shows that the inhibitor and the natural substrate have approximately the same affinity for the enzyme.

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Variability of Tooth Formation in Man

Data on the timing of tooth formation are of potential value in a wide variety of applications, ranging from the estimation of age in skeletal remains and accident victims (*1*) to the investigation of dental development in precocious puberty and endocrinopathies (*2*). However, it would appear that values for tooth formation commonly given in the literature greatly underestimate the variability that exists.

Table 1. Variability of mandibular tooth formation (in months) as found in the present study, and as commonly given.

Tooth	This study			Kronfeld (*4*) "Range"*
	No.	Percentile 5th	Percentile 95th	
Beginning calcification				
$\overline{P_1}$	164	19	36	21– 24
$\overline{P_2}$	179	32	56	27– 30
$\overline{M_1}$	157	1	3	birth
$\overline{M_2}$	196	34	58	30– 36
$\overline{M_3}$	135	90	131	96–120
Crown completion—root formation				
$\overline{P_1}$	172	72	97	60– 72
$\overline{P_2}$	166	80	112	72– 84
$\overline{M_1}$	175	37	58	30– 36
$\overline{M_2}$	177	88	122	84– 96
$\overline{M_3}$	53	143	205	144–192
Root completion—apical closure				
$\overline{P_1}$	40	134	168	144–156
$\overline{P_2}$	32	145	184	156–168
$\overline{M_1}$	87	105	139	108–120
$\overline{M_2}$	37	154	211	168–180

* Identical ranges given in Kronfeld (*4*) and Wilkins (*2*). Values given by Schour and Massler (*5*) and Arey (*6*) were obtained by combining maxillary and mandibular "ranges." $\overline{P}$, premolar; $\overline{M}$, molar.

Using serial oblique-jaw x-rays of a total of 255 white Ohio-born participants in the Fels Longitudinal Studies, we determined the time of occurrence of three stages of formation in five mandibular teeth on an individual basis, after reference to each succeeding and each previous x-ray in the series (*3*). Because of skewness, percentiles were computed, rather than means and standard deviations. Combined-sex distributions were employed throughout.

The 5th and 95th percentiles from the present study were compared with the "ranges" given by Kronfeld (*4*), which are the basis for the varying values cited in abridged form by other authors (*2, 3, 5, 6*). As is shown in Table 1, the present 5th to 95th percentile ranges greatly exceed in magnitude the "ranges" previously given, for each of 14 tooth-stage comparisons. On the average, the present ranges and those published by Kronfeld differ by a factor of 3.

There are several possible explanations for the fact that variability of tooth formation as determined here is so much greater than has been accepted hitherto. These possibilities include: the inevitable differences between histological and radiographic approaches; differences in the measure of variability employed; and differences in the populations sampled. However, the most likely explanation lies in the extremely small samples previously investigated. The earlier values are based on a total of 25 to 30 cadavers, most of them from children who were debilitated at the time of death, and many of whom were developmentally abnormal (*7*). For most of the developmental stages of the teeth here compared, the ranges previously given could not have been based on more than two individuals. In contrast, the present data, though not intended for use as norms, are based on from 32 to 196 examples of each stage of each tooth considered (*8*).

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Formation of Metal Alkyls by Ionizing Radiation

Abstract. It has been demonstrated that liquid hydrocarbons, under the influence of gamma radiation, react with "high-surface sodium" to form metal alkyls. The nature of these metal alkyls has been determined, and possible mechanisms for their formation are discussed.

The interaction of alkyl free radicals with metals to form metal alkyls is a well-known reaction. We have found that the irradiation of liquid hydrocarbons in contact with sodium metal supported on aluminum oxide (*1*) results in the formation of low concentrations of metal alkyls and sodium hydride (*2*).

Samples of the five saturated hydrocarbons studied were prepared for irradiation by fractional distillation of the best grades of materials available with the final distillation taking place in a vacuum from "high surface sodium." The irradiation vessels were 4.0-ml Pyrex ampoules in which 0.75 to 1.0 g of the "high-surface sodium" (25 percent sodium by weight) had been loaded in a nitrogen-filled dry box. One-gram samples of the hydrocarbons were distilled into the irradiation vessels and degassed thoroughly by repeated freezing, pumping, and thawing cycles. Irradiations were carried out in a 500-c cobalt-60 source having a dose rate of about 3.0×10^{20} ev/lit. min. Carbonation of the samples with $C^{14}O_2$ following irradiation was carried out by the method of Collins (*3*). The resulting carboxyl-labeled sodium alkanoates were separated by paper chromatography, located on the paper by means of a thin-window Geiger tube, and identified by comparison with the known R_f values for these compounds.

Experimental results relating to the relative yields of the various free radicals captured by sodium are summarized in Table 1. The total dose was 4.0×10^{21} ev for each sample, based on the weight of hydrocarbon in the sample. For the lower hydrocarbons (C_5 or less) the yield of free radicals isomeric to the parent hydrocarbon was about equal to that of the parent. The chromatographic procedure employed did not separate the isomers efficiently above C_5.

Approximate values of the 100-ev yield of total free radicals captured by sodium are: *n*-hexane, 0.10; *n*-heptane, 0.16; 2-methylpentane, 4×10^{-4}; 2,2,4-trimethylpentane, 1×10^{-4}. These values are cal-