from the "norleucine-region" concentrated. Aliquots of the concentrate were chromatographed in butanol-benzyl alcohol and failed to show any trace of norleucine. The sensitivity of this approach is limited but our results indicate that norleucine, if present, occurs in concentrations of less than 1.6 mg./100 g. casein. Norleucine from casein samples of Trial I were identified on the chromatogram both from the radioactivity and from the color reaction with ninhydrin spray. These samples contained considerably more norleucine than the maximum that could have been present in the control samples and from Carbon-14 measurements we have estimated that the minimum concentration of norleucine in the three hour casein sample of Trial I was 4.73 mg. of norleucine/100 g. casein.

SCHOOL OF VETERINARY MEDICINE
AND COLLEGE OF AGRICULTURE
UNIVERSITY OF CALIFORNIA
DAVIS, CALIFORNIA

A. L. BLACK
MAX KLEIBER

RECEIVED OCTOBER 7, 1955

SODIUM FLUOBORATE AS A FLUORINATING AGENT

Sir:

We treated triphenylchlorosilane with sodium fluoborate in acetone solution, in an attempt to prepare triphenylsilyl fluoborate, but the resulting product was triphenylfluorosilane which was obtained in fair yield. The reaction may be described by the equation

$$(C_6H_5)_3SiCl + NaBF_4 + (CH_3)_2CO \longrightarrow (C_6H_5)_3SiF + \mathit{NaCl} + (CH_3)_2CO{:}BF_3$$

This is believed to be the first reported use of sodium fluoborate as a direct fluorinating agent without the intervening preparation of a diazonium salt. It is the most convenient method known for replacing chlorine on silicon by a fluorine atom. No special apparatus is needed and acid solutions are avoided.

The Swarts reaction, using SbF_3,[1] has been most commonly used in carrying out these reactions; other methods employ anhydrous zinc fluoride,[2] or anhydrous hydrogen fluoride.[3] The most convenient method previously reported involved the reaction of the chlorocompounds with aqueous HF at 0°.[4]

Sodium fluoroborate was found to be insoluble in diethyl ether, petroleum ether and dioxane. It was slightly soluble in alcohol and soluble to the extent of 1.0 g. per 100 ml. in acetone.

Materials.—The triphenylchlorosilane was Dow-Corning purified grade. The sodium fluoborate was commercial grade which had been recrystallized once from water (m.p. 364–367°).

Preparation of Triphenylfluorosilane.—In a typical preparation, triphenylchlorosilane (6.32 g., 0.0215 mole) was dissolved in dry acetone and the solution poured into a clear acetone solution of sodium fluoborate (2.23 g., 0.0203 mole). A precipitate appeared almost immediately. After two hours the solution was filtered, with recovery of 76% of the calculated NaCl. The filtrate was concentrated, and on crystallization a trace of tetraphenylsilane, triphenylfluorosilane and an intractable tar were obtained in three different fractions.

On recrystallization, the triphenylfluorosilane (2.9 g., 54% yield) had a m.p. 59–60° (lit. value 61.5°).[5] A cryoscopic determination in benzene gave a molecular weight of 274 (calcd. 278). Qualitative tests confirmed the presence of silicon and fluorine and the absence of boron.

The tar contained material melting slightly above room temperature which gave a positive test for boron and fluorine but not for BF_4^- (by nitron test). The solid could not be easily isolated, as it decomposed on attempted recrystallization. This was assumed to be impure $(CH_3)_2CO{:}BF_3$.

In another reaction performed similarly, a 66% yield of triphenylfluorosilane was obtained. No attempt was made to determine optimum conditions for maximum yield.

One attempt was made to prepare triphenylsilyl fluoborate by passing BF_3 over a benzene solution of the fluorosilane, in the manner of Witschonke and Kraus,[6] but without success.

The generality of the fluorination is being investigated.

---

[1] H. S. Booth and P. H. Carnell, THIS JOURNAL, **68**, 2736 (1946), and subsequent papers.

[2] J. J. Emeleus and C. J. Wilkins, *J. Chem. Soc.*, 454 (1944); A. E. Newkirk, THIS JOURNAL, **68**, 2736 (1946).

[3] W. H. Pearson, T. J. Brice and J. H. Simons, *ibid.*, **67**, 1769 (1947).

[4] N. S. Marans, L. H. Sommer and F. C. Whitmore, *ibid.*, **73**, 5127 (1951).

[5] C. Curran, R. W. Witucki and P. A. McCusker, *ibid.*, **75**, 4471 (1953).

[6] C. R. Witschonke and C. A. Kraus, *ibid.*, **69**, 2472 (1947).

BATTELLE MEMORIAL INSTITUTE
COLUMBUS 1, OHIO

EMIL A. LAWTON
ARTHUR LEVY

RECEIVED OCTOBER 17, 1955

INCORPORATION OF ADENOSINE-5′-PHOSPHATE INTO RIBONUCLEIC ACID

Sir:

Since we have shown that cell-free preparations of pigeon liver that incorporate adenine into ribonucleic acid (RNA)[1] can also convert added adenine into adenosine-5′-phosphate (AMP),[2] it was pertinent to determine whether the mononucleotide was a precursor of the polynucleotide. Previous work indicated that mononucleotides were not as efficient as adenine in RNA formation by intact animals,[3] and that surviving tissue slices did not incorporate 5′ nucleotides into RNA.[4] A recent report, however, seems to implicate nucleoside-5′-diphosphates in RNA biosynthesis by extracts of micro-organisms.[5]

AMP labeled with C^{14} in the 4 and 6 positions of the adenine moiety was isolated from the pooled acid-soluble nucleotides derived from the viscera of mice that had been injected with adenine-4,6-

---

[1] E. Goldwasser, *J. Biol. Chem.*, **202**, 751 (1953).

[2] E. Goldwasser, *Biochem. Biophys. Acta*, **13**, 341 (1954)

[3] H. Weinfeld, P. M. Roll and G. B. Brown, *J. Biol. Chem.*, **213**, 523 (1955).

[4] K. C. Leibman and C. Heidelberger, *ibid.*, **216**, 823 (1955).

[5] M. Grunberg-Manago and S. Ochoa, THIS JOURNAL, **77**, 3165 (1955).