studies as being a "very important" application for sensory analysis, whereas our study found that Australian companies rated this further down on the list.

Quality control measures and the evaluation of competitor products were seen to be important areas for the application of sensory analysis by both American and Australian companies.

What factors influence the decision to use sensory analysis?

There were 21 responses to this question. We offered as potential answers:

- the value of panel data
- the availability of panellists
- cost effectiveness of panels

Only six respondents nominated cost-effectiveness as a factor. Nine nominated the availability of panellists. The majority (19 out of 21) felt that the perceived value of the panel data was an important factor in the decision.

The nature of the product being evaluated, or the project being undertaken (ie high or low risk) was important.

The use of sensory analysis was also seen as being an important way to conduct data comparisons on products worldwide.

cont. pg 5

Debate will always rage over the benefits and trade-offs that science and technology has brought us. But this argument turns to consensus over technology's application to the fight against terrorism in all its forms.

Sensor technology for the detection of explosives developed rapidly in the eighties in response to the upturn in terrorist activity worldwide and the inadequacies of X-Ray imaging. At the time there was a great need for devices which could quickly and easily screen persons and luggage at airports. A range of both physical and chemical devices was developed.

By and large, the physical devices, based on principles such as the reduction of energy of penetrating neutrons and magnetic field anomalies, are ideal for quick screening and are very sensitive, but they are notorious for their lack of specificity and resultant false positive responses. In contrast, many of the chemical devices (often based on gas chromatography and the relatively new ion mobility spectrometry) are very sensitive and selective. A disadvantage is that they rely on physical sampling, albeit of nanogram quantities, of the explosives.

It may not always be possible to obtain such samples as the explosive may have been packaged in a well-sealed container, and the bomb maker may have worked under very carefully controlled conditions. Current opinion is that the best protection can be gained by combining physical and chemical methods of detection.

Regardless of the mode of operation, just about all of these devices detect the presence of nitrogen - either as a nitrate, or as part of a more complex chemical species with an attached nitro group.

Explosives can be thought of as intimate mixtures of fuel and oxidant. When an explosive is initiated the fuel 'burns' rapidly in the presence of the oxidant, commonly a nitrogen-containing species, to release large amounts of energy in the form of heat, light and shock waves. With modern explosives the intimacy of this mix is maximised as the oxidant and fuel are combined in the same molecule, for example in the case of TNT (trinitrotoluene). The energy content of these modern explosives can be many times that of older varieties.

Electronic nose faces up to terrorism

by Sam Khoudair

Debate will always rage over the benefits and trade-offs that science and technology has brought us.

Volatile explosives such as TNT and ANFO (ammonium nitrate/fuel oil, used in the Oklahoma bombing) are relatively easy to detect as the vapour molecules emitted can be collected and identified. However, many modern explosives have a very low volatility and they are formulated with waxes and as gels (hence the term plastic explosive) which further reduce the volatility of the explosive components. A solution to this non-volatility is to rely on the collection of the minute particles of explosive mixtures sometimes found on the outside of luggage carrying explosives. These particles must be heated to release the vapour of the explosives contained, and the resulting vapour is introduced into the sensing system.

Presently, instruments with this dual capability are in use in many airports around the world. A major limitation, however, is their cost, since it limits the number that can be used at major events such as the Olympics. The need exists for a device that is portable, easy to use, cheap and reliable. Electronic nose technology could fit the bill.

Devices based on electronic nose technology are already used to detect a wide variety of substances, particularly products in the food industry. It is the ability to portray complex mixtures as a simple pattern, that can be compared with patterns of standard substances kept in a library, that makes this technology particularly suited to discerning the numerous commercial, military and home-made mixtures which can be employed by terrorist bomb makers.

Sam Khoudair is a PhD student in the Department of Analytical Chemistry at the University of New South Wales

GENETICALLY MODIFIED FOODS - THE TASTE OF THINGS TO COME continued

"They currently see it as technology that's serving the interests of a select few. Right now there are not as many clear benefits to the consumer coming through genetically modified foods as there are benefits to the producers," she said.

This perception is understandable. So far in Australia there are no genetically modified whole foods on sale. There are many food products containing modified ingredients (mainly soy-based) originating in America, but these products are 'substantially equivalent' so there is no perceptible difference (even on a molecular level) between them and their traditionally made counterparts. Even the food companies often don't know which of their products contain genetically modified ingredients. Consumers are demanding clear labelling of food products in reaction to the confusing debate that rages in scientific circles about the health and environmental issues that arise from GM foods. They feel they are being compelled to take a risk, yet with nothing tangible to gain.

When will consumers see an improved food product?

Currently, gene technology is in the 'first horizon' stage where technology is focussing on agricultural production efficiency, plant protection and agricultural sustainability.

It will only be in the 'second horizon' stage that consumers will see a better food product being sold at the supermarket. According to Dr Chris Hudson of Goodman Fielder, "We are going to see new food products and improved quality attributes." But, so far, he says "There's a lot of research going on, but in terms of what the consumers see - not a lot yet." Most of these improved food products won't be on the market for about another 6 years.

Currently, gene technology is in the 'first horizon' stage where technology is focussing on agricultural production efficiency, plant protection and agricultural sustainability.

Better food

But examples of these 'second horizon' food products are emerging all the time.

British scientists (New Scientist, April 3, 1999) have identified genes that control the taste and smell of strawberries. This creates the potential for better fruit as well as more realistic strawberry flavouring developed by biotechnology. In addition, the gene that codes for the protein that transports sucrose across cell membranes during ripening has been identified, as have several genes that code for production of volatiles that contribute to the strawberry smell.

In Australia, the CSIRO's Horticultural Crop Improvement Program is working on a number of projects that involve both genetic engineering and traditional breeding to alter food crops at all stages of production.

One project involves the modification of tomatoes to produce a more flavourful fruit. Everyone knows what it's like to buy tomatoes that are firm and red and beautiful to look at, only to find that they are dry and flavourless when it comes to the munch. Ironically, it was breeders reacting to consumer demands who created these good looking but tasteless imposters. CSIRO scientists (Spiers et al.) have experimented with genetic manipulation of the levels of an alcohol dehydrogenase enzyme in tomato fruit. This enzyme is thought to be responsible for controlling relative amounts of flavour volatiles which are present in the fruit during ripening. Sensory evaluation has already been carried out, with tasters noticing a "riper" flavour from the genetically modified tomatoes.

Other foods that may be tastier and grow more prolifically, but are still in the research stage include peas, capsicum, raspberries, bananas, sweet potatoes and melons.



Public attitudes

A greater public awareness of this impending explosion of genetically modified whole foods might go a long way toward quelling some of the concerns expressed by consumers. Dr Katrine Baghurst of the CSIRO presented the results of a national survey of consumer attitudes toward the use of genetic engineering in the production of food.

The survey found the acceptance of gene technology by Australians was on par with that in the US with up to 50% of people willing to buy genetically engineered foods if they were of better quality than their conventional counterparts. It seemed that the amount of risk involved was very important. If there was an improvement in vitamin, mineral content and taste of fruit and vegetables, and it was known that little risk was involved, 76% of respondents approved of the sale of GM foods. But this dropped to 11% if the risk was unknown.

cont. pg 5

Sensory Analysis continued

One respondent summed up the factors behind their use of sensory analysis with this statement: "Taste and texture are key drivers, understand this better, understand the consumer better and you have the competitive edge."

OTHER COMMENTS

A few comments were made about the expense of outsourcing sensory analysis. These were from companies that did spend part of their budget on outsourced sensory analysis regardless. In the American survey, cost was given as the primary reason for avoiding using sensory analysis.

Other problems that were mentioned were that of maintaining panel numbers when in-house staff were used, and the statistical analysis of data.

One respondent mentioned the difficulty of finding data and research that did not originate from outside Australia.

One respondent made the statement that "research of a sensory nature is very subjective which is why untrained panels are usually used", and another cited the quality of results as a problem associated with sensory analysis. Assessing panel performance and training panellists was seen to be another problem.

SUMMING UP

Employment of people dedicated to sensory analysis is now relatively common in Australian food companies. This survey, and its USA counterpart strongly suggests further investment in sensory research, both in-house and outsourced is a growing trend and worthwhile investment.

GENETICALLY MODIFIED FOODS - continued

Sixty percent of men said they would eat genetically engineered foods if they were of better quality and the same price as 'conventional' foods. If the sole benefit of GM foods were that they cost less, then only 25% would buy them. Almost 80% of respondents believed that citizens deserve a role in decisions about gene technology.

The debate continues

Meanwhile, the Australian public still displays a deep mistrust of gene technology. Brands of soy milk state that their product "Does not contain genetically engineered soy beans" as a selling point - "There is a brand of soy milk you can trust" the ads proudly proclaim.

Some companies are testing their products for genetically modified ingredients, and ceasing to use those ingredients in response to the demands of consumers.

Waverley Council in NSW recently became the first council in that state to ban genetically engineered foods from their child care centres.

The public obviously needs to be reassured that the risks associated with the genetic modification of foods are being recognised and dealt with. According to Mr Mitchell Hooke, executive director of the Australian Food and Grocery Council, the responsibility for this lies squarely with the scientific community.

"Unless those who have the capability, and therefore bear the responsibility, stand up and join in this debate, communicating in lay terms about the technology, its

application and its profound implications to us all, we will continue to witness the irrational reactions of politicians and regulators to the irrational reactions of a community confused and concerned, if not cynical."

References

Spiers, J., Lee, E., Holt, K., Yong-Duk, K., Steele Scott, N., Loveys, B. and Schoch, W. (1998) *Genetic manipulation of alcohol dehydrogenase levels in ripening tomato fruit affects the balance of some flavor aldehydes and alcohols*, Plant Physiol., 117, 1047-1058.
Coghlan, A. (1999) *Exquisite Taste*, New Scientist, April 3rd.

For further information:

For Australian and international web sites that offer pro- and anti-genetic engineering views
(<http://www.ausfoodnews.com.au/flapa/ge.htm>)



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news from the CCR AND ABROAD

Centre for ChemoSensory Research

"TASTES AND AROMAS - THE CHEMICAL SENSES IN SCIENCE & INDUSTRY"

This is the title of our new book, produced by the CCR with support from the Food and Packaging CRC, which is due to be published around October this year by UNSW Press. Experts from around the world give an introduction to the chemical senses of taste, smell and pungency, and examine the important questions currently being studied and applied in this field.

Subjects covered include:

- value-adding applications of smell and taste research around the world
- applications for chemosensory research in the fragrance and wine industries
- new statistical and design tools for the sensory practitioner
- important fundamental progress in smell and taste research
- progress on three basic molecular mechanisms of olfaction
- artificial chemical sensing

Whether you are new to chemosensory science, or are already involved in teaching, in research or professional practice, this book will provide useful new perspectives and an enhanced appreciation of the chemical senses.

To reserve your copy, contact Marilyn Styles, (02) 9209 4086.

"UNDERSTANDING AND MEASURING CONSUMER RESPONSES TO FOODS"

This useful 3-day workshop was held in April at the Sensory Science Research Centre of The University of Otago, Dunedin, New Zealand. About 35 people attended, representing a mix of both professionals (sensory scientists, market researchers, product developers from industry) and students with some familiarity with the basics of sensory evaluation. The sessions were interesting, intense, and interactive.

Presenters included international sensory celebrities Professor Hal MacFie and Dr Herbert Meiselman. Hal MacFie highlighted the need for valid experimental design techniques and discussed methods of removing bias from sensory data obtained during consumer evaluations. Herb Meiselman gave a critical overview of the field of food acceptance research and promoted the concept of moving away from laboratory studies to that of food in its real-life consumer context. Dr Hester Cooper, a well-known sensory consultant, gave an enlightening lecture on precautions and guidelines for cross-cultural sensory research.

The workshop was invaluable in developing a better understanding of important issues and enhancing skills in the area of sensory research, as well as creating a forum for the discussion of real-life issues confronting sensory researchers.

RESEARCH IN ASIA CONTINUES

The CCR has been busy over the last few months, completing a number of sensory research contracts in Sydney, Hong Kong, Tokyo and London. Late in May we'll be back in Singapore, following up our study of July 1998.

Our next Asian trip will be to Japan. Space is still available, so if your company is interested in expanding your business in Japan, contact Marilyn Styles on (02) 9209 4086.

Upcoming international events...

- Electronic NOSE User Forum, June 17-18, 1999, Ispra, Italy
http://nose.wia.ac.be/nose/ispra.htm
- 6th International Symposium "Olfaction and Electronic Nose", September 20-22, 1999, Tübingen, Germany
Details at <http://ion.ipc.uni-tuebingen.de/ISOEN99/>
- ISOT XIII/ECRO XIV International Symposium on Olfaction and Taste/European Chemoreception Research Organisation combined meeting, July 20-24, 2000, Brighton UK.
For more information: <http://www.warwick.ac.uk/~psraw/>
- Chemical Signals in Vertebrates IX, July 25-30, 2000, Jagiellonian University, Cracow Poland
For more information: <http://darwin.iz.uj.edu.pl/csv>

Other Australian Meetings...

- Marketing Sweeteners and 'Lite' Food, May 27-28 1999, The Mercure Hotel, Sydney.
email: caroline_morrissey@ibcox.com.au
- Fine Food '99, August 30th to September 1st 1999 The 18th Australian International Food Drink & Equipment Exhibition, Sydney Convention & Exhibition Centre, NSW. Contact: *Timothy Collett. Ph: (03) 9261 4500. Fax: (03) 9261 4545. Email: food@ausexhibit.com.au. Website: www.ausexhibit.com.au*
- 10th World Congress of Food Science and Technology and World Food Expo, October 3-8 1999, Darling Harbour, Sydney.
Enquires infost10@aifst.asn.au

Annual meeting of the Australasian Association for ChemoSensory Science (AACSS)

The annual meeting of AACSS will be held in Sydney this year, to coincide with the 10th World Congress of Food Science and Technology, which will run from October 3-8. The AACSS meeting will be held at the Garvan Institute on October 6.

The 10th World Congress of Food Science and Technology will feature two sessions dealing with applied aspects of sensory science, and attendees at these sessions may also be interested in attending the AACSS meeting.

For more information contact either John Prescott (John.Prescott@stonebow.otago.ac.nz) or Anne Cunningham (a.cunningham@garvan.unsw.edu.au)

Understanding Between Indonesia and Australia Grows

On February 15th this year a Memorandum of Understanding (MoU) was signed by Associate Professor Graham Bell of the CCR, Mr Archie Slamet of Austindco Pty Ltd and Professor M. Aman Wirakartakusumah of the Institut Pertanian Bogor (IPB).

IPB is an agricultural university in Bogor, near Jakarta. The intention of the MoU is to establish a strategic alliance to facilitate cooperative research and academic exchange between Australia and Indonesia. There is excellent potential for Australian scientists to collaborate with their Indonesian counterparts.

The CCR is interested in hearing from anyone who might wish to help foster the linkages created by this MoU.



Signing the MoU in Bogor, Indonesia.