Y E A S T

A News Letter for Persons Interested in Yeast

January 1968 Volume XVI, Number 2

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Many thanks to those who have contributed to this issue by sending in news items and accounts of research projects. The next issue will be published in May 1968. A contribution of $1.00 from those who have not contributed for some time would be appreciated to finance future editions of the News Letter. Many thanks to those who have contributed recently. Beginning with this issue the News Letter is printed by a new procedure. To reduce mailing costs, which has increased substantially during the last year, the text appears on both sides of the paper.

The Editor extends to the readers of the Yeast News Letter his warmest wishes for a happy and productive new year ahead.

H. J. Phaff

I Centraalbureau voor Schimmelcultures (Netherlands), Yeast Division, Delft, Julianalaan 67a. Communicated by Dr. D. Yarrow.

The following is a list of recent acquisitions of yeast cultures to the collection of the yeast division and for which a description has been published.

Candida koshuensis C.B.S. 5777
I. Yokotsuka and S. Goto, J. Agr. Chem. Soc. Japan 29, 132, 1955.
Candida shehatae C.B.S. 5813
H. Buckley and N. van Uden, Mycopath. Mycol. Appl. 32, 297, 1967.
Candida tepae C.B.S. 5115
J. Grinsberg, Arch. Mikrobiol. 56, 204, 1967.
Cryptococcus dimmenae C.B.S. 5770
Cryptococcus kutzingii C.B.S. 1926
Cryptococcus lactativorus C.B.S. 5771
J. W. Fell and H. J. Phaff, Antonie v. Leeuwenhoek 33, 464, 1967.
Endomycopsis fukushimae C.B.S. 5782
M. Soneda, Trans. Mycol. Soc. Japan 3, 36, 1962.
Endomycopsis muscicola C.B.S. 5800
Pichia zaruensis C.B.S. 5799
T. Nakase and K. Komagata, J. Gen. Appl. Microbiol. 12, 347, 1966.
Pichia stipitis C.B.S. 5773
M. C. Pignal, Bull. Mens. Socc. Linn. Lyon 36, 163, 1967.
Saccharomyces cerevisiae var. terrestris C.B.S. 5829
Saccharomyces silvestris C.B.S. 5828
V. Jensen, Den. Kgl. Veterinaer-og Landbohøjskole Årsskrift, p. 179, 1967.
Sporobolomyces coprophilus C.B.S. 5811
Cryptococcus albidus var. ovalis C.B.S. 5810
J. Sugiyama and S. Goto, J. Jap. Bot. 42, 75, 1967.
Torulopsis peltata C.B.S. 5576
D. Yarrow, Antonie v. Leeuwenhoek 34, 81, 1968.

II Université de Lyon, Laboratoire de Biologie Végétale, Villeurbanne, France. Communicated by Dr. M. C. Pignal.

Since the appearance of the last issue of the Yeast News Letter the following articles have appeared:

- S. PONCET A numerical classification of yeasts of the genus Pichia Hansen by a factor analysis method. Antonie van Leeuwenhoek 33 n° 3 345-358 1967.
- F. ABADIE Utilisation par les levures de quelques acides aminés comme source d'azote et comme source d'azote et de carbone. Ann. Inst. Pasteur 113 81-95 1967.
- F. JACOB et F. ABADIE Contribution à l'étude de l'assimilation de quelques substances organiques par les levures. Mycopath. Mycol. appl. 33 (2) 113 1967.
- F. ABADIE L'uréase chez les levures. Ann. Inst. Pasteur 113 791-813 1967 (Ce dernier article fait partie de la thèse de Doctorat d'Etat qu'elle a soutenue le 1/11/67).

Besides the following two articles are in press:

- J. B. FIOL Intérêt systématique des tests de croissance en milieu déficient en vitamines pour les genres Kluyveromyces et Pichia. Revue de Mycologie 32 1967.
-R. MONTROCHER Quelques nouvelles espèces et variétés du genre Candida (Hemiascomycètes) Revue de Mycologie 32 1967.

We have had the great pleasure of a visit by Dr. Kockova-Kratochvilova last September 15th. In spite of her short visit and the absence of Prof. Boidin we were able to exchange numerous ideas and her visit was very fruitful.

III Department of Food Science and Technology, University of California, Davis, Calif. 95616. Communicated by Dr. H. J. Phaff.

1. The following paper has been published since the last issue of the Newsletter. "Ascospore numbers in Metschnikowia" by M. W. Miller, E. R. Barker and J. I. Pitt. J. Bacteriol. 94, 258-259, 1967. By microdissection of asci the authors have shown that most species of Metschnikowia contain two needle-shaped spores instead of one, as was formerly believed.

2. J. I. Pitt and M. W. Miller have submitted a manuscript to Mycologia, dealing with the taxonomy of Metschnikowia. An abstract of this paper follows below.

Sporulation of Candida pulcherrima, C. reukaufii, Chlamydozyma pulcherrima, Chl. reukaufii and Chl. zygota was achieved. Ascospores are acicular, and two per ascus, characteristic of the genus Metschnikowia. On the basis of two distinct ascus shapes, two new species are described, M. pulcherrima and M. reukaufii. Mating occurs between haploid cultures derived from M. zobellii and the above Candida and Chlamydozyma species. Taxonomic implications are considered, and Chlamydozyma is concluded to be an illegitimate name.

The complete life cycles of these yeasts are presented. Germinating ascospores give rise to heterothallic haploid cultures, which on mating form diploid vegetative cells, and chlamydospores. Chlamydospores may differentiate to form asci, or revert to vegetative cells by budding.

Details of the methods inducing sporulation are given. Reduced temperatures and diluted media provide optimum conditions for this process. Medium composition and pH are of lesser importance.

Ecologically, Metschnikowia is shown to be a much more widely distributed genus than has been believed hitherto.

3. The following paper is in press in Antonia van Leeuwenhoek 33 (1967) 000-000. "Three new yeasts: Cryptococcus dimennae, Cryptococcus kutzingii and Cryptococcus lactativorus spp.n." by J. W. Fell and H. J. Phaff.

4. Miss Manuela Vidal Leiria has completed her work on the degree of Master of Science in Microbiology and has returned to Oeiras, Portugal where she has rejoined the staff of the Gulbenkian Institute of Science.

Her thesis, prepared under the guidance of Professor H. J. Phaff, is entitled

"A study of yeast relationships by cell wall analysis".

The following is a brief summary of the results of her work.

Purified cell walls were prepared from 15 strains belonging to the following yeast species: Debaryomyces franciscae, D. globosus, D. hansenii, D. nilssonii, Saccharomyces bisporus, S. cerevisiae, S. delbrueckii, S. eupagycus, S. fermentati, S. florentinus, S. inconspicuus, S. microellipsodes, S. pretoriensis, S. rosei and S. vafer.

Acid hydrolysates in 2 N HCl for 30 min at 120° of the 15 species examined by paper chromatography yielded glucose, mannose and oligoglucosides containing β-1→3 and β-1→6 glucosidic linkages in all cases.

Chemical analysis showed that the walls of all strains contained glucan, mannan, chitin and protein.

Acid hydrolysis (with 2 N H_2SO_4 for 2 hrs at 100°) solubilized only part of the glucan. The ratios of acid-insoluble to acid-soluble glucan ranged from 1.05 to 4.24.

Ratios of glucan to mannan ranged from 1.23 to 2.48.

Chitin concentrations were less than 2% (dry weight basis) in all cases, except for D. globosus and D. hansenii whose walls contained 6.5 and 3.8% chitin, respectively.

Protein contents of the cell walls ranged from 8.7 to 17.0%.

Walls of the various species were tested as enzyme inducers for the production of lytic enzymes by Bacillus circulans and as substrates for enzymes induced by its own walls and those from all other species tested in a so called cross-induction test.

Marked differences were observed between a number of species with regard to their cross-induction patterns.

Cell wall suspensions of each of the species were treated for 4 days with a purified preparation of endo-β-1→3 glucanase from B. circulans. The solubilized portion of the walls was then treated with purified β-1→6 glucanase. The use of β-1→3 glucanase led to decrease in turbidity and increase in reducing sugar. With some species an initial decrease in turbidity together with an increase of reducing sugars was followed by a long period in which the reducing sugars increased without a further decrease in turbidity. In other species the long term increase of reducing sugar was more or less paralleled by a further decrease in turbidity.

The final products of β-1→3 glucanase hydrolysis were susceptible to further hydrolysis by β-1→6 glucanase in nearly all species but nonsusceptible in D. franciscae and D. florentinus.

The taxonomic implications of the overall experimental results are briefly as follows: (a) S. bisporus is a typical representative of the genus Saccharomyces

sensu strictu. (b) S. delbrueckii, S. rosei and S. fermentati are very closely related. (c) D. franciscae and S. pretoriensis are not closely related. (d) D. nilssonii and S. microellipsodes are very far apart. (e) S. vafer seems more closely related to S. delbrueckii than to S. microellipsodes and S. pretoriensis. (f) S. florentinus is markedly different from S. pretoriensis and S. microellipsodes.

IV Institute of General Pathology and Bacteriology, University of Aarhus, Denmark. Communicated by Dr. A. Stenderup.

At the 4th Meeting of the International Society for Human and Animal Mycology in New Orleans 31st July - 2nd August 1967 the following paper was presented: A. Stenderup and A. Leth Bak: Deoxyribonucleic Acid-Base Composition of Some Species within the Genus Candida.

The results obtained were:

"Melting point", Tm, with standard deviation, and the mean base composition expressed as %(G + C) of pure DNA from species of the genus Candida.

Species:	Tm in ° C:	%(G+C):
Candida albicans	83.7 ± 0.05	35.1
- tropicalis	83.6 ± 0.10	34.9
- claussenii	83.6 ± 0.10	34.9
- stellatoidea	83.9 ± 0.15	35.7
- pelliculosa	84.4 ± 0.15	36.8
- truncata	84.4 ± 0.15	36.9
- krusei	85.5 ± 0.05	39.6
- atmosphaerica	85.6 ± 0.10	39.7
- parapsilosis	86.0 ± 0.15	40.8
- melinii	86.1 ± 0.10	40.9
- pseudotropicalis	86.2 ± 0.10	41.3
- tenuis	87.4 ± 0.15	44.0
- utilis	88.1 ± 0.10	45.8
- pulcherrima	89.0 ± 0.15	48.0
- lipolytica	89.6 ± 0.00	49.6
- brumptii	91.5 ± 0.10	54.1
- catenulata	91.7 ± 0.05	54.5
- zeylanoides	92.9 ± 0.15	57.6

V Southwest Center for Advanced Studies, Division of Biology, Dallas, Texas 75230. Communicated by Dr. H. Gutz.

In our work with Schizosaccharomyces pombe an unexpected phenomenon was found, which I have suggested to call "twin meiosis". Asci of Schiz. pombe normally have 4 ascospores, but when diploid strains of compatible mating type are crossed, asci with 8 haploid spores are also formed. Using strains with suitable markers it could be shown that, in the eight-spored asci, no spores occur which are recombinant for the markers of the parental strains. It was therefore concluded that the eight-spored asci originate from zygotes in which,

after fusion of the cells, karyogamy does not occur but the diploid nuclei undergo separate meioses (twin meiosis). In crosses between diploid strains of opposite heterothallic mating type (which are not able to sporulate individually) twin meioses occur also after copulation of the cells. Apparently the unfused heterothallic diploid nuclei are able to complement each other for successful meiosis.

In crosses between haploid and diploid heterothallic strains (e.g., h^+ x h^-/h^-) of Schiz. pombe a few asci have 6 haploid spores. Four spores show markers of the diploid parent, and the other two possess markers of the haploid parent. It may be concluded that these asci also originate from zygotes in which no karyogamy occurs. Apparently the diploid nucleus undergoes a meiosis, whereas the haploid nucleus undergoes a mitosis.

A paper on twin meiosis has been published (H. Gutz: "Twin meiosis" and other ambivalences in the life cycle of Schizosaccharomyces pombe. Science 158, 796, 1967). I have reported on the same subject at the meeting of the "Deutsche Botanische Gesellschaft" in Göttingen, Germany (September 4-10, 1967). Further studies on the physiological conditions inducing twin meiosis and its cytology are in progress.

Our research on gene conversion in Schiz. pombe was continued. As has been reported earlier (H. Gutz: Genetics 54, 338, 1966), one ade-6 mutant (M26) is remarkable in giving high frequencies of gene conversion. The conversion event has been studied in 10 different crosses by tetrad analysis, a total of 6503 asci being analyzed using micromanipulation. In crosses with other ade-6 mutants it was found that M26 is converted frequently to the other allele even when the map distance between the two sites is about half the total ade-6 map. Since gene conversion appears to involve a repair process in hybrid DNA, these results would appear to be a direct proof that a single conversion event involves large regions of hybrid DNA extending between the two sites of mutation involved in the cross, and is not restricted to small regions in the immediate vicinity of the two sites. Furthermore, the results indicate that in the presence of M26, hybrid DNA within the ade-6 locus is more frequently formed than in crosses without M26. A comprehensive publication of this work is in preparation.

Diploid strains of Schiz. pombe can be haploidized by treatment with p-fluorophenylalanine (H. Gutz: Induction of mitotic segregation with p-fluorophenylalanine in Schizosaccharomyces pombe. J. Bacter. 92, 1567, 1966). These experiments were continued in cooperation with M. da Cunha to map genes of hitherto unknown locations. So far, eight further genes could be located in linkage groups I and II, respectively.

Drs. Peter Angehrn and Hans-Jörg Treichler (both from Switzerland) have joined my group as research associates September 1, 1967. They participate in the work on twin meiosis and gene conversion. Dr. Treichler has just spent two weeks (November 27 - December 9, 1967) in the laboratory of Dr. C. Robinow in London, Canada, to learn cytological techniques.

VI Chalk River Nuclear Laboratories, Biology and Health Physics Division, Chalk River, Ontario. Communicated by Dr. A. P. James.

The following articles have been published recently:

Anwar Nasim and C. Auerbach. The origin of complete and mosaic mutants from mutagenic treatment of single cells. Mutation Res. 4, 1-14.

Anwar Nasim. The induction of replicating instabilities by mutagens in Schizosaccharomyces pombe. Mutation Res. 4, 753-763.

Anwar Nasim. Repair-mechanisms and radiation-induced mutations in fission yeast (Submitted for publication).

A. P. James. Division probability and radiation-induced cell death. Nature vol. 213, 843-844.

A. P. James. Lethal sectoring in yeast. Brookhaven Symposium 1967. "Recovery and rapair mechanisms in microbiology" (in press).

A. P. James and M. M. Werner. Multi-site damage and x-ray induced lethality in yeast. Can. J. Genet. Cytol. 9, 129-135.

A. P. James, M. M. Werner, A. S. Saunders and M. A. Harris. Persistence of X-ray induced lethal sectoring in yeast. Radiation Research (in press).

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The main problems currently being investigated are:

1) The induction of lethal sectoring in Saccharomyces cerevisiae after u.v. and X-ray irradiation.

2) The induction and repair of induced mutational damage in Schizosaccharomyces pombe after mutagenic treatment with chemical mutagens and u.v. irradiation.

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Dr. A. Nasim has joined the staff at Chalk River.

Dr. A. James will spend the next year with the Division of Plant Industry of CSIRO in Canberra, Australia.

VII University of Puget Sound, Tacoma, Washington 98416. Communicated by Dr. J. G. Kleyn.

On or about December 15 our department will occupy a niche in a new $4 million science complex, Thompson Hall, which will provide excellent facilities for both teaching and research. Some new course offerings of interests to mycologists include Cellular Physiology, Mycology and Electron Microscopy. An M.S. degree in biology is also offered for which we cordially invite interested applicants to contact our department chairman, Dr. Gordon Alcorn, for additional information.

In October I attended the national meeting of the Master Brewers Association of America in Mexico City and presented a paper titled "Future Pathways for

Brewing Microbiology" which will be published in the MBAA Quarterly. Incidentally, the beer in Mexico was excellent.

Current research interests include:

1. Genetic and nutritional studies by a new staff member, Dr. James Bourret, related to the evaluation of circadian rhythsm in certain higher fungi. Dr. Bourret joined us in September after spending a year at Long Beach State College. He received his Ph.D. degree in 1966 in Plant Pathology from the University of California at Berkeley.
2. Studies related to evaluation of the yeast dwarf cell system as a model for studying cancer.
3. Studies related to biological preservation of non-pasteurized package beer.

We would appreciate receiving any available recent information related to methods for disrupting the cell walls of S. cerevisiae and related yeasts.

VIII University of Miami, Institute of Marine Sciences, One Rickenbacker Causeway, Miami, Florida 33149. Communicated by Professor S. P. Meyers.

1. The paper listed below has been published since the last Newsletter.

   Yeasts from the North Sea. (Marine Biology 1:000-000-1967). Samuel P. Meyers, Donald G. Ahearn,[1] Wilfrid Gunkel and Frank J. Roth, Jr. Institute of Marine Sciences and Department of Microbiology, University of Miami, Miami, Florida, U. S. A. and Biologische Anstalt Helgoland.

   Yeasts were isolated from twelve established sites in the North Sea from 1964 to 1966. A percentage frequency of 99% with populations varying from <10 to >3000 viable cells/L was observed. This mycota was characterized by considerable spatial and temporal fluctuation, with the dominant yeast present being the ascosporogenous species, Debaryomyces hansenii. This taxon, as well as other common North Sea yeasts, e.g., Rhodotorula rubra and Candida diddensii, have been reported frequently from other marine locales. Noteworthy concentrations of yeasts, especially D. hansenii, were observed during summer months, often in association with various stages of development of the dinoflagellate, Noctiluca miliaris. The population dynamics of the North Sea yeasts are discussed in relation to similar studies of other marine environments.

   [1] present address: Department of Biology, Georgia State College, Atlanta, U. S. A.

2. Our paper, ECOLOGY AND CHARACTERIZATION OF YEASTS FROM AQUATIC REGIONS OF SOUTH FLORIDA (D. G. Ahearn, F. J. Roth, Jr. and S. P. Meyers) will be submitted to Marine Biology this December.

Dr. Ahearn's paper (co-authored with N. J. W. Kreger-van Rij), ULTRA-STRUCTURE OF THE ASCOSPORES OF THE GENUS HANSENIASPORA, will be submitted to Mycologia this December.

IX Department of Biology, Illinois Institute of Technology, Chicago 60616. Communicated by Dr. L. R. Hedrick.

a) "Yeasts and Molds in Water and Sediments of Lake Ontario", L. R. Hedrick and Marjorie Soyugenc, in press, to appear in Proceedings, Tenth Conference on Great Lakes Research, 1967.

Abstract. Yeasts and molds were isolated from 27 widely distributed stations in Lake Ontario. Each station represented 4 samples, three from the water - the surface (1 meter), the mid-depth and near the bottom - and one from the bottom sediment. Twenty species of yeasts, representing 7 genera, were identified. Eight genera of molds were isolated. The density distribution of fungi with respect to the depth of the water samples showed that the frequency of occurrence increased with depth. For the 27 stations, the average number of yeasts isolated per 100 ml was: 10 for water at 1 meter, 130 for water at mid-depth and 460 for water near the bottom, sediment 46; the respective values for molds were 6, 16, 16 and 11. Stepwise multiple correlation analyses did not reveal any consistent association of any one parameter with the distribution of the two most numerous species, Candida guilliermondii and Rhodotorula mucilaginosa. For the total yeast population there was a definite relationship between the numbers of cells at the different water depths and the organic nitrogen and nitrate nitrogen concentrations at the corresponding depths.

b) "Ecology of Yeasts in Polluted Waters of the Calumet Area", Lynn Larsen Woollett, MS thesis.

Abstract. Yeasts were isolated from 11 different freshwater environments with varying degrees of pollution by domestic and commercial wastes. The yeast genera found with their relative frequency of isolation were: Candida 46%, Rhodotorula 32%, Torulopsis 8%, Sporobolomyces 6%, Cryptococcus 5%, Hansenula 3%, Saccharomyces 1%, Trichosporon 0.5%, and Pichia 0.3%. The number of species isolated for each genus were: Candida 22, Rhodotorula 7, Torulopsis 5, Cryptococcus 5, Sporobolomyces 3, Hansenula 3, Saccharomyces 2, Trichosporon 2, and Pichia 1. A statistical analysis was employed in an attempt to relate the total number of yeasts and the number of Rhodotorula yeasts with the different biological, chemical and physical pollution parameters. This work is being continued, but the collection of samples is restricted to one relatively unpolluted lake, a river receiving domestic sewage and a river receiving industrial wastes.

c) Warren Cook of New York State University at Plattsburgh and L. R. Hedrick with the cooperation of the Limnological Station at the University of Minnesota collected yeasts from Lake Superior in the summer of 1967.

X Division of Laboratories and Research. New York State Department of Health, New York, Albany 12201. Communicated by Dr. Mercedes R. Edwards.

The following is an abstract of a piece of work from this laboratory recently published in the Journal of Bacteriology (Vol. 94, 766-777, 1967).

MICROMORPHOLOGY OF CRYPTOCOCCUS NEOFORMANS

Mercedes R. Edwards, Morris A. Gordon, Edward W. Lapa,
and William C. Ghiorse

Fine details of the internal and external morphology of Cryptococcus neoformans as seen in ultrathin sections are described and illustrated with electron micrographs. The capsule characteristic of this species contained microfibrils (30 to 40 A in diameter) that appeared to radiate from the cell wall and to coil and intertwine in various directions. These thin, uniformly structured, electron-dense filaments are believed to represent complex polysaccharide molecules. The internal morphology of C. neoformans was in many ways similar to that of yeasts studied by other authors. The cell was uninucleate with a single nucleolus. The nuclear envelope, a pair of unit membranes interrupted by pores, was typical of that found in eucaryotic organisms. Smooth endoplasmic reticulum, mitochondria, vacuoles, storage granules, and ribosomes were consistent features of the cytoplasm. In addition, C. neoformans presented membranous organelles derived from the plasma membrane and comparable to bacterial mesosomes and mitochondria of an annulate type.

XI Institute of Applied Microbiology, The University of Tokyo, Bunkyo-ku, Tokyo, Japan. Communicated by Professor Hiroshi Iizuka.

The following article has been published "Microbiological studies on Petroleum and Natural Gas. IX. Candidal oxidation of decane. H. Iizuka, M. Iida, and Y. Unami, J. Gen. Appl. Microbiol. 12, 119-126, 1966.

I am preparing for publication "JFCC Catalogue of Cultures. Additional edition 1968" about 200 pages. JFCC is the abbreviation of the Japanese Federation of Culture Collections of Microorganisms.

Last August The Seventh International Congress of Biochemistry was held in Tokyo. The abstract of my report at the Congress is given below.

DECANE OXIDATION BY A CELL-FREE EXTRACT OF CANDIDA RUGOSA. H. Iizuka and M. Iida. Inst. Appl. Microbiol., Tokyo Univ., Tokyo, Japan.

C. rugosa JF101 was grown on malt agar for 36 hr at 30 C. A loopful of cells was transferred to each shaking flask (500 ml) which contained 80 ml of sterile malt broth. The cell growth was collected at the log-phase by centrifugation. The cells obtained were washed twice with 1/30 M phosphate buffer (pH 7.0), the washed cells were suspended in the same buffer and disrupted in a Toyoriko oscillator for 30 min. Centrifugation at 20000 x g for 30 min at 5 C yielded the supernatant which was used either directly or fractionated further by treatment with ammonium sulfate. The enzyme system containing the same buffer, 1 μM decane and 3 μM pyridine nucleotides in a total volume of 5 ml were incubated for 1 hr at 30 C. Protein varied between 0.1 and 0.2 mg/ml. The isolation and identification of the oxidation products were carried out by the procedure of the previous papers.[1),2)] The decane dehydrogenase activity of the crude extract was measured in Thunberg tube gassed with N_2 using a NAD-2.6-dichlorophenol indophenol

(DCPI) couple as electron acceptor. The transmittance of this pigment was determined colorimetrically at 610 mμ. Decane oxidation to decanol, decylaldehyde and decanoic acid was demonstrated in the crude extract containing NAD. The pigment of DCPI was reduced immediately in the presence of decane. One of the dehydrogenation products may be assumed to be most likely decene. The initial dehydrogenation of decane is of special interest. The proposed scheme of oxidation pathway is as follows.
N-decane-NAD,-2H→decene-(H_2O)→decanol-NAD,-2H→decylaldehyde-H_2O,NAD, -2H→decanoic acid.
1) Z. Allg. Mikrobiol. 6, 335 (1966)
2) J. Gen. Appl. Microbiol. 12, 119 (1966)

XII Noda Institute for Scientific Research, Noda-shi, Chiba-ken, Japan. Communicated by Dr. H. Onishi.

In our laboratory work is continuing on aspects of aerobic dissimilation of carbohydrate materials by yeasts and the following are abstracts of our papers recently published or presented at an academic meeting.

The polyalcohol production from pentoses such as D-xylose, L-arabinose and D-ribose by various genera and species of yeasts was examined and quite different patterns of polyalcohol production from that of D-glucose were observed. For example, Candida polymorpha produced xylitol from D-xylose, L-arabinitol from L-arabinose and ribitol from D-ribose in good yields of 30 to 40% of sugar consumed, though the yeast produced D-arabinitol and erythritol from D-glucose. [H. Onishi and T. Suzuki, Agr. Biol. Chem., 30, 1139 (1966)].

Pichia miso produced xylitol, meso-glycero-ido-heptitol and D-glycero-D-ido-heptitol from D-xylose. This is the first report of the natural occurrence of these two heptitols. We are much interested in the biosynthetic pathway of the two heptitols from D-xylose. [H. Onishi and M. B. Perry, Can. J. Microbiol., 11, 929 (1965)].

Pichia quercuum produced xylitol and D-xylonic acid by aerobic dissimilation of D-xylose in good yields of 40% of the sugar consumed. It is interesting that both xylitol, a reduction product of D-xylose, and D-xylonic acid, an oxidation product, simultaneously accumulate in the fermented broth [T. Suzuki and H. Onishi, Agr. Biol. Chem., 31, 1233 (1967)].

The pattern of polyalcohol production from D-galactose could be classified into two types: the same polyalcohols were produced from both D-glucose and D-galactose by Sacch. fragilis and Debaryomyces sake but another pattern was observed with Candida polymorpha and Pichia farinosa, showing galactitol formation from D-galactose. [H. Onishi and T. Suzuki, Lecture read at the meeting of the Agr. Chem. Soc. of Japan (June 3, 1967)].

Aerobic dissimilation of L-rhamnose by yeasts gave two major products of 1,2-propanediol and L-rhamnonic acid. [T. Suzuki and H. Onishi, Lecture read at the annual meeting of the Soc. of Fermentation Technol., Japan (Nov. 18, 1967)].

XIII Department of Plant Physiology, Eötvös University, Muzeum krt 4a, Budapest VIII. Communicated by Dr. Z. Böszörmenyi.

In the framework of a research agreement between the Czechoslovakian and Hungarian Academies of Sciences a round-table discussion was held at Balatonalmádi (Hungary) on "Transport processes in microbial, plant and animal cells" from 2nd till 5th October 1967. The discussion was centered around the role of transport ATPases, the regulation of the processes and some problems of ion transport by higher plants. Concerning the transport processes of yeasts the most important event of the meeting was A. Kotyk's (Laboratory for Cell Membrane Transport, Institute of Microbiology, Prague) review about the kinetics of sugar transport by yeast. M. Höfer (Lab. Cell Membrane Transport) discussed the energetics of some transport processes by Rhodotorula gracilis. T. Deák (College of Food Industries, Budapest) reported the results of his studies on uphill transport of monosaccharides in Hansenula subpelliculosa, which were carried out in the Laboratory for Cell Membrane Transport, Prague. E. Balogh (Hungarian United Breweries, Budapest) described some of her experiments with S. carlsbergensis, which showed that preloading with some neutral amino acids or with NH_4^+ ion was repressive for methionine absorption. J. Zsolt, in collaboration with E. K. Kovák, (Department of Mycology, National Health Institute, Budapest) summarized their extensive studies on the sugar utilization by different yeast species. Finally G. Haskovec presented the latest results of the work which is going on in the laboratory for Cell Membrane Transport for the isolation of the inducible protein carrier involved in galactose transport in yeasts.

The informal discussion of the meeting helped to establish a promising co-operation between the two Academies in the field of the biological transport problem. The next meeting will be held in Czechoslovakia in the autumn of 1968.

The VIIIth Annual Meeting of the Biochemical Section of the Hungarian Chemical Society was held at Szeged from 17 till 19 August 1967.

The following lectures of the program contained data concerning the biochemistry and physiology of yeasts:

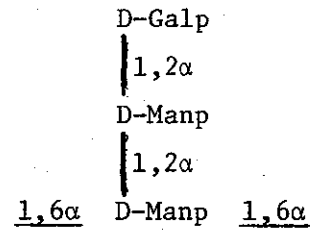
Ferenczy, L. and Kevei, F.: The selectivity of an antifugal steroidal-glycoside.
Novák, E. K. and Deák, T.: Some biochemical aspects of yeast taxonomy.
Tüske, M.: A transglucosidase from yeast.
Balogh, E., Böszörményi, Z. and Jámbor, B.: Changes of uranyl- and calcium-binding capacity during batch-fermentation by brewer's yeast.

The text of the lectures are published in Hungarian with abstracts in English and it is available from the Hungarian Chemical Society, Budapest V, Szabadság tér 17, Hungary.

XIV Prairie Regional Laboratory, Saskatoon, Sask., Canada. Communicated by Dr. P. A. J. Gorin and Dr. J. F. T. Spencer.

An examination of the mannans extractable from several Trichosporon species showed that these yeasts could be divided into three groups. Trichosporon

cutaneum, Trichosporon inkin, Trichosporon pullulans, Trichosporon sericeum and Trichosporon undulatum contained pentosylmannans, Trichosporon fermentans, Trichosporon hellenicum and Trichosporon penicillatum contained galactomannans, and Trichosporon aculeatum produced a polymer containing only mannose. The pentosylmannan produced by T. cutaneum had xylose and arabinose side chains; that of T. pullulans, xylose and traces of fucose and galactose, and the other three had xylose only as the pentose residue. The structure of the galactomannan from T. fermentans was



XV Research Laboratories of the State Alcohol Monopoly (Alko), Helsinki, Finland. Communicated by Dr. Heikki Suomalainen.

In addition to the work reported in the Yeast News Letter 15, 23-24 (1966), and 16, 19 (1967) the following publications have appeared during recent years.

H. Suomalainen, E. Oura and P. Nevalainen. What happens when a yeast cell dies? Federation of European Biochemical Societies (FEBS), Second Meeting, Vienna 1965, Abstr. Commun. p. 67.
A larger communication is being prepared for publication.

H. Suomalainen, T. Nurminen and E. Oura. Preparation of mitochondria from yeast protoplasts. FEBS Third Meeting, Warsaw 1966, Abstr. Commun. p. 161.

E. Oura and H. Suomalainen. The nucleotides of baker's yeast during different phases of growth and fermentation. FEBS Third Meeting, Warsaw 1966, Abstr. Commun. p. 198-199.

E. Oura and H. Suomalainen. Free nucleotides in resting and metabolizing baker's yeast. J. Inst. Brewing 73, 370-376 (1967).

The free nucleotides of semi-aerobically and aerobically cultured baker's yeast in different industrial stages have been investigated. In yeasts cultured under different conditions of aeration and nutrient addition, the nucleotide spectra were rather similar, but the proportions of the free nucleotides change considerably when the yeast passes from the resting state to growth or metabolism. On transfer from respiration to fermentation the nucleotide spectrum remained practically unchanged. However, a small addition of ethanol to a respiring yeast suspension caused clear alterations in the spectrum, the most obvious being the reduced amount of nucleotides with energy-rich phosphate bonds.

E. Oura and H. Suomalainen. Uptake of nicotinic acid and nicotin-amide by the yeast cell and their incorporation into pyridine nucleotides. Second International Symposium on Yeast, Bratislava 1966, p. 64.

H. Suomalainen. The structure and function of the yeast cell. Second International Symposium on Yeast, Bratislava 1966, p. 78.

The full text of the papers presented will appear 1968 in the second volume of the Proceedings of the Symposium.

H. Suomalainen, T. Nurminen and E. Oura. Leakage of some enzymes and cofactors from the cell during the preparation of protoplasts from baker's yeast. Arch. Biochem. Biophys. 118, 219-223 (1967).

Protoplasts were prepared from log phase cells of baker's yeast by two methods: by plain snail gut enzyme digestion or using a pretreatment with 2-mercaptoethanol. During preparation of protoplasts by snail gut enzyme digestion alone, thiamine, riboflavin, and nicotinic acid were released into the medium in considerable amounts. By the pretreatment, however, the amount of these vitamins could be kept at a higher level in the protoplasts. By both methods, 85% of the acid phosphatase and 65-75% of the saccharase were liberated into the medium. The bulk of protein and intracellular enzymes investigated remained in the protoplasts regardless of which preparative procedure was used.

H. Suomalainen, T. Nurminen and E. Oura. Preparation of the plasma membrane fraction from yeast. FEBS Fourth Meeting, Oslo 1967, Abstr. Commun. p. 111.

T. Nurminen and H. Suomalainen. Respiratory enzyme activities of anaerobically and aerobically grown baker's and brewer's yeast. FEBS Fourth Meeting, Oslo 1967, Abstr. Commun. p. 111.

More detailed communications are being prepared for publication.

P. Ronkainen, S. Brummer and H. Suomalainen. Chromatographic identification of carbonyl compounds. VIII. The carbonyl compounds in a fermented glucose solution. J. Chromatog. 28, 443-445 (1967).

P. Ronkainen, S. Brummer and H. Suomalainen. Chromatographic identification of carbonyl compounds. IX. The carbonyl compounds in crude spirits. J. Chromatog. 28, 270-276 (1967).

The aldehydes and keto acids formed by baker's yeast in fermenting glucose solution and the carbonyl compounds in crude spirits were investigated. The aldehydes formed under anaerobic conditions in fermenting solution were isolated as their 2,4-dinitrophenylhydrazones and thereafter oxidized to carboxylic acids and analysed by gas chromatography. The keto acids were converted into their methyl esters. In addition to acetaldehyde, propionaldehyde, isobutyraldehyde, butyraldehyde, isovaleraldehyde and/or 2-methylbutyraldehyde were found. Pyruvic acid was the predominating keto acid and, further 2-oxobutyric acid, 2-oxoisovaleric acid, 2-oxoisocaproic acid, 2-oxo-3-methylvaleric acid and 2-oxoglutaric acid could be identified. In crude spirits the main component of the carbonyl compounds was found to be acetaldehyde, whereas C_3-C_6 aldehydes were present in smaller quantities. The amounts of acetaldehyde, propionaldehyde, isobutyraldehyde, isovaleraldehyde and/or 2-methylbutyraldehyde were determined quantitatively by means of gas chromatography. Crude spirits were found to contain also diacetyl and

2,3-pentanedione analysed as their bis-2,4-dinitrophenylhydrazones on thin-layer plates.

World Wide Survey of Fermentation Industries 1963. Pure and Applied Chemistry 13, 405-417 (1966).

A survey was prepared for the International Union of Pure and Applied Chemistry (IUPAC) by its Fermentation Industries Section concerning the present status, the trends and future potential of industrial fermentations in the world. In consequence of this, 40 inquiries were sent during 1963-64 to experts in different countries around the world with request for statistical data regarding various branches of the fermentation industry and reports regarding production, export and import. Response to this questionnaire form has brought data from 28 countries. Also other available statistics have been used to supplement the survey. The data are dealt with and the survey drawn at the Research Laboratories of the Finnish State Alcohol Monopoly (Alko). The survey contains a chapter on the production of industrial alcohol and of alcoholic beverages, divided into beer and wine and distilled beverages, as well as separate chapters concerning the production of pressed baker's yeast, active dried baker's yeast, food and feed yeast and other yeast products.

XVI The Australian Wine Research Institute, Adelaide, South Australia. Communicated by Dr. B. C. Rankine.

For a number of years part of the work of The Australian Wine Research Institute has been concerned with examining a large number of yeasts for their application in wine fermentations. The yeasts are all species and strains of Saccharomyces and show wide differences in various products of fermentation, such as hydrogen sulphide formation, l-malic acid decomposition, pyruvic acid formation, formation of fusel oils and various other secondary products.

This work is still in progress and results so far obtained have been published in the following papers:

"Nature, Origin and Prevention of Hydrogen Sulphide Aroma in Wines", B. C. Rankine, J. of the Science of Food and Agriculture (1963) 14, No. 2:79-91.

"Hydrogen Sulphide Production by Yeasts", B. C. Rankine, J. of the Science of Food and Agriculture (1964) 15, No. 12:872-877.

"Decomposition of l-malic acid by Wine Yeasts", B. C. Rankine, J. of the Science of Food and Agriculture (1966) 17:312-316.

"Factors Influencing the Pyruvic Acid Content of Wines", B. C. Rankine, J. of the Science of Food and Agriculture (1965) 16:394-398.

"Influence of Yeast Strain and pH on Pyruvic Acid Content of Wines", B. C. Rankine, J. of the Science of Food and Agriculture (1967) 18:41-44.

"Schizosaccharomyces malidevorans sp.n. a yeast decomposing l-malic acid", B. C. Rankine & J. C. M. Fornachon, Antonie van Leeuwenhoek (1964) 30:73-75.

"Pichia Membranaefaciens, a yeast causing film formation and off-flavour in table wine", B. C. Rankine, American J. of Enology and Viticulture (1966) 17, No. 2:82-86.

"Quantitative assessment of dominance of added yeast in wine fermentations", B. C. Rankine & B. Lloyd, J. of the Science of Food and Agriculture (1963) 14:793-798.

In addition, J. C. M. Fornachon has continued with his work on Sherry-Flor Yeasts (film-forming strains of Saccharomyces), and both these and the yeasts intended for the primary fermentation are distributed to Australian wineries for use commercially. The Institute also houses a collection of non-Saccharomyces yeasts representing many genera.

We hope to continue this work on the differences between strains of yeasts and I have recently received some cultures from Dr. F. W. Beech of the Cider Research Station of the University of Bristol, whom I visited last year. I hope to be able to relate differences in products of fermentation by different yeasts to quality in wines.

XVII Institut de Recherches Viti-Vinicoles, Matuškova 21, Bratislava, Czechoslovakia. Communicated by Dr. E. Minárik.

The following is a summary of a recently published paper. Minárik, E. and Navara, A. Biologic destruction of malic acid in fermenting grape juice by various species of the genus Schizosaccharomyces. Wein-Wissenschaft, 22, 385-395, 1967.

The influence of various Schizosaccharomyces species, Sch. pombe, acidodevoratus, mosquensis, mellacei, on the destruction of L-malic acid in fermenting grape juice was studied. An intensive malic acid - alcoholic fermentation of the juice was evoked by these yeasts only if the original yeast flora of the juice had been eliminated by pasteurization prior to pure yeast starter addition.

The activity of Schizosaccharomyces sp. is suppressed by strong sulfiting up to 200 ppm sulfur dioxide connected with settling so that no malic acid destruction takes place. Schizosaccharomyces acidodevoratus and pombe caused a very profound deacidification. The rate of sugar fermentation by Schizosaccharomyces sp. is slower by approximately 50 per cent as compared to Saccharomyces cerevisiae var. ellipsoideus and oviformis. The quality of wines fermented by various Schizosaccharomyes species does not achieve that of spontaneously fermented wines or those by pure cultures of Saccharomyces sp. owing to strong acidity reduction and by-products arisen from the malic acid-alcoholic fermentation. Aspects of pilot-plant application of Schizosaccharomyces sp. in wine making is discussed briefly.

Annual Meeting of Workers in Yeast Research at the Smolenice Castle, Czechoslovakia. Communicated by Dr. E. Minárik.

The Committee for Yeasts of the Czechoslovak Microbiological Society organized the First Annual Meeting, December 7-8, 1967 at Smolenice near Bratislava. This was the first meeting of yeast specialists in this country since the 2nd International Symposium on Yeasts held in 1966 in Bratislava. Twenty two

lectures were given in 8 sections, viz. taxonomy, ecology, cytology, genetics, immunology, pathogenicity, biochemistry and technology. Here are the main contributions:

1. A. Kocková-Kratochvílová: Recent problems in numerical taxonomy
2. E. Minárik: Yeasts and yeast-like microorganisms in marginal wine regions
3. O. Nečas: Advances in yeast cytology
4. L. Sedlárová: Actual problems in yeast genetics
5. V. Kováčová et al.: Recent problems in RD mutants
6. A. Tomšíková: Significance of immunological reactions in yeasts
7. Z. Jesenská: Pathogenic properties of yeast-like microorganisms
8. A. Kotyk: Regulation of transport processes in yeasts
9. S. Hunčíková: Problems of yeast research and utilization in the Czechoslovak industry
10. O. Bendová: Some results in brewer's yeast research

A very vivid and useful discussion followed each of the actual papers read. The Committee for Yeasts will organize annual meetings dealing with yeast research, the next being held in November 1968 at the same place.

A summary of the papers given will be published in 1968.

XVIII Department of Agriculture, University of Mie, Kamihama-Cho, Tsu-City, Mie Prefecture, Japan. Communicated by Dr. Morio Akaki.

The following paper has been published:

Studies on the Brewing of Sake using Pure Culture of Saccharomyces sake instead of "Moto". (IV) Production of Yeast Cells by Tank Culture (2); R. Miyazaki, O. Nagano, H. Yoshida, and M. Akaki. Jour. Soc. Brewing, Japan, 61(8), 730-734 (1966).

SUMMARY

In the preceding paper [Journal of the Society of Brewing, Japan, 61(6), 546 (1966)] we have introduced our newly devised propagation tank with full capacity 240 liters for the production of sake yeast, and reported the relationship between the growth of Saccharomyces sake and conditions of aeration and agitation by using this propagation tank.

This paper deals with the conditions for manufacturing yeast cell using this tank, and the keeping qualities of yeast cells harvested from the culture in media containing malic acid, urea and molasses. Results as mentioned below were obtained.

1. In producing yeast cells of Saccharomyces sake, which is especially favourable to sake brewing, pretreatment of the raw material may be

necessary to remove precipitable colloidal substances present in molasses.

But excessive removal of colloidal substances in molasses is apt to cause some decrease in the yeast yield. Hence it is desirable that precipitable colloidal substances in molasses are removed only to such an extent as to prevent yeast cells from being contaminated with impurities present in molasses, and as to facilitate separation and washing of yeast cells.

2. Media for culturing yeasts were prepared by adding each one of six kinds of organic acids, i.e., lactic, malic, succinic, citric, tartaric and maleic acids, in the amount of 10 g per liter, to molasses containing about 5% of total sugar, urea and salts. Saccharomyces sake was cultivated in the media with aeration and agitation using the propagation tank. Effects of the addition of these organic acids were examined on the yield of yeast, on pH stability of the media used during cultivation, and on the colour of harvested yeast. The most favourable results were obtained in the molasses medium supplemented with malic acid.

3. The most suitable temperature for keeping the compressed sake yeast was found in a range of 0-5°C.

XIX International Meetings.

1. Third International Symposium on Yeasts, Delft Julianalaan 67a, The Netherlands, June 2-7, 1969. Communicated by Dr. T. O. Wiken, Chairman of the Organizational Committee.

In June 1969 the Third International Symposium on Yeasts will be held in Delft and the Hague in the Netherlands.

The subjects that will be dealt with are:
Taxonomy; cytology; genetics; ecology; pathology and immunology; technology; nutrition and growth; intermediate and energy metabolism; special biosynthesis; enzymology; permeability and accumulation.

The membership will be open to all persons, interested in scientific work on yeasts.

The symposium will be held from June 2nd to June 6th inclusive 1969.

Any person or institution interested in the Symposium is invited to ask for a Provisional Registration Form at the following address:

Drs. L. Rodrigues de Miranda
General Secretary of the Organizing Committee
"Third International Symposium on Yeasts"
Julianalaan 67A
Delft
The Netherlands.

2. International Conference on Culture Collections, Tokyo, Japan, October 7-12, 1968.

The International Conference on Culture Collections will be held in Tokyo, from 7 to 12 October 1968, sponsored by UNESCO organized by the Japanese Federation of Culture Collections of Microorganisms and the ICRO/Unesco panel on microbiology in cooperation with the International Association of Microbiological Societies.

Background:
At the 12th General Conference of UNESCO, in 1962, the Delegates of the Japanese Government proposed UNESCO's assistance to promotion of research on microorganisms which was adopted at the following General Conference, in 1964, and resolved to be a long term project "Promotion of the Research on Microorganisms" starting in 1965. In July 1966, UNESCO organized a Specialists' Meeting on Culture Collections for implementation of the long term project. It was suggested at the Meeting to hold an international conference on culture collections which was approved by the Executive Committee and Section on Culture Collections of IAMS as well as by the UNESCO/ICRO Panel on microbiology. Upon receiving strong request to hold the conference in Japan, who first suggested the conference, an organizing committee has been appointed.

Aims of the Conference:
The aims of this conference are to exchange information on existing culture collections of the world and to review the present conditions of the fields concerned and further to contribute to the formation of an international network of culture collections.

The conference will serve its purpose if it will become a world-wide gathering of researchers, administrators, etc. in the field of culture collections of microorganisms.

Membership will be open, except for a special meeting, to any person interested in Culture Collections of Microorganisms and related fields.

Application for Participation:
Write to Professor Hiroshi Iizuka
Secretary General ICCC
Institute of Applied Microbiology
The University of Tokyo
Bunkyo-ku, Tokyo, Japan.

3. The IInd International Symposium on Yeast Protoplasts will take place at the end of August 1968 in Brno, Czechoslovakia. Thus far about 70 applications of participants intending to present papers dealing with problems of protoplasts and cell walls have been received. The secretary of the Symposium is Dr. A. Svoboda, Dept. of Biology, Medical Faculty, Purkyne University, Brno, Czechoslovakia.

XX Brief News Items

1. Charles M. Bump writes: I have changed positions as indicated below.

   From: Department of Bacteriology
   Massachusetts General Hospital
   Boston, Massachusetts

   To: Bacteriology Department
   New England Medical Center
   171 Harrison Avenue
   Boston, Massachusetts 02111

   I have a paper entitled "Mixed Grain Extracts: A new concept in Media for Production of Chlamydospores by Candida albicans" to be published in the January-February issue of the American Journal of Medical Technology.

2. Another change of address was received from Dr. C. Akin. He left Falstaff Research Laboratory and accepted a new position with the Research and Development Department of American Oil Company at Whiting, Indiana. His new work involves Microbial Utilization of Petroleum.

   From: Falstaff Brewing Corporation
   1920 Shenandoah Avenue
   St. Louis, Missouri 63104

   To: Dr. Cavit Akin
   American Oil Company
   Post Office Box 431
   Whiting, Indiana 46394

3. Ministério da Educacao e Cultura, Universidade Federal de Pernambuco, Instituto de Micologia, Recife, Brazil. Professor A. Chaves Batista, director of the Institute writes: We are continuing a study of fungi in forest soils - native, burned over, and mechanically altered.

4. Ronald E. Simard, agronome-professeur, Ecole d'Agriculture, Rimouski, Qué., Canada, writes: In January 1968, I will start working under Dr. A. C. Blackwood at Macdonald College. I am interested in the Serological and Biochemical classification of different yeasts.

5. Over 1,200 references to microbiological culture techniques, many applicable to the study of yeasts, are included in a book to be published by Academic Press in January, 1968. The title is Miniaturized Microbiological Methods, by Paul A. Hartman of Iowa State University. It will appear as Supplement 1 to Advances in Applied Microbiology, edited by Wayne W. Umbreit.

6. Professor F. Blank, Dept. of Dermatology, Temple University Health Sciences Center, The Skin and Cancer Hospital of Philadelphia, 3322 North Broad Street, Philadelphia, Pa. 19140, writes: The following studies on yeast polysaccharides were published.

R. J. Yu, C. T. Bishop, F. P. Cooper, H. F. Hasenclever and F. Blank. Structural studies of mannans from Candida albicans (serotypes A and B), Candida parapsilosis, Candida stellatoidea, and Candida tropicalis. Canadian J. Chem. 45:2204-2211, 1967.

R. J. Yu, C. T. Bishop, F. P. Cooper, F. Blank, and H. F. Hasenclever. Glucans from Candida albicans (serotype B) and Candida parapsilosis. Canadian J. Chem. 45:2264-2267, 1967.