

apparent dose response of the toxic compounds suggesting that liver microsomal content of cyt. b_5 or P_{450} is dependent upon the concentration of the components generated in the oil during heating (19). The reductase is known to receive electrons from NADPH through FAD and FMN. This suggests that NADPH was being used during the detoxification process by the P_{450} mixed-function enzyme. Indeed, the activity of glucose-6-phosphate dehydrogenase measured in the liver (31,000 \times g supernatant fluid was significantly depressed ($P < 0.0001$) when rats were fed either CFAM or 7-DH diets in comparison to the control group of rats fed the NH diet (Fig. 4). These results indicate that large amounts of NADPH were being produced and that the excess of the reducing equivalent NADPH inhibited the activity of the enzyme discussed previously (19).

The decreased activity of CPT-1 measured in rats fed either CFAM or 7-DH diets in comparison to the control animals fed the NH diet (Fig. 2) is compatible with the possibility that less long-chain fatty acids were being degraded via the mitochondrial β -oxidation pathway and more fatty acids were being incorporated into triglycerides.

The highly significant decrease in liver glycogen (Table 2), which was measured when rats were fed either CFAM diet or 7-DH diet, suggests increased glycolytic activity, leading to the formation of pyruvate which would subsequently be converted to acetyl-CoA via the pyruvate dehydrogenase complex enzyme in the mitochondrial matrix. The acetyl-CoA formed could undergo oxidative degradation through the tricarboxylic acid (TCA) cycle or might be utilized for the biosynthesis of long-chain fatty acids such as palmitic acid via fatty acid synthase.

The decreased activity of ICDH, which was measured when rats were fed either CFAM or 7-DH diets (Fig. 3), suggests an impairment of TCA cycle enzyme activity in the presence of CFAM and supports our previous finding (19). If the TCA cycle is impaired, acetyl CoA oxidation would be impaired. It could therefore be inferred that cyclic compounds and other oxidation products which were generated in the fat during the commercial deep-frying process were in part responsible for the impairment of ICDH in the mitochondrial TCA cycle.

Heated fats exert generalized nutritional toxic effects on rat morphology and physiology and these mechanisms are not yet completely understood. Siess *et al.* (27) reported an increased activity of NADPH-cyt. P-450 reductase in female Wistar rats fed for 4 wk a semisynthetic diet containing different quantities of cyclic monomers isolated from linseed oil. In a related study of oil/olestra blends, heated soybean oil was used. No statistical differences were found in the physiological responses to the heated or unheated oil (28).

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資料 4

Codex 提出書類

(The Hague, the Netherlands, 25-29 April 2005)

codex alimentarius commission



FOOD AND AGRICULTURE
ORGANIZATION
OF THE UNITED NATIONS

WORLD
HEALTH
ORGANIZATION



JOINT OFFICE: Viale delle Terme di Caracalla 00100 ROME Tel: 39 06 57051 www.codexalimentarius.net Email: codex@fao.org Facsimile: 39 06 5705 4593

Agenda Item 18

CX/FAC 05/37/37

December 2004

JOINT FAO/WHO FOOD STANDARDS PROGRAMME CODEX COMMITTEE ON FOOD ADDITIVES AND CONTAMINANTS

Thirty-seventh Session

The Hague, the Netherlands, 25 – 29 April 2005

PRIORITY LIST OF FOOD ADDITIVES, CONTAMINANTS AND NATURALLY OCCURRING TOXICANTS PROPOSED FOR EVALUATION BY JECFA

• COMMENTS (CL 2004/9-FAC)

The following comments have been received from: Japan and ISA

JAPAN

Background

1. In Japan, instant noodles have been regulated by the standards in the Food Sanitation Law; Acid value (AV) of fats and oils contained in instant noodles shall not be more than 3 and peroxide value (PV) shall not be more than 30. This standard was established after we experienced food-poisoning incidents (69 patients) in 1964 caused by the degradation of oil in the instant noodle.
2. The 27th Session of the Codex Alimentarius Commission noted that the Committee on Food Additives and Contaminants (CCFAC) considered that the PV for instant noodles was not a question of safety and therefore was not included in the priority list for JECFA evaluation. The CCFAC noted that there were no data proving a positive correlation between peroxide values of foods and food toxicological parameters. The Commission noted that the draft Standard for Instant Noodles, adopted at Step 5 by its 26th Session, had been circulated for comments at Step 6. A revised text was under preparation to take account of the comments received; the revised draft Standard would be circulated for additional comments and consideration for advancement to Step 8 by the Committee on Cereals, Pulses and Legumes while the list of food additives was to be completed and endorsed by CCFAC.
3. The Delegation of Japan expressed its concern that the CCFAC reply was not based on a risk assessment and reiterated its proposal to include PV in the draft Standard for Instant Noodles.
4. The Commission agreed that the elaboration of the draft Standard should proceed without further delay, with the understanding that the inclusion of PV could be decided by CCFAC in the future in the light of relevant data to be submitted by the Government of Japan to the CCFAC for consideration.

Comments

1. Japan believes that the provisions on PV should be established to protect not only the quality but also the consumers' health, because only the provision of Acid Value is not enough to catch the rancidity of oils and fats. PV holds the amount of peroxide caused by absorption of atmospheric oxygen in fats and shows the producing amount of peroxide as a toxic substance.

2. Japan has been performing the study on the degree of PV and toxicity of fats with degradation in Instant Noodles, and also the study on actual condition of PV in Instant Noodles being distributed in the international markets. Japan herewith submits the results of these studies.
3. According to the results of these studies, it is concluded that oxidation of the oil is very apprehensive phenomenon for food safety because it involves formation of lipid hydroperoxide (indicated by PV) and the secondary oil oxidized product. This change can be measured only by PV, not by AV, because PV and AV do not increase simultaneously. Consequently, measuring PV in oil is very important to grasp the deterioration level of the oil in food from the food safety point of view. The formation of lipid hydroperoxide is slow at first; however, it increases at an explosive pace after the induction period. To prevent this explosive increase of lipid hydroperoxide, keeping the PV at low level, such as 30 meq/kg, is a significant point.
4. Japan strongly proposes that the provision of PV should be considered in the CCFAC based on the evaluation by JECFA (Information on PV to be evaluated by JECFA is attached below).

INFORMATION ON THE CONTAMINANT TO BE EVALUATED BY JECFA

1. Proposal for inclusion submitted by:
Japan
2. Name of compound; chemical name(s):
Peroxide Value
3. Identification of (additional) data (toxicology, metabolism) which could be provided to JECFA:
 - Studies on Degradation of Fats in Foods Regarding Relationship between the Degree of Degradation and the Toxicity of Fats in Pre-Cooked Instant Noodles (See Annex 1)
 - List of articles available (See Annex 2)*
4. List of contact persons, including name and address, providing surveillance data with quality assurance information, preferably from three or more regions of the world:
Codex Contact Point for Japan

* The hard copies of the articles listed in the Annex 2 will be submitted by separate mail.

Studies on Degradation of Fats in Foods Regarding Relationship between the Degree of Degradation and the Toxicity of Fats in Pre-Cooked Instant Noodles

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Dept. of Food Science and Technology

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Introduction

Instant Noodle (instant ramen) was invented in Japan about a half century ago and is now eaten 65.2 billion packages per year (2003 data) by a lot of people all over the world¹⁾. This food is easy to cook and just boiling it in a hot water for a few minutes (Packaged Noodle) or just pouring a hot water to the noodle (Cup-type Noodle) because the starch of the noodle is pregelatinized. Gelatinization is important process to cook noodle, for instance, the pasta before cook is very hard because the starch in the pasta is not gelatinized. Therefore, the pasta must be boiled to make it soft. This process is "gelatinization" and the way of frying a boiled noodle with oil was hired to fix the pregelatinization condition for instant noodles¹⁾. Consequently, it would be easily understood that frying the boiled noodle is very important process to prepare Instant Noodle and oil is indispensable ingredient for Instant Noodle.

About 40 years ago, 1964-1965, Japan had terrible food-poisoning incidents caused by the degradation of oil in Instant Noodle²⁾. Fortunately, no one died in these incidents, however, many people who ate degraded Instant Noodle had nausea, vomiting, diarrhea, abdominal pain, feeling of weariness and headache. In the severest case, 69 people (men: 38, women: 31) who ate Instant Noodle manufactured by the same company suffered from food-poisoning. The degradation levels of the oil in the noodles were peroxide value (PV): 565-805 meq/kg and acid value (AV): 7.1-28.8. After that, the Ministry of Health and Welfare, current the Ministry of Health, Labor and Welfare, in Japan set standard value for fried type Instant Noodle in Food Sanitation Law to protect the food-poisoning and control the quality of Instant Noodle³⁾. In the law, the standard value for PV was set in 30 meq/kg or less than that and AV was set in 3 or less than that. After setting these values, no food-poisoning incidents caused by Instant Noodle have happened so far in Japan.

Japan has proposed the food standard for Instant Noodle to the Codex Committee on Cereals, Pulses and Legumes through the Codex Regional Coordinating Committee for Asia to make it international standard. However, including standard value on PV is still under discussion because many countries believe that measuring only AV is enough to grasp the degradation situation of oil in Instant Noodle. Taking account of food poisoning incident in Japan, measuring PV would be very important from the food sanitation point of view. Consequently, in this review, the relationship between PV and AV in Instant Noodle, how increase PV in Instant Noodle and the relationship between oxidation of the oil and toxicity were discussed.

Relationship between PV and AV in Instant Noodle

The concept for measuring PV and AV are completely different. It is now accepted that the secondary oil oxidized products such as polymerized oil, cyclic fatty acid, hydroperoxy alkenal and hydroxyl alkenal are main cause of toxicity in oxidized oil^{4),14)}. Therefore, the formation of lipid hydroperoxide, the primary oil oxidized product, must be suppressed to prevent the formation of the secondary oil oxidized products in Instant Noodle. In Japan, PV is hired to monitor the formation of the primary oil oxidized product, namely lipid hydroperoxide¹⁵⁾⁻¹⁷⁾. On the contrary, AV is measured to keep the food quality. During the food processing and storage, free fatty acids are formed in the noodle by the hydrolysis of the oil. Free fatty acid itself is not a very toxic compound, however, it becomes a cause of the reduction of flavor and taste. The purpose of measuring AV is to check the free fatty acid level in Instant Noodle¹⁸⁾¹⁹⁾.

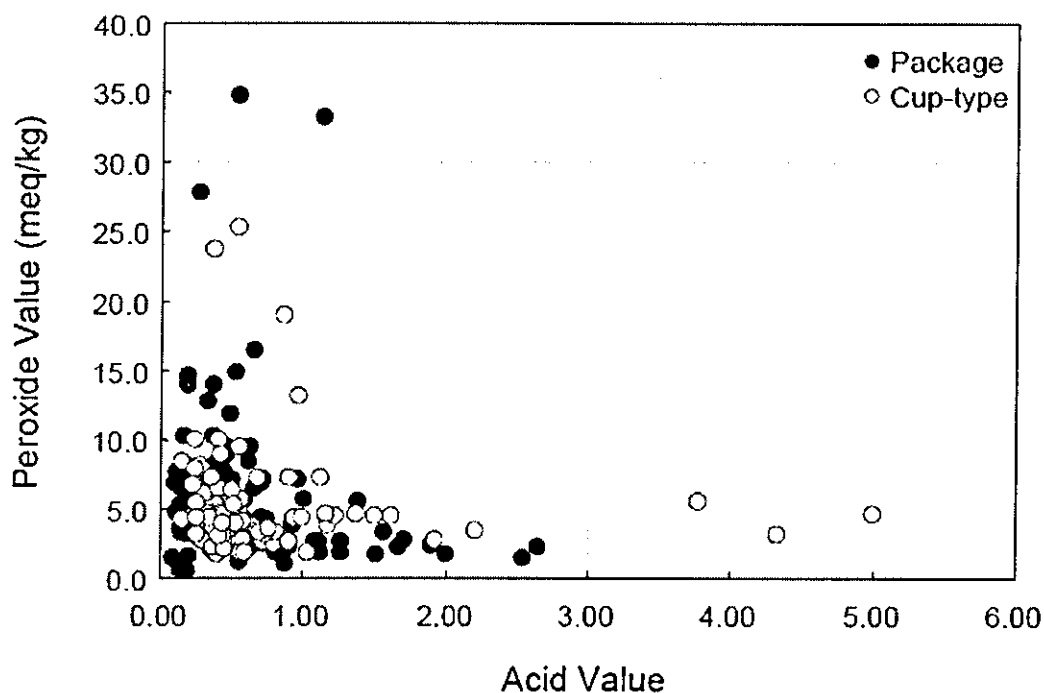


Figure 1. Acid value (AV) vs peroxide value (PV) in 218 Instant Noodles collected from all over the world²⁰⁾.

Japan proposed the food standard of Instant Noodle that contains PV and AV to the Codex Regional Coordinating Committee for Asia to make it international standard. However, several representatives of Asian countries did not accept the proposal from Japan. Particularly, including PV in the standard was opposed because they recognized that the PV and AV would increase together during the deterioration of Instant Noodle and measuring AV is enough to keep the food safety and quality. As mentioned above, the concepts for measuring PV and AV are completely different and PV is an essential item to keep the food safety. Consequently, 218 kinds of fried type Instant Noodles were collected from commercial base of all over the world and measured PV and AV of them to grasp the deteriorated situation of Instant Noodles sold in the market²⁰⁾. Furthermore, the relationship between PV and AV values was investigated to confirm the truth of other countries opinions. All the measured values on PV and AV are plotted in Figure 1. These results show that the both values are spread to wide range and some of them exceed the criteria (PV: 30 meq/kg and AV: 3) established in Food Sanitation Law in Japan. Since almost all samples were sold in cool condition, the samples exceeding 30 in PV might be exhibited under strong light for a long period. On the other hand, the samples exceeding 3 in AV might be stored under high humidity. Light and moisture strongly affect the degradation of oils. Miura et al.¹¹⁾¹²⁾ made a deteriorated Instant Noodle, which is as same as deteriorated Instant Noodle caused food poisoning in 1964, with sunlight and high temperature and succeeded in reappearing the food poisoning with the sample. Consequently, it would be said that cutting light or sun light is the most important way to preserve Instant Noodle even the material of the package film can suppress the UV and water transmission. In Figure 1, if the both PV and AV increase simultaneously during storage, the approximating curve against these plots must become ever-increasing curve. However, the plots are not scattered like that. The coefficient of correlation for PV and AV was calculated with Pearson's product-moment coefficient of correlation and the result was -0.1083. This value means that the plots are scattered in the downward-sloping and the correlation between PV and AV is poor because the coefficient of correlation is lower than zero and the absolute value is near zero. Consequently, the coefficient of correlation reveals that PV and AV do not form simultaneously in the oil of Instant Noodle during the deterioration. Furthermore, the *P* value was also calculated and the value was 0.1106. This value also explains that the relation between PV and AV is not significant because the value was bigger than 0.05. Therefore, analyzing only AV cannot grasp any deteriorated situation of the oil in Instant Noodle and analyzing both PV and AV has a strong and significant meaning. We conclude that PV is also an indispensable factor to keep the food safety and quality of Instant Noodle.

How increase PV in the oil of Instant Noodle

A great number of studies concerning the oxidation or heating of the oil have been carried out so far. These studies are mainly separated to three types of studies.

(1) The most popular study is that the oil is heated at more than 250 °C under oxygen omitted circumstances such as under nitrogen, carbon dioxide, etc⁴⁾⁶⁾. This kind of heating forms polymerized oil and cyclic fatty acid without containing oxygen molecular in the structure. These compounds are very toxic, however, these compounds are not oxidized compound. Furthermore, it must be said that these study conditions are not realistic. Consequently, these results are not available when the food toxicity of the oil is discussed.

(2) The oxidations of the oil under atmospheric condition are also carried out⁷⁾⁻¹⁰⁾. In this degradation, the oxidation of the oil proceeds by radical chain reaction via lipid peroxy radical (Figure 2)²¹⁾. Therefore, the compound formed in this reaction contains oxygen molecular in it. These studies are separated to two types of studies. One is heating the oil over 100 °C and the other is less than that. Taking account of the accumulation of lipid hydroperoxide (PV) in the system, the heating temperature is important point. For instance, the temperature usually hired for deep-fry and stir-fry is around 180 °C and the lipid hydroperoxide is decomposed easily under this condition²²⁾. As the result, the PV of the oil does not increase it and the secondary oil oxidized products are formed instead of that. However, it has been reported that the polymerized oil and cyclic fatty acid are not accumulated much in the system. Frankel et al. measured the cyclic fatty acid level in the oil used at fast foods restaurant and found that 0.1-0.5% of total fatty acid was changed to cyclic fatty acid²³⁾. The oxidation heated at less than 100 °C accumulates lipid hydroperoxide in the system because the rate of the formation of lipid hydroperoxide is faster than the rate of the decomposition of that. Normally, this kind of oxidation is called “autoxidation”. The autoxidation also proceeds under atmospheric condition and accumulates the lipid hydroperoxide (PV) in the system at first (Figure 3)²⁴⁾. The amount of the lipid hydroperoxide finally reaches to the top, after that, it starts to decrement because the rate of the formation of lipid hydroperoxide becomes slower than the rate of the decomposition of that. The reaching level depends on the kinds of fatty acids consisting of the oil, heating temperature, etc. The decomposed lipid hydroperoxide forms aldehyde, ketone, alcohol, alkane, etc. It is now accepted that the hydroxyl alkenal and hydroperoxyl alkenal formed in autoxidation is very strong toxic compounds¹⁴⁾. Therefore, the autoxidized oils are also toxic.

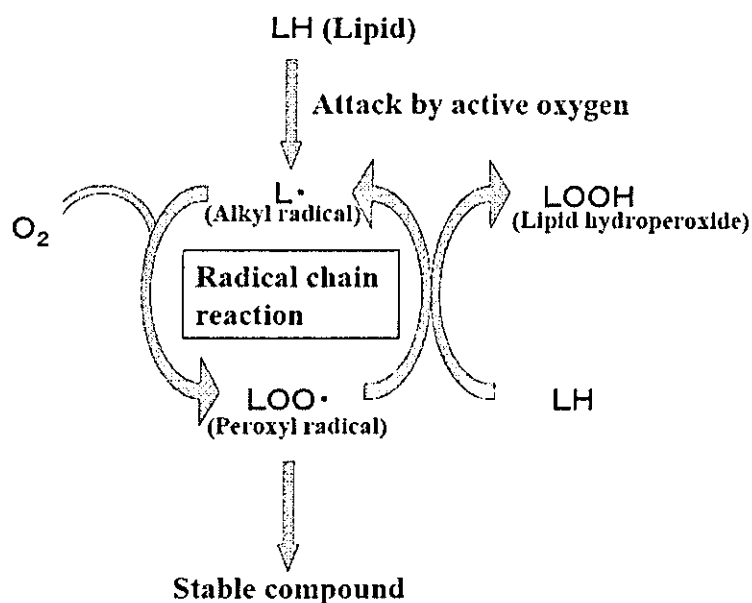


Figure 2. Radical chain reaction on lipid oxidation.

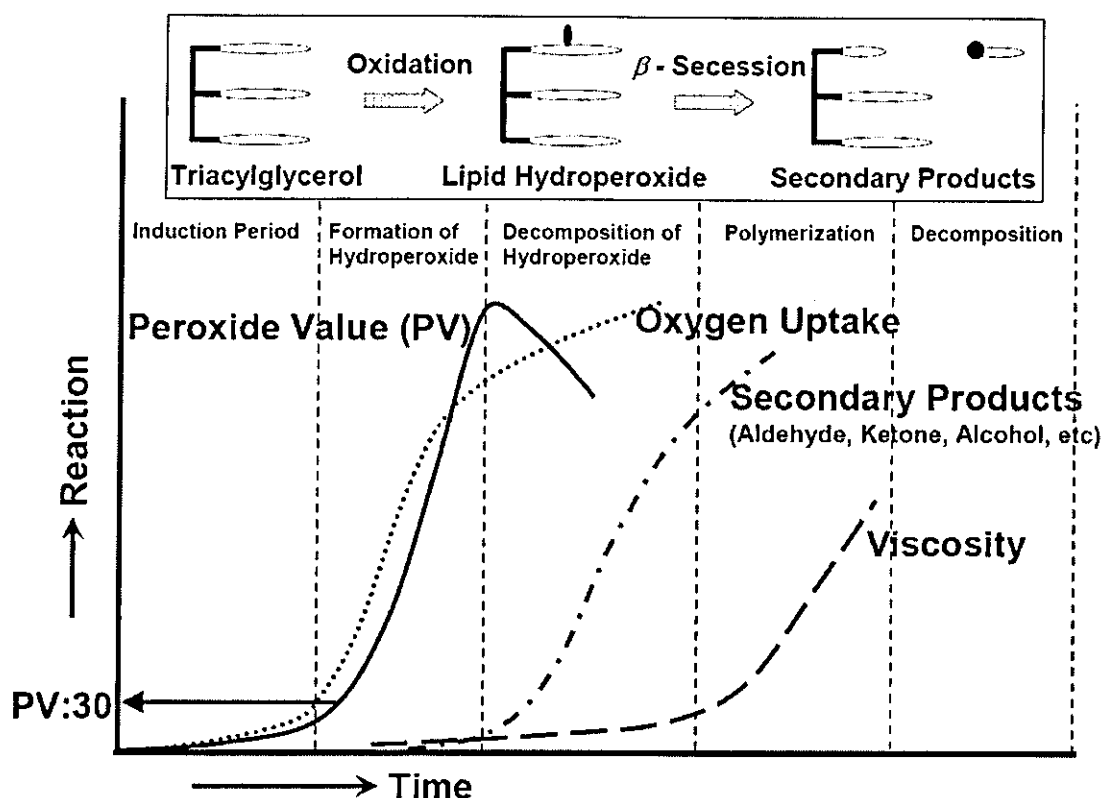


Figure 3. Each stage of autoxidation of the lipids.

(3) The oil degraded by heat and light is also a big problem. This degradation is mixture of autoxidation and photooxidation¹¹⁾⁻¹³⁾. Photooxidation is not radical reaction, but ene reaction²⁵⁾. Therefore, the reaction mechanism is different from radical chain reaction to form the different kinds of degraded oil compounds. The oxidation of the oil in Instant Noodle that caused the food toxicity was developed by these reactions as already mentioned in previous section. It is very difficult to understand how the individual reaction intertwine with each other and finally cause the toxic compounds in this oxidation.

Almost all of the oxidation reactions proceed via formation of lipid hydroperoxides. Therefore, to prevent the formation of lipid hydroperoxides is the best way to keep the food safety and quality. The oil in Noodle is also no exception. In fact there are a few studies which measured how increased PV during the degradation of the oil. Therefore, oxidation of the Instant Noodle was carried out to grasp how increase PV in Instant Noodle. As the results, PV increases slowly till the PV reaches to 50 meq/kg, however, after beyond the 50 meq/kg²⁶⁾, explosive increment of PV started in the case of the Instant Noodle is Stored at 60 °C. In Food Sanitation Law of Japan, PV is set in 30 meq/kg or less than that. This would not be a high value. The toxicity of lipid hydroperoxide was investigated by Tovar et al. and the LD₅₀ was 12,760 mg/kg mice. On the contrary, LD₅₀ of 4-hydroperoxy-2-nonenal, strong toxic compound formed in oil deterioration, is 77.5 mg/kg mice¹⁴⁾. Though the deteriorated oil in Instant Noodle which PV is 30 meq/kg does not show any toxicity, the concept of the setting PV in 30 meq/kg is to prevent the oxidation to proceed to the next stage reaction via lipid hydroperoxide and the formation of toxic compounds. Therefore, setting PV in a low value possesses great significance to obtain the quality and safety. Particularly, the low standard value has a great meaning in the case of the oxidation pathway is complicated like the mixture of autoxidation and photooxidation.

The relationship between oxidation of the oil and toxicity

As mentioned above, the lipid hydroperoxides (indicated by PV) are not strong toxic compounds, however, many kinds of studies reveal that the toxicity of the degraded oil increases according to the increase of the lipid hydroperoxide level¹⁰⁾. Of course, the toxicity of the oil furthermore increases after decomposition of lipid hydroperoxide starts. In a word, both of lipid hydroperoxide and the secondary oil oxidized products are important toxic compounds¹⁴⁾.

The toxicity of the degraded oil is normally evaluated by the weight loss, the survival rate, autopsy report, etc. However, the main symptoms of the food-poisoning incident caused by eating of degraded Instant Noodle were nausea and vomiting²⁾. In fact, there is few study with animal which evaluate the nausea and vomiting after administrated oxidized oil because no animal can vomit with the exception of monkey and ferret. To recognize the food-poisoning incidents happened in 1964-1965, to develop a new method which can analyze the nausea and vomiting with animal is indispensable. It has been known that pica²⁷⁾⁻³⁴⁾, a behavior characterized by eating a nonfood material such as kaolin, is related to the emesis. Animal that was administrated harmful compound is eager to eat non-nutritional kaolin to relieve malaise and the amount of kaolin consumption increases with the degree of the toxicity. Also, it has been recognized that the amount of consumption is related to the degree of gastrointestinal malaise, namely nausea and vomiting. This method might be able to utilize to understand the feeling of animal after fed oxidized oils. Therefore, several degree of oxidized oils extracted from degraded Instant Noodle were administrated to mice and pica was observed (Figure 4)³⁵⁾. All the mice administrated these oils were survived in 28 days sub-acute toxic study (data not shown), however, the amount of kaolin intake increased according to the degree of oil degradation. These results indicate that not severely oxidized oil also indicate harmful symptom in mice. In a previous paper¹⁰⁾, the oil oxidized over 400 meq/kg in PV was needed to observe the depression of the weight in rat. Therefore, the oil oxidized to around 100meq/kg in PV was recognized as safe in that paper.

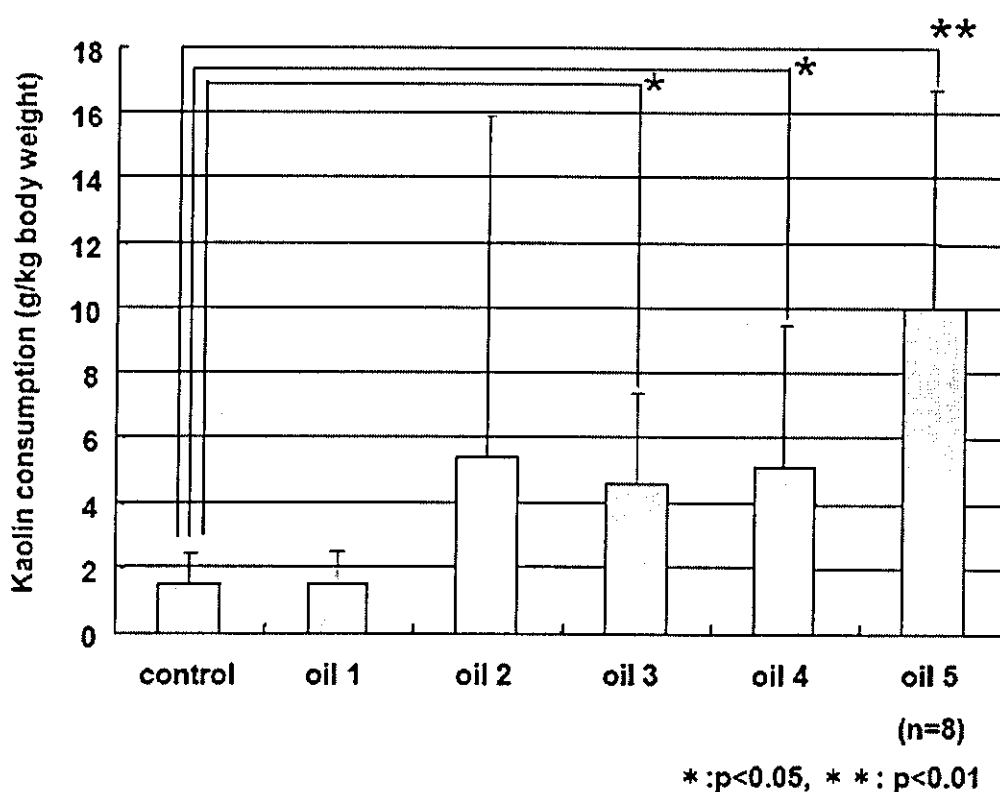


Figure 4. The comparison of kaolin consumption among control oil group and 5 kinds of oxidized oil groups. The control oil is extracted from not oxidized Instant Noodle. All kinds of oxidized oil were extracted from Instant Noodle exposed under sunlight in summer. The degradation degree of the oil increases with the sample number. Peroxide value of each oil is shown below.

Control: 2.1 meq/kg, Oil 1: 85.0 meq/kg, Oil 2: 107.2 meq/kg, Oil 3: 138.5 meq/kg,

Oil 4: 302.0 meq/kg, Oil 5: 334.0 meq/kg

However, harmful symptom was expressed when the oil oxidized to 138.5 meq/kg in PV was administrated in this pica experiment. Probably these would be correlated to nausea and vomiting in human and this level of oxidation is also harm to mice.

Summary

Oxidation of the oil is very apprehensive phenomenon for food safety because it involves formation of lipid hydroperoxide (indicated by PV) and the secondary oil oxidized product. This change can be measured by only PV, not by AV because PV and AV do not increase simultaneously. Consequently, measuring PV in oil is very important matter to grasp the deterioration level of the oil in food from the food safety point of view. The formation of lipid hydroperoxide is slow at first, however, it increase at an explosive pace after finish the induction period. To prevent this explosive increase of lipid hydroperoxide, to keep the PV at low level, 30 meq/kg in Japan, is a significant point.

From the point of view of keep the food safety, Japan strongly proposes including PV in food standard of Instant Noodle.

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Year	Title	Authors	Journal	V o l	Pages
1945	Toxicity of Rancid Fats	Quackenbush, E. W.	Oil & Soap	22	336-338
1949	Spectrophometric Studies of the Oxidation of Fats. VII. Coupled Oxidation of Carotene	Holman, R. T.	Archives Biochem.	21	51-57
1950	Spectrophometric Studies of the Oxidation of Fats. IX. Coupled Oxidation of Vitamin A Acetate	Holman, R. T.	Archives Biochem.	26	85-91
1951	Studies to Determine the Nature of the Damage to the Nutritive Value of Some Vegetable Oils from Heat Treatment II. Investigation of the Nutritiousness of the Products of Thermal Polymerization of Linseed Oil	Crampton E.W., Common R.H., Farmer F.A., Berryhill F.M. and Wiseblatt L..	J. Nutrition	4 4	177-189
1951	The effect of Heat Treatment on the Nutritional Value of Some Vegetable Oils	Crampton E..W., Common R.H., Farmer F.A. and Berryhill F.M.	J. Nutrition	43	431-440
1951	Studies to Determine the Nature of the Damage to the Nutritive Value of Some Vegetable Oils from Heat Polymerization	Crampton E..W.,	J. Nutrition	43	533-539
1952	Rancid Lard Effect on Rats Fed Complete and Riboflavin-Deficient Diets	Kaunitzu, H., Johnson, R. E. and Slanetz, C.A.	J. Nutr.	46	151-159

1952	The Effect of Oxidized Fatty Acids on the Activity of Certain Oxidative Enzymes	Bernheim, F.	Arch. Biochem. Biophys.	38	177-184
1953	Studies to determine the nature of the damage to the nutritive value of some vegetable oils from heat treatment III. Segmentation of toxic and non-toxic material from the esters of heat-polymerized linseed oil by distillation and by urea adduct formation	Crampton E.W., Common R.H., Farmer F.A., Wells A.F. and Crawford D.	J. Nutrition	49	333-346
1954	Nutritive Value or Toxicity of Highly Unsaturated Fatty Acids. (I)	Kaneda, T., Sakai, H. and Ishii, S.	J. Biochem	41	327-335
1954	Studies on the Toxicity of Fish Oil	Matsuo N.	J. Biochem	41	481-487
1955	Nutritive Value of Heated Vegetable Oils	Raju N.V. and Rajagopalan R.	Nature	176	513-514
1955	Studies of the Mechanism of Vitamin E Action. (I). <i>In vitro</i> Copolymerization of Oxidized Fats with Protein	Tappel, A. L.	Arch. Biochem. Biophys.	54	266-280
1955	The Inhibition of Certain Mitochondrial Enzymes by Fatty Acids Oxidized by Ultraviolet Light or Ascorbic Acid	Ottolenghi, A.	Arch. Biochem. Biophys.	56	157-164
1955	Nutritive Value or Toxicity of Highly Unsaturated Fatty Acids. (II)	Kaneda, T., Sakai, H. and Ishii, S.	J. Biochem	42	561-573
1955	Antagonism of Fresh Fat to the Toxicity of Heated and Aerated Cottonseed Oil	Kaunitz H., Slanetz C.A. and Johnson R.E.	J. Nutrition	55	577-587
1956	Biological Effects of the Polymeric Residues Isolated from Autoxidized Fats	Kaunitz H., Slanetz C.A. and Johnson R.E.	J. Am. Oil Chem. Soc	33	630-634
1956	Studies to Determine the Nature of the Damage to the Nutritive Value of Some Vegetable Oils from Heat Treatment	Crampton E.W.,	J. Nutrition	60	13-24
1956	Nutritional properties of the molecularly distilled fractions of autoxidized fats	Kaunitz H., Slanetz C.A., Johnson R.E. and Guilmain J.	J. Nutrition	60	237-244
1957	Studies on the nutritional and physiological effects of thermally oxidized oils	Johnson O.C., Perkins E., M. Sugai and Kummerow F.A.	J. Am. Oil Chem. Soc	34	594-597
1957	Studies to Determine the Nature of the Damage to the Nutritive Value of Menhaden Oil from Heat Treatment	Crampton E.W., Common R.H., Farmer F.A. and DeFreitas A.S.W.	J. Nutrition	62	341-347
1958	A Note on the Toxicities of Methyl Oleate Peroxide and Ethyl Linoleate Peroxide	Holman, R.T. and Greenberg, S.I.	J. Am. Oil Chem. Soc.	35	707
1958	Brown-Colored Oxypolymers of Unsaturated Fats	Venolia, A. W. et al.	J. Am. Oil Chem. Soc.	35	135-138
1959	Cyclization of Linolenic Acid by Alkali Isomerization	Scholfield, C.R., Cown, J.C.	J. Am. Oil Chem. Soc.	36	631-635
1959	A Note on the Preparation of Pure Oleic and Linoleic Acid	Keppler, J. G. and Sparreboom, S.	J. Am. Oil Chem. Soc.	36	308-309

1959	Influence of Feeding Fractionated Esters of Autoxidized Lard and Cottonseed Oil on Growth, Thirst, Organ Weights and Liver Lipids of Rats	Kaunitz H., Slanetz C.A., Johnson R.H., Knight H.B., Koos R.E. and Swern D.	J. Am. Oil Chem. Soc	36	611-615
1960	On the Digestion and Absorption of Lipoperoxides	Glavind, J. et al.	Acta. Physiol. Scand.	49	97-102
1960	A Nutritive Evaluation of Over-Heated Fats	Rice, E. E.	J. Am. Oil Chem. Soc.	37	607-613
1960	The American Oil Chemists' Society Fats in Human Nutrition	Kummerow, F. A.	J. Am. Oil Chem. Soc.	37	503-509
1960	Pharmacologic Effects of Fractions of Oxidized Oleate and Linoleate	Kaunitz H., Slanetz C.A., Johnson R.H., Knight H.B., Koos R.E. and Swern D.	Metab. Clin. & Exp.	9	59-66
1960	Nutritional and Chemical Changes Occuring in Heated Fats: A Review	Perkins E.G.	Food Technol.	10	508-514
1960	Nutritional Properties of Fresh Fats Added to Diets Containing Autoxidized Cottonseed Oil	Kaunitz, H.	J. Nutr.	70	521-527
1960	Toxicity of air-oxidized soybean oil	Andrews J.S., Griffith W.H. and Mead J.F.	J. Nutrition	70	199-210
1961	Heated Fats. I. Studies of the Effects of Heating on the Chemical Nature of Cottonseed Oil	Friedman, L.	J. Am. Oil Chem. Soc..	38	253-257
1961	Influence of Dietary Tallow on the Utilization of Calcium by the Laying Hen	Hunt, J.	Poultry Sci.	40	1193-1197
1961	Further Evidence for Cyclic Monomers in Heated Linseed Oil	MacDonald, J. A.	Can. J. Chem.	39	1906-1914
1962	Studies of the Generalized Shwartzman Reaction Produced by Diet	Kaunitz, H., Malins, D. C. and McKay, D. G.	J. Exp. Med.	115	1127-1136
1962	The Effect of Vitamin E Administration on Rats Fed Fresh or Autoxidized Beef Tallow	Krier, C.	Am. J. Vet. Res.	22	795-799
1962	Nutritive Value of Methyl Linoleste and Its Thermal Decomposition Products	Bonitto, N. R.	J. Am, Oil Chem. Soc.	39	25-27
1962	The Influence of Temperature, Heating Time, and Aeration upon the Nutritive Value of Fats	Poling, C.E. et al.	J. Am, Oil Chem. Soc.	39	315-320
1963	Toxicity of Fatty Acid Ester Hydroperoxides.(28809)	Olcott, H. S.	Proc. Soc. Exp. Biol. Med.	114	820-822
1963	Nutritive Value of Marine Oils. Effects of <i>in Vivo</i> Antioxidants in Feeding Menhaden Oil to Swine	Oldfield, J.E.	J. Am. Oil Chem. Soc.	40	357-336
1963	The Structure of a Cyclic C18 Acid from Heated Linseed Oil	Hutchison, R. B. and Alexander, J.C.	J. Org. Chem.	28	2522-2526
1964	Heated Fats and Allied Compounds as Carcinogens	Arffmann, E.	Acta. Path. Microbiol. Scand.	61	161-180
1965	The Reaction of an Autoxidized Lipid with Proteins	Andrews, F. et al.	J. Am. Oil Chem Soc.	42	779-781
1965	Chemical Reactions Involved in the Deep Fat Frying of Foods I. A Laboratory Apparatus for Frying Under Simulated Restaurant Conditions	Krishnamurthy, R. G., Kawada, T. and Chang, S. S.	J. Am. Oil Chem Soc.	42	878-882

1965	Heated Fats. IV. Chemical Changes in Fats Subjected to Deep Fat Frying Processes: Cottonseed Oil	Perkins, E.G. and Van Akkeren, L. A.	J. Am. Oil Chem Soc.	42	782-785
1965	Chromatographic Studies on Oxidative and Thermal Fatty Acid Dimers	Evans, C. D.	J. Am. Oil Chem Soc.	42	764-776
1965	Mechanisms of Lipid Peroxide Formation in Tissues Role of Metals and Haematin Proteins in the Catalysis of the Oxidation of Unsaturated Fatty Acids	Wills, E. D.	Biochem. Biophys. Acta.	98	238-251
1965	Nutritive Value of Heated Vegetable Oils	Raju N.V., Narayana M., Rao and Rajagopalon R.	J. Am. Oil Chem. Soc	42	774-776
1965	A Long-Term Nutritional Study with Fresh and Mildly Oxidized Vegetable and Animal Fats	Kaunitz H., Johnson R.E. and Pegus L..	J. Am. Oil Chem. Soc	42	770-774
1966	Damage to proteins, Enzymes, and Amino Acids by Peroxidizing Lipids	Roubal, W. T. et al.	Arch. Biochem. Biophys.	113	5-8
1966	Polymerization of Proteins Induced by Free-Radical Lipid Peroxidation	Roubal, W. T. et al.	Arch. Biochem. Biophys.	113	150-155
1966	Oxidation of Reduced Glutathione by Subcellular Fractions of Rat Liver	Christophersen, B. O. et al.	Biochem. J.	100	95-101
1966	Inactivation of Glyceraldehyde 3-Phosphate Dehydrogenase by Linoleic Acid Hydroperoxide	Little, C. et al.	Biochem. J.	101	13p
1966	Oxidation of Small Thiols by Lipid Peroxides	Little, C. et al.	Biochem. J.	102	10p
1966	Chronic Toxicity of Methyl Linoleate Hydroperoxide for the Rabbit.	Kokatnur, M. G., Bergan J. G. and Draper, H. H.	Proc. Soc. Exp. Biol. Med.	123	254-258
1966	Effects of Moderate Levels of Oxidized Fat in Animal Diets under Controlled Conditions	Carpenter, K. J. et al.	Proc. Nutr. Soc.	25	25-31
1966	The Effect of Lipid Peroxides on the Biochemical Constituents of the Cell	O'Brien, P. J. et al.	Proc. Nutr. Soc.	25	9-18
1966	INCIDENCES NUTRITIONNELLES ET TOXICOLOGIQUES DE L'INGESTION D'HUILE DE LIN CHAUFFEE	Bpotteau B. and Cluzan R.	Annuls. Biol. Anim. Biochem. Biophys.	6	47-64
1967	Nutritional Aspects of Thermally Oxidized Fats & Oils	Kaunits H.	Food Technol.	21	278-280
1967	Autoxidation of polyunsaturated esters in water: chemical structure and biological activity of the products	Schauenstein, E.	J. Lipid Res.	8	417-428
1967	Chemical Reactions Involved in the deep Fat Frying of Foods. Identification of Acidic Volatile Decomposition Products of Corn Oil	Kawada, T., Krishnamurthy, R. G. Mookherjee, B.D. and Chang, S. S.	J. Am. Oil Chem Soc.	44	131-140
1967	Long-term Rat Feeding Study with Used Frying Fats	Nolen, G. A., Alexander, J. G. and Artman, N. R.	J. Nutr.	93	337
1967	The Effects of a Lipid Peroxide on Intracellular Metabolism	O'Brien, P. J. et al.	Biochem. J.	103	32p-33p
1968	On the postulated peroxidation of unsaturated lipids in the tissues of vitamin E-deficient rats	Bunyan, J. et al.	Brit. J. Nutr.	22	97-110
1968	An Intracellular GSH-Perxidase with a Lipid Peroxide Substrate	Little, C. et al.	Biochem. Biophys. Res. Commn.	31	145-150

1968	The Effectiveness of a Lipid Peroxide in Oxidizing Protein and Non-Protein Thiols	Little, C. et al.	Biochem. J.	106	419-423
1969	Synthesis and Characterization of Fluorescent Products Derived from Malonaldehyde and Amino Acids	Chio, K. S.	Biochemistry	8	2821-2827
1970	Free Radicals, Malonaldehyde and Protein Damage in Lipid-Protein Systems	Roubal, W. T.	Lipids	6	62-64
1970	Metabolism of 1- ¹⁴ C-Methyl Linoleate Hydroperoxide in the Rabbit	Findlay, G. M., Draper, H. H. and Bergan J. G.	Lipids	5	970-982
1971	Denatured Hemoproteins as Catalysts in Lipid Oxidation	Eriksson, C. E. et al.	J. Am. Oil Chem. Soc.	48	442-447
1971	Fat Oxidation at Low Oxygen Pressure: III. Kinetic Studies on Linoleic Acid Oxidation in Emulsions in the Presence of Added Metal Salts	Marcuse, R. E. et al.	J. Am. Oil Chem. Soc.	48	448-451
1973	Purification of Cyclic Fatty Acid Esters: a GC-MS Study	Perkins, E.G. and Iwaoka, W.T.	J. Am. Oil Chem. Soc.	50	44-49
1974	Studies on Peroxidative Hemolysis and Erythrocyte Fatty Acids in the Rabbit: Effect of Dietary PUFA and Vitamin E	Horn, L. R., Barker, M. O., Reed, G. and Brin, M.	J. Nutr.	104	192-201
1976	Nutritional Effects of the Cyclic monomers of Methyl Linolenate in the Rat	Iwaoka W.T. and Perkins E.G.	Lipids	11	349-353
1976	Nutrition and Metabolic Studies of Methyl Esters of Dimeric Fatty Acids in the Rat	ALEXANDER HSIEH and EDWARD G. PERKINS	LIPIDS	11	763-768
1977	Studies on the Toxicity of the Autoxidation Oils VI Comparative Toxicity of Secondary Oxidation Products in Autoxidized Methyl Linoleate	Tovar L.R. and Kaneda T.	Yukagaku	26	169-172
1978	Determination of Peroxide Value by the Colorimetric Iodine Method with Protection of Iodine as Cadmium Complex	Takagi T., Mitsuno Y. and Masumura M	Lipids	13	147-151
1979	Lipid Oxidation Products and Chick Nutritional Encephalopathy	Budowski P., Bartov I., Dror Y., and Frankel E. N.	Lipids	14	768-772
1980	Absorption of Methyl Linoleate Hydroxides in Rabbit	Nakatsugawa K and Kaneda T	Yukagaku	30	74-77
1980	A Colorimetric Microdetermination of Peroxide Values Utilizing Aluminum Chloride as the Catalyst	Asakawa T., and Mathushita S.	Lipids	15	965-967
1981	Analysis of Thermally Abused Soybean Oils for Cyclic Monomers	J.B.MELTZER, E.N.FRANKEL, T. R.BESSLER and E.G.PERKINS	JAOCS (July)		779-784
1983	Absorption and Metabolism of Methyl Linoleate Hydroperoxides in Rats	Nakatsugawa K and Kaneda T	Yukagaku	32	361-366
1984	Occurrence of Cyclic Fatty Acid Monomers in Frying Oils Used for Fast Foods	E.N.FRANKEL and L.M.SMITH, C.L.HAMBLIN, R.K. CREVELING and A.J.CLIFFORD	JAOCS	61	87-90
1986	Distribution of ¹⁴ C after Oral Administration of (U- ¹⁴ C) Labeled Methyl Linoleate Hydroperoxides and their Secondary Oxidation Products in Rats	Oarada M, Miyazawa T. and Kaneda T	Lipids	21	150-154

1986	Retardation of Rancidity in Deep-Fried Instant Noodles (Ramyon)	K.L.Rho,P.A.Seib,O.K.Chung and D.S.Chung	JAOCS	63	251-256
1988	Studies on the Concentration of Oxidized Components of Abused Fats and the Application of HPLC to their Separation	E.G.Perkins and Suzanne Pinter	JAOCS	65	783-787
1990	Suggested Mechanisms for the Production of 4-Hydroxy-2-Nonenal from the Autoxidation of Polyunsaturated Fatty Acids	Pryor W. A. and Porter N. A.	Free Radic. Biol. Med.	8	541-543
1991	The Presence of Oxidative Polymeric Materials in Encapsulated Fish Oils	Vijai K.Sshukla and Edward G perkins	LIPIDS	26	23-26
1994	Rapid Determination of Double Bond Configuration and Position Along the Hydrocarbon Chain in Cyclic Fatty Acid Monomers	M.M.Mossoba,M.P.Yurawecz,J.A.G.Roach,H.S.Lin,R.E.McDonald,B.D.Flickinger	LIPIDS	29	893-896
1995	Assessment on the Digestibility of Oxidized Compounds from [1- ¹⁴ C]Linoleic Acid Using a Combination of Chromatographic Techniques	Marquez-Ruiz G. and Dobarganes M. C.	J. Chromatogr. B	675	1-8
1996	Effects of Dietary Heated Fats on Rat Liver Enzyme Activity	Coirdjo Lamboni and Edward G.Perkins	Lipids	31	955-962
1997	The Effects of Cyclic Fatty Acid Monomers on Cultured Porcine Endothelial Cells	Brent D. Flickinger,Robert H. McCusker,Jr,and Edward G.Perkins	Lipids	32	925-933
1998	Cyclic Fatty Acid Monomers from Dietary Heated Fats Affect Rat Liver Enzyme Activity	Courdjo Lamboni,Lean-Louis Sebedio,and Edward G.Perkins	Lipids	33	675-681
2003	4-Hydroxy-2-Nonenal: a Product and Mediator of Oxidative Stress	Uchida K.	Prog. Lipid Res.	42	318-343

ISA

The International Sweeteners Association (ISA) - representing manufacturers and industrial users of high intensity sweeteners – would like to make the below comment on document ALINORM 04/27/12 Appendix XXVII “Priority List of Food Additives, Contaminants and Naturally Occurring Toxicants proposed for evaluation by JECFA”.

Aspartame acesulfame salt – revision of specifications

The Dutch delegation has proposed to correct a few errors that appear in the current specifications for aspartame acesulfame salt. **ISA fully supports the Dutch proposal to:**

- delete the text “after adjusting the pH to alkalinity” in the description of the process;
- change the text under Solubility to “Sparingly soluble in water; slightly soluble in ethanol”;
- change the number 0.643 under Specific Rotation to 0.646.

The former two points were simply entered wrongly into the JECFA specifications while the latter point was entered due to an error made by the producer of aspartame acesulfame salt; they used a slightly wrong number for the molecular weight of aspartame. Using the correct number, the end result is 0.646 and not 0.643. The producer hopes to have this corrected.

When the European Commission in September 2003 issued a draft proposal for purity criteria for aspartame acesulfame salt, it based its text on the JECFA specifications, including the errors referred to above. ISA pointed out the errors to the Commission who agreed to have them corrected in the text that was adopted on 16 April 2004 (please see Commission Directive enclosed).

ISA supports the Dutch delegations' request for the errors now to be corrected in the JECFA specifications. Our comments will also be formally submitted to JECFA upon their call for data for the 65th meeting on food additives next June.

資料 5

関連する新聞記事

ロケット試作中に爆死

クラブ活動の学生

東海大 禁じられた学内で

【東京14日通信】東海大学(名古屋)の学生が、学内でロケットの試作中に爆死した。犠牲者は、中央のロケット部部長の長岡大司(21)であった。長岡君は、ロケット部部長として、学内のクラブ活動に熱心に取り組んでいた。この事故は、学内のクラブ活動の危険性を示している。長岡君は、学内のクラブ活動に熱心に取り組んでいた。この事故は、学内のクラブ活動の危険性を示している。



山本君(内)がロケットを正面のロッカーへしきりあげようとしたとき爆発した。中央のロケット部部長(前右)長岡大司

荒川取水口ほぼ完成

18日から切替え工事



荒川取水口見取図

【東京14日通信】荒川取水口の建設がほぼ完了した。18日から切替え工事が始まる。この取水口は、荒川の水量を確保するために建設された。切替え工事は、約2ヶ月間かかる見込みである。工事期間中は、荒川の水量が一時的に減少する可能性がある。関係者は、切替え工事を慎重に進めたいとしている。

湘南・千葉も高波注意

御前崎から西日本に波及

【東京14日通信】湘南・千葉方面に高波注意。御前崎から西日本に波及する可能性がある。気象庁は、この高波に注意を呼び出している。高波は、沿岸部の施設や船舶に被害をもたらす可能性がある。関係者は、高波に注意を払ってほしいとしている。

きょう通水始める

江東へ初の工業用水道

【東京14日通信】江東区に初の工業用水道が通水を開始した。この水道は、江東区の工業発展に貢献する。通水開始は、きょう(15日)である。この水道は、高品質の水を提供する。関係者は、通水開始を歓迎している。



正午、サイレンで祈り

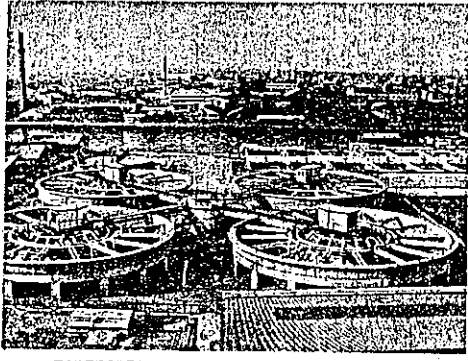
きょう全国戦没者追悼式

【東京14日通信】正午、サイレンで全国戦没者を追悼する。きょう(15日)は、全国戦没者追悼式の日である。各地で追悼式が行われる。追悼式は、戦没者を追悼し、平和を祈る機会である。関係者は、追悼式に参加してほしいとしている。

母子はさまれ死傷

駐車場捜しの車後退

【東京14日通信】母子が車に巻き込まれ、死傷した。事故現場は、駐車場の捜しをしていた車の後退時に発生した。母子は、車の後退時に巻き込まれた。母子は、死傷した。関係者は、事故の原因を調査している。



江東地区に工業用水を供給する荒川取水口工事現場(荒川区内で撮影)

【東京14日通信】江東地区に初の工業用水道が通水を開始した。この水道は、江東区の工業発展に貢献する。通水開始は、きょう(15日)である。この水道は、高品質の水を提供する。関係者は、通水開始を歓迎している。

二百人の人工

【東京14日通信】二百人の人工が、荒川取水口の建設に投入された。この人工は、取水口の建設に重要な役割を果たしている。関係者は、人工の投入を歓迎している。

二人が食中毒

【東京14日通信】二人が食中毒に罹患した。食中毒の原因は、不明である。関係者は、食中毒の原因を調査している。

貸貸・分譲・別荘

【東京14日通信】貸貸・分譲・別荘の募集。関係者は、貸貸・分譲・別荘の募集をしている。

明日を築こう!

【東京14日通信】明日を築こう! 関係者は、明日を築こう! というテーマで活動している。

山谷でひんげ物

【東京14日通信】山谷でひんげ物。関係者は、山谷でひんげ物を販売している。

高橋の梅園

【東京14日通信】高橋の梅園。関係者は、高橋の梅園を運営している。

YASHICA

【東京14日通信】YASHICAのカメラ。関係者は、YASHICAのカメラを販売している。

文化生活に貢献する最高の仕事!

【東京14日通信】文化生活に貢献する最高の仕事! 関係者は、文化生活に貢献する仕事を募集している。

京浜倉庫

【東京14日通信】京浜倉庫。関係者は、京浜倉庫を運営している。

あなたの才能を活かす!

【東京14日通信】あなたの才能を活かす! 関係者は、あなたの才能を活かす仕事を募集している。

鎌倉光明寺 高級分譲地

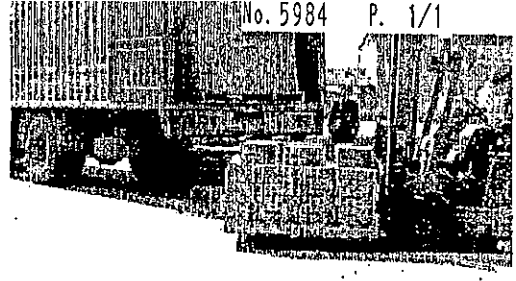
【東京14日通信】鎌倉光明寺 高級分譲地。関係者は、鎌倉光明寺 高級分譲地を販売している。

社員募集

【東京14日通信】社員募集。関係者は、社員を募集している。

日産自動車 社員募集

【東京14日通信】日産自動車 社員募集。関係者は、日産自動車 社員を募集している。



1日に40台のトラックが出荷にかかわる

40アイテム扱う
I RMAによくと、世界での即席麺年間消費量(03年)は547億食で、2010年には1000億食に達するとの予想がなされている。03年の消費量の内訳は、中国が108億食、インドネシアが108億食、日本が53億食、韓国が37億食、米国が33億食と

価格競争に勝てる生産構造構築

行先を左右し、川港での売り上げが現在の2倍になれば、採算ラインを超え、生産拠点を新たに「つくれる」と話す。この場合、新工場建設で年間10億方式の採用を念頭に、専攻を描いている。現在までに生産拠点を増やすか選定している段階で、競争力があるか、武漢にするか、具体的な作業に入っているようだ。

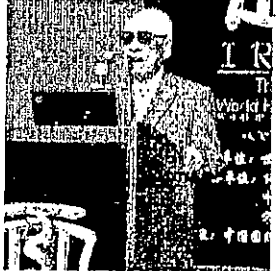
MR「世界ライメンスミット」開催

即席麺 品質向上を図る

東京海洋大 和田俊氏 油脂酸化問題で講演



大会あいさつする林議長



大会あいさつする安藤 I RMA会長

「下などの物質が過剰摂取を向上して検出されている」というため、「食中毒を防止するために食物油脂をとり取り扱うことが問題で、過酸化脂質と遊離脂肪酸の2つを科学的に分析する世界標準を決める必要がある」と指摘する。

「油脂は酸化すると、食品の味や食感、栄養価が低下する。また、酸化生成物の中には、アレルギーを引き起こすものや、発がん性物質がある」と指摘する。

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上海市から感謝状を呈渡される林(左)と安藤(中)の両氏

「世界ライメンスミット」を開催するI RMAは、長年、大会をいざい、0回、同市から感謝状を手渡され、現任、世界11カ国の代表、Eコンテス、各国の市場、1カ10社で協会で構成、報告、ライメンスミット、のワールド流通と品質保証、東洋海洋大の和田氏が、即席麺の品質向上と消費拡大を図ることを柱に、和田俊教授の講演などが行われ、2日間の日程で、大会進行役として議務を務める林



講演する東京海洋大和田俊教授

「油脂は酸化すると、食品の味や食感、栄養価が低下する。また、酸化生成物の中には、アレルギーを引き起こすものや、発がん性物質がある」と指摘する。

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じっくり
コトコト煮込んだ
おいしさを、あなたに。
食品産業新聞 (9)
2004.3.22