

obtained with a preparation which contained impurities, the action of which is not known.

All of the samples of "commercial" penicillin were 3 to 5 times as effective as crystalline penicillin G in protecting the animals against the infection. Moreover, the protective action exerted by these impure penicillins was of the same order regardless of the unitage per mg or the value of the *Bacillus subtilis-Staphylococcus aureus* dif-

ferential ratio. The protective power of pure X is as great as that observed following the administration of the impure "commercial" penicillins. As the latter were manufactured by a process which presumably excludes the presence of X, it would not seem that the superiority of the impure penicillins over crystalline G could be attributed to the presence of X in the impure material.

15580 P

Nicotinic Acid and Pantothenic Acid Content of Sunflower Seed Meal and Some Oil Seed Products.*

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Interest in the nutritional significance of sunflower seed meal has been aroused by recent reports, based on feeding experiments, that it is a good source of B complex vitamins¹ and protein.^{2,3} Such procedures indicated that the content of pantothenic acid is relatively lower than most of the other B complex vitamins. Also, chemical analyses for nicotinic acid in this product gave uncertain results. Therefore, in this investigation particular attention was given to the determination of these 2 vitamins by microbiological methods. Several products in addition to sunflower seed meal were analyzed.

Well known analytical methods for pantothenic acid^{4,5} and nicotinic acid⁶ were used.

The materials assayed were commercial products. All, except one, had been defatted by solvent extraction processes.

The analytical results, as shown in Table I, reveal that sunflower seed meal contains approximately 150% more preformed nicotinic acid than does the best grade of wheat germ analyzed, and it is approximately 500% richer in this vitamin than is corn germ or solvent-extracted soybean meal. Of the materials analyzed, only sunflower seed meal showed the presence of the "alkali-labile precursor" of nicotinic acid.⁷ Since the precursor is biologically active in both dogs and chicks,⁷ the total nicotinic acid value for sunflower seed meal is approximately the same, if not higher, than that of peanut meal.⁸ This is of considerable interest because the latter has been rated as an outstanding source of nicotinic acid, as compared with other edible oil seed and cereal products.⁹

The pantothenic acid content of the sunflower seed meal is similar to that of the solvent-extracted soybean meal but it is ap-

* Aided by a grant from the VioBin Corporation.

¹ Day, H. G., and Levin, E., *Science*, 1945, **101**, 438.

² Mitchell, H. H., Hamilton, T. S., and Beadles, J. R., *J. Nutrition*, 1945, **29**, 13.

³ Grau, C. R., and Almquist, H. J., *Proc. Soc. Exp. Biol. and Med.*, 1945, **60**, 373.

⁴ Skeggs, H. R., and Wright, L. D., *J. Biol. Chem.*, 1944, **156**, 21.

⁵ Cheldelin, V. H., and Williams, R. R., *Ind. and Eng. Chem., Anal. Ed.*, 1942, **14**, 671.

⁶ Krehl, W. A., Strong, F. M., and Elvehjem, C. A., *Ind. and Eng. Chem., Anal. Ed.*, 1943, **15**, 471.

⁷ Krehl, W. A., Elvehjem, C. A., and Strong, F. M., *J. Biol. Chem.*, 1944, **156**, 13.

⁸ Payne, D. S., *Chem. and Eng. News*, 1942, **20**, 1173.

⁹ Zucker, T. F., and Zucker, L., *Ind. and Eng. Chem.*, 1943, **35**, 868.

TABLE I.
 Summarized Analytical Data.

Materials*	Nicotinic acid								
	HCl extraction			NaOH extraction			Pantothenic acid		
	Samples used	Avg γ/g	Range γ/g	Samples used	Avg γ/g	Range γ/g	Samples used	Avg γ/g	Range γ/g
Sunflower seed meal	7	184	173-198	5	312	285-330	8	43	33-58
Wheat germ meal (A)	2	77	72-82	3	67	63-72	8	30	23-35
" " " (B)	2	40	38-42	3	39	38-40			
Corn germ meal	5	38	35-40	5	35	34-36	8	25	24-26
Soybean meal	4	27	26-29	4	24	23-26	9	43	34-59
" " (expeller)	2	17	16-19	2	17	17-18	10	26	19-32

* Furnished by Archer-Daniels-Midland Company, Minneapolis, Minn.; Central Soya Company, Decatur, Ind.; and ViöBin Corporation, Monticello, Ill.

proximately 60% greater than that of soybean meal produced by an expeller process. The corn germ and wheat germ have less pantothenic acid than the sunflower seed meal. This is probably due to inherent differences between these materials and not to differences in the manufacturing processes because the corn germ, one lot of wheat

germ, and the sunflower seed were subjected to the same conditions in the removal of the oil and in the subsequent treatment.

Summary. Sunflower seed meal is an excellent source of nicotinic acid. The content of pantothenic acid is equal or superior to that of soybean meal, wheat germ or corn germ.

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Chemical Derivatives of Gramicidin.

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Gramicidin has been found to react readily with formaldehyde to yield a product of improved pharmaceutical properties.¹ A study of the reaction mechanism indicated that formaldehyde was added in the form of hydroxymethyl groups quantitatively to the indole rings of the tryptophane,² which occurs to the extent of 40% in gramicidin. It was the object of the present investigation to search for other reagents which might, like formaldehyde, reduce the hemolytic and

toxic but not the antibiotic activity of gramicidin, and at the same time render the derivative more water-soluble.

¹ Lewis, J. C., Dimick, K. P., Feustel, I. C., Fevold, H. L., Olcott, H. S., and Fraenkel-Conrat, H., *Science*, 1945, **102**, 274.

² Fraenkel-Conrat, H., Brandon, B. A., and Olcott, H. S., *Fed. Proc.*, 1946, **5**, 134; in press.

Reaction with Various Aldehydes. Representative results obtained with a series of aldehydes are summarized in Table I, Section A. Nitrogen analyses indicated that all aldehydes used combined with gramicidin, though to a variable extent. Acetal and glucose did not react appreciably. In contrast to the selective effect of formaldehyde, which decreases the hemolytic but not the antibacterial activity, all other aldehydes appeared to affect both activities to a similar degree. The aliphatic aldehydes generally caused a slight reduction, but glyoxal and