own mothers this increase would have been, roughly, four times. Conversely, normal young suckled by pure food mothers increase their body weight but four times in spite of the somewhat superior vigor with which these animals start life.

Now it is conceivable that the excellent lactatory powers of the normal animals are not actually due to the food consumed by them during the lactation period, but to "reserve" substances in their tissues which can be called upon in this unique need. An answer to this is given by the imperfect lactation resulting when an animal is shifted from a satisfactory diet to the "pure" one. The mammary stimulant must hence be an element of the food.

The natural foods therefore contain a substance, or substances, essential for the normal function of the mammary gland. We have been able to shed some light upon which particular natural foods contain and which do not contain this material, which may be variously termed the lactation auximone, or auximones, or nutritive galactagogue according to one's preference. Early in our studies various amounts of different natural foods were added to the basal pure diet in order to induce fertility, and we took occasion to study not only the function of reproduction but, when young were born, that also of lactation. Many substances (*e.g.*, vegetable oils) which induce reproduction do not improve the lactation of animals upon the basal régime; on the other hand, some of them greatly improve mammary function. Among the substances studied are leaves, grains and animal tissues. A considerable body of data has been secured with the use of lettuce, wheat, egg yolk and beef muscle. Fresh leaves in high amounts improve lactation; when dried, they do not do so. Wheat embryo does so when fed as a considerable portion of the ration. Egg yolk and meat help lactation markedly. Furthermore, the fat has been extracted from both egg yolk and wheat embryo, and in their fat-free form these foods were as effective in galactagogic action as they were formerly. It would appear, therefore, that the food material necessary for normal mammary function is not soluble in fats. Implication of a protein factor is suggested by the potency of meat and grains, even though experiments with milk itself make it seem less likely that either protein or inorganic matter constitutes the dietary substance conditioning normal mammary performance. The total milk solids (we have used as much as a third by weight of the entire ration in the form of whole milk powder) do not repair lactation delinquency so effectually as do the other substances mentioned. Yet the difference between bovine and muridine milk in these very constituents robs such an argument of crucial value. Attention is being paid to the distribution and possible isolation of the food constituent in question. It is by no means ascertained that this is not a well-known substance. A suggestion, however, that this is not the case and that we may be dealing here with one of those specific stimulants to the biochemical mechanism constituted by the so-called auximones like *bios*, is furnished by the superior effect of fresh leaves when contrasted with the same desiccated leaf substance. Be that as it may, a single conclusion—yet an important one—seems clearly validated by the "pure food" lactation studies. Food requirements for normal lactation in the rat are not fulfilled by the classical "synthetic" dietaries of fat, carbohydrate and protein, together with salts and an abundance of the known vitamines A, B, C, D and X—dietaries entirely adequate for growth and reproduction.

Herbert M. Evans
University of California

THE AMERICAN CHEMICAL SOCIETY

Division of Organic Chemistry

(*Continued*)

3-amino-4-hydroxyphenylarsine: G. W. Raiziss and B. C. Fisher. This dihydrochloride of 3, 3′-diamino-4, 4′-dihydroxyarsenobenzene, known under the names of arsphenamine and salvarsan, is a remedy of great value in medicine. Its oxidation product, the 3-amino-4-hydroxyphenylarsineoxide, possesses a still greater destructive effect upon parasites, but it is more toxic and therefore has not been used in treatment of diseases. The authors were interested to study the biological properties of the reduction product of the first-named compound and therefore it became necessary to secure the product as pure as possible. German and English patents in which the preparation of the 3-amino-4-hydroxyphenylarsine is described, when followed, gave extremely small yields and a very impure product. A systematic and prolonged study led to a satisfactory method which gave comparatively good yields and what is very important, a chemically pure product. This arsine was made from arsphenamine by the reduction with zinc dust and hydrochloric acid at 40° C. It was precipitated out by means of a saturated solution of sodium acetate. The crude product was extracted with ether, the work having been performed strictly under pure nitrogen gas. The crude product has been purified four times, dissolving it in dilute alkali and reprecipitating by acetic acid. This again was done under nitrogen. The product so obtained represents a pure white substance easily oxidizable to the yellow arsenobenzene. It is an interesting substance from the biological standpoint, being highly trypanocidal, more so than arsphenamine and the corresponding arsineoxide.

The use of silicon tetrachloride for the synthesis of acid chlorides. (By title): R. E. Montonna and H.

HIBBERT. Silicon tetrachloride can be used for the manufacture of acid chlorides from the corresponding acid. In general, one mole of acid was used to one mole of silicon tetrachloride, temperature and operating conditions varying with the acid employed. In most cases it is advisable to dilute the acid with an inert solvent, for example, toluene, xylene, etc. The yields of acetyl-, propionyl-, butyryl-, iso-butyryl-, benzoyl and phenyl acetyl chloride were 85 per cent., 50 per cent., 49 per cent., 53 per cent., 77 per cent., 61 per cent., respectively. It is best to use an iron reaction vessel with suitable agitator, when the residue left consists only of dry silica in a form of powder.

Thermolysis of organic esters: H. HIBBERT and E. M. BILGER. Both organic and inorganic esters decompose on heating, and their behavior is similar in many respects. With organic esters the nature of the decomposition into acid and hydrocarbon varies with the type of ester employed. Ethyl acetate and other esters containing hydrogen atoms attached to the carbon atom in the beta position to the ether oxygen, when heated above a definite temperature limit decompose smoothly into acid and hydrocarbon. Those esters containing no hydrogen atoms in this position are much more stable (methyl acetate, benzyl benzoate, etc.). The mechanism of the reaction may consist of either a straight dissociation (Neff) or intermediate formation of a five-, four- or three-membered ring, and the authors submit certain theoretical speculations as to the mechanism involved in such decompositions.

The application of the diazo reaction in the synthesis of diaryl compounds: M. GOMBERG and W. E. BACHMANN. About 20 compounds of this nature are described, which have been prepared in this manner and the constitution of which has been definitely determined.

New researches on the proteins of silk: E. M. SHELTON and T. B. JOHNSON. The research in progress is a continuation of an investigation of silk proteins which has been in operation for several years. New evidence has been presented through X-ray analysis by other workers that fibroin of silk is a mixture of two or more proteins. Conclusions regarding the uniformity of the protein sericine has never been established and the chemistry of this substance is at present in a very undeveloped state. This research has dealt with a critical study of the properties and chemical behavior of sericine prepared under different conditions. The action of the enzyme pepsin has also been incorporated in the research. Data have been obtained which have revealed a clearer understanding of the behavior and the practical utility of this enzyme as a degumming agent.

Dissociation and reversible rearrangement of the propyl bromides by heat, and their formation from propene and hydrogen bromide: R. F. BRUNEL and H. G. RAFSKY. Heating of either normal or isopropyl bromide in the gas state gives an equilibrium mixture of the two bromides with their dissociation products, hydropropyl bromide and propene. The ratio of iso- to normal propyl bromide at 300° is 73:27. The degree of dissociation of these bromides does not differ greatly from that of the butyl bromides previously investigated. The action of hydrogen bromide on propene gives mixtures running all the way from nearly pure n-propyl to nearly pure isopropyl bromide.

Evidence of the symmetrical constitution of the dihalogen substitution products of acetylene: L. B. HOWELL. In studying the reactions of C_2Cl_2, striking evidence against the existence of so-called acetylidine structure, *i.e.*, $Cl_2C:C:$ (Nef, Ann., 298, 345, 361; 308, 325) is found. When dichloro-acetylene adds a mole of iodine it should, according to Nef's theory, give $Cl_2C:CI_2$ identical with the chlorination product of C_2I_2. Iodination of C_2Cl_2 has been carried out, and it is found to yield a $C_2Cl_2I_2$ (w. solid, m.p. 67.5°–8.5°) different from the liquid isomer (m.p. 2.5°–3°, b.p. 243°) obtained from C_2I_2 and chlorine in previous work. These dichloro-diiodo-ethylenes are evidently the cis and trans stereomers. $ClIC=CClI$. Similar evidence is found in the fact that C_2Cl_2 upon bromination gives the symmetrical $ClBrC:CBrCl$ (b.p. 172°) obtained by Swarts from $CClBr_2 \cdot CHClBr$ and alcoholic KOH. (Cent., 1889, 1, 588.)

The behavior of acetylene and cuprous chloride catalyst in an ammonia system (By title): H. WENZKE and J. A. NIEUWLAND. Acetylene condenses with aniline in the presence of cuprous chloride catalyst to form a substance thought to be bis-ethylidine aniline. When this is heated, a rearrangement takes place with the formation of substituted quinolines. The reaction takes place with the formation of substituted quinolines. The reaction proceeds much like a Skraup's synthesis, especially when nitrobenzene is added in the presence of HCl solution. Efforts to prepare, or rather separate a pure compound from quinaldines have not as yet been successful, except the identification of β-methyl-quinoline. The mixture has a boiling point range from 200° C. to over 300° C., and it is impossible to make any separations with fractional distillation. Mono-ethyl-analine reacts similarly to aniline, except that the product is less fluid in nature. In the condensation with CuCl as a catalyst, the optimum concentration of the catalyst was 6 per cent. to 7 per cent. of the weight of the reacting mixture. Benzylamine, dimethylaniline and diphenylamine were also tried.

The reaction of bromo-nitro-methane with aromatic compounds in the presence of aluminium chloride: M. L. SHERRILL. An investigation of the reaction of bromo-nitro-methane upon the following aromatic compounds has been made: benzene, mono-bromo-benzene, mono-chloro-benzene and anisol. In every case that has been studied, the isolation of two types of products indicates the main trend of the reaction. The one type is either the aromatic nitro-methane, or the corresponding aromatic aldehyde or acid, the latter two compounds formed by the decomposition of the aromatic nitro-methane; the other type is the brominated aromatic compound. The yields of the former type of product have been from 10 to 45 per cent. of the theoretical, while those of the brominated compounds have been from 25 to 65 per cent.

The preparation of thioacetic acid: H. T. Clarke and W. W. Hartman. Hydrogen sulfide does not react with either acetic anhydride or acetyl chloride alone, but readily converts acetic anhydride into a mixture of acetic acid and thioacetic acid in the presence of a small proportion of acetyl chloride. Hydrogen chloride, sulfuric acid and acetyl bromide act in the same way, the last being a particularly efficient catalyst. The resulting thioacetic acid and acetic acid may readily be separated by fractional distillation.

Hydroxamic acids of hydroxy and alkoxy fatty acids: D. H. Powers and L. Jones. Glycolic ethyl ester reacts with hydroxylamine in alcohol solution to give glycolhydroxamic acid, m. p. 85°, from which were prepared the benzoyl and acetyl derivatives and their salts. The rearrangement of these salts in alcohol solution does not give the expected urethanes, but allophanic ester: a product which may be explained by the formation of cyanic acid in the course of the rearrangement. Methoxyacethydroxamic acid and ethoxyacethydroxamic acid were prepared from the ester and acid chloride, and their derivatives prepared and studied. Rearrangement of their salts does not give the amines of urea derivatives expected, but their decomposition products: carbon dioxide, ammonia, formaldehyde and methyl or ethyl alcohol. Attempts to prepare these amines by other methods invariably gave the same decomposition products. Methoxymethyl isocyanate, b. p. 87°, and ethoxymethyl isocyanate, b. p. 106°, were prepared from silver cyanate and the corresponding monochlor ethers. In the presence of moisture, they were hydrolyzed to carbon dioxide, ammonia, formaldehyde and methyl and ethyl alcohol, respectively.

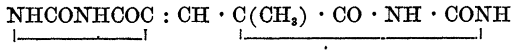
Action of the hypochlorous acid on alcohols: M. C. Taylor, R. B. MacMullin and C. A. Gammal. It has been shown that the action of HOCl on monohydric alcohols to form esters is a general reaction. Determinations of molecular weight of ethyl hypochlorite based on alcohol and chlorine content and on vapor density agree in showing that this compound is an ester and not a double compound similar to those described by Kendall. Comparatively stable solvent solutions of these esters may be readily prepared by shaking HOCl, made by chlorinating a limestone suspension, with alcohol and a solvent immiscible with water. The reaction proceeds to equilibrium so rapidly and uniformly that the distribution of the available chlorine between the water and solvent layer can be used as a means of estimating accurately the amount of alcohol present. A physical chemical study of the action of HOCl on ethyl alcohol in the presence of CCl_4 has been made including the following points: (a) Equilibrium constant of the reaction $HOCl — EtOh — EtOCl — H_2O$. (b) Distribution ratio of EtOCl between CCl_4 and water. (c) Effect of temperature on rate of reaction. It has been found that these solvent solutions can be made to react with hydrated lime and water to form solid calcium hypochlorite which can be filtered off.

Hyponitrites: A. W. Scott and L. W. Jones. Sodium hyponitrite was prepared by the action of ethyl nitrite on free hydroxylamine. Since the alkali hyponitrites are most stable in an alkaline solution, methanol containing sodium methylate was employed as the reaction medium. Sodium hyponitrite was obtained in a yield of 13½ per cent. and in a state of comparative purity. Silver hyponitrite was made by the addition of an aqueous solution of silver nitrite to a neutral aqueous solution of sodium hyponitrite. The yield was practically quantitative.

A contribution to the chemistry of pyruvic ureide: D. Davidson and T. B. Johnson. The name pyruvic ureide indicates a product of reaction formed by condensation of pyruvic acid with urea. It is represented structurally in chemical literature as a monomolecular compound containing free methylene group as illustrated by formula I. Gabriel has assigned the constitutional formula II to this compound. New evidence has been obtained indicating that the formula given by Gabriel is correct.

$$\underbrace{NH \cdot CO \cdot NHCO \cdot C}: CH_2$$

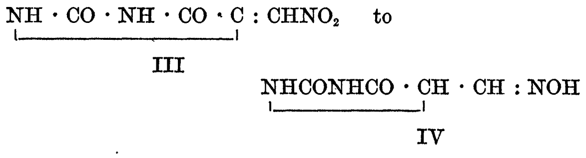
I



$$\underbrace{NHCONHCOC} : CH \cdot \underbrace{C(CH_3) \cdot CO \cdot NH \cdot CONH}$$

II

The research has also involved the study of the nitro derivatives of pyruvic ureide III, particularly its behavior on reduction. It has been found that this substance behaves in a manner analogous to nitrostyrene and is reduced in the presence of platinum to the oxime of hydantoin aldehyde IV.



$$\underbrace{NH \cdot CO \cdot NH \cdot CO \cdot C} : CHNO_2 \quad \text{to}$$

III

$$\underbrace{NHCONHCO \cdot CH} \cdot CH : NOH$$

IV

Preparation and hydrolysis of di-n-butylcyanamide and diallylcyanamide: E. B. Vliet. A method was desired by which di-n-butylamine and diallylamine could be prepared in relatively pure form, free from primary and tertiary amines. The hydrolysis of the corresponding cyanamides, using dilute sulfuric acid, furnished a very satisfactory method.

$$R_2NCN + 2H_2O = R_2NH + NH_3 + CO_2.$$

Di-n-butylcyanamide and diallylcyanamide were prepared by first obtaining a solution of sodium cyanamide by the action of sodium hydroxide on a suspension of lime nitrogen in water. This, upon addition of alcohol, readily reacts with butyl and allyl bromides to form the desired products.

J. A. Nieuwland,
Secretary

(To be continued)