New Radiolabeled Compounds in the Diagnosis of Disease of the Adrenal Cortex and Medulla

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1. Alkanesulfonanilides:
Previously, we have demonstrated that $^{14}$C dopamine concentrates strikingly in the adrenal medulla, pheochromocytomas and in neuroblastomas. We have attempted for eight years to develop a gamma emitting analog of dopamine that would concentrate similarly to $^{14}$C-dopamine. Recently, we have synthesized a $^{75}$Se labeled methanesulfonanilide which concentrates strikingly in the adrenal medulla with a high target-to-non-target ratio (Fig. 1).

\[
\text{CH}_3\text{-}^{75}\text{Se}\text{-}\text{H}_2\text{C} \\
\text{HO} \\
\text{NH}^{35}\text{SO}_2\text{CH}_3 \\
\text{CH}_2\text{CH}_2\text{NH}_2
\]

Fig. 1

2. $^{75}$Se-19-selenocholesterol:
This compound is similar to $^{131}$I-19-iodocholesterol in structure (Fig. 2) but concentrates more in the dog adrenal medulla than in the dog adrenal cortex. On May 26, 1975, we first imaged a human pheochromocytoma as a positive image (proved at operation).

\[
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\text{HO} \\
\text{NH}^{35}\text{SO}_2\text{CH}_3 \\
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\]

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\text{HO} \\
\text{NH}^{35}\text{SO}_2\text{CH}_3 \\
\text{CH}_2\text{CH}_2\text{NH}_2
\]

Fig. 2

3. 6-nor-iodocholesterols
This compound (Fig. 3), an “impurity” in $^{131}$I-19-iodocholesterol has been synthesized and demonstrated to have a five times greater uptake in the adrenal cortex than $^{131}$I-19-iodocholesterol
and a good uptake in the adrenal medulla. We have produced images in three humans superior to images produced with $^{131}$I-19-iodocholesterol.

4. **Radiolabeled enzyme inhibitors of adrenal cortical and adrenal medullary enzymes:**

We have demonstrated in the rat, dog and human that $^3$H aminoglutethimide, an inhibitor of 20-alphahydroxylase and phenylethanolamine N-methyl transferase, concentrates strikingly in the adrenal medulla and cortex with a peak uptake within one hour, with most of the radioactivity gone from the body in four hours. The ortho radioiodinated aminoglutethimide (Fig. 4) has been demonstrated to concentrate similarly in the adrenal of the rat.

These compounds should enable us to more effectively diagnose diseases of the adrenal glands than at present with $^{131}$I-19-iodocholesterol. At present, we are: In patients with aldosteronism: a) localizing aldosterone secreting tumors of the adrenal cortex, b) differentiating preoperatively micronodular hyperplasia from macronodular hyperplasia from aldosteronomas; In patients with Cushing’s syndrome: a) making the diagnosis before it can be made with conventional hormonal studies, b) differentiating ACTH excess from adrenocortical adenomas, c) localizing functional adrenal remnants after “total” bilateral adrenalectomy, allowing successful surgical removal; In patients with masculinizing syndromes: a) demonstrating autonomous hyperplasia or nonsuppressible nodules or adenomas of the adrenals before proof of adrenal source of excess androgens by hormonal studies; Diagnosis of unilateral adrenocortical hypofunction: due to, a) post venography infarction, b) post-trauma, c) metastatic carcinoma to adrenal, and d) pheochromocytomas compressing adrenal cortex; When adrenal venography or arteriography is contraindicated or unsuccessful: allowing diagnosis of not only structural abnormalities but also functional abnormalities.

![Chemical structures](attachment:image.png)