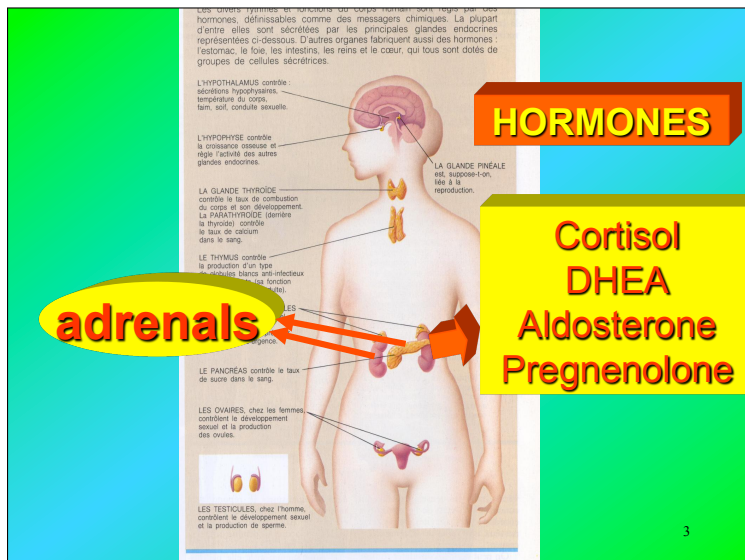


# Aldosterone Therapy

Thierry Hertoghe M. D.

## Aldosterone : Origin ?

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## Aldosterone : Action ?

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**Aldosterone's  
main action =>  
mineral corticoid**

↑ salt (+ water)  
retention

↑ plasma  
volume

↑ blood pressure

5

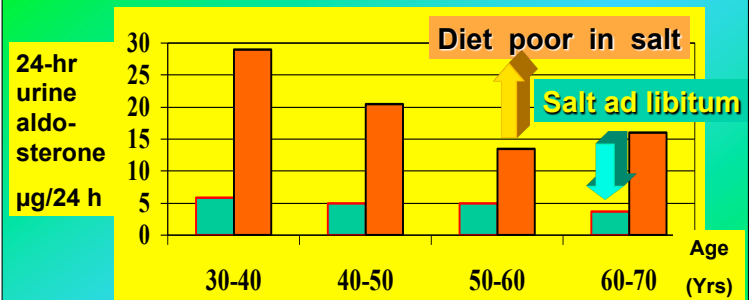
# Aldosterone Deficiency

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# Aldosterone & age-related decline in secretion

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## Age => Urinary aldosterone



**Figure :** the urinary aldosterone excretion declines with age in normal subjects during a diet with ad libitum salt intake. This age-related decline is even more severe with a diet poor in salt. (Hegstad r et al, aging and aldosterone. AM J med, 1983, 74: 422-448)

# Diagnosis of Aldosterone Deficiency

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## Diagnosis

Clinical  
symptoms

Clinical  
signs

Blood

24-hr  
urine

Therapeutic  
test

10

## Clinical Symptoms

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Aldosterone's  
deficiency =>  
↓ mineral corticoid  
activity

↓ salt (+ water)  
retention

↓ plasma  
volume

## Complaints

12 12

**Aldosterone's  
deficiency =>  
↓ mineral corticoid  
activity**

↓ salt (+ water)  
retention

↓ plasma  
volume

↓↓ blood pressure  
(w/orthostatism) & polyuria

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## **ALDOSTERONE DEFICIENCY: SYMPTOMS**

- **Orthostatism** : dizziness, absent-mindedness, low mood when standing up
- **Difficult visual focusing** when standing up
- **Feels better in horizontal position**
- **Salt(y food) cravings**
- **Pollakiuria** w/ important urine volume during the day

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## **Clinical Signs**

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**The foggy look of  
aldosterone deficiency**

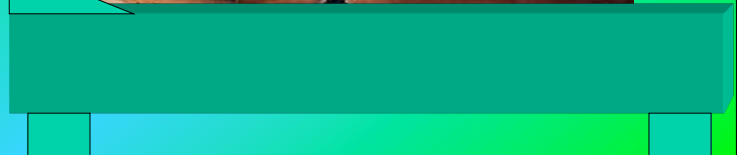
16



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**better  
horizontal**



## Orthostatic hypotension => low BP standing up

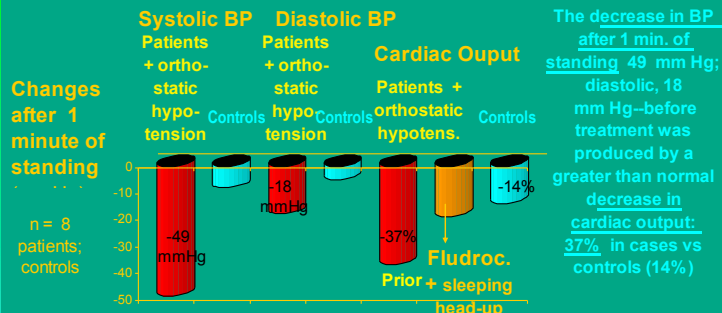


Figure : Treatment increased upright BP by limiting the decrease in cardiac output. The period during which the patients were able to remain in the standing position without orthostatic complaints increased minimally from 3 to 10 minutes.

van Lieshout JJ, ten Harkel AD, Wieling W. Fludrocortisone and sleeping in the head-up position limit the postural decrease in cardiac output in autonomic failure. Clin Auton Res. 2000 Feb;10(1):35-42 Academic Medical Centre, The Netherlands

## Fludrocortisone => ↑ BP

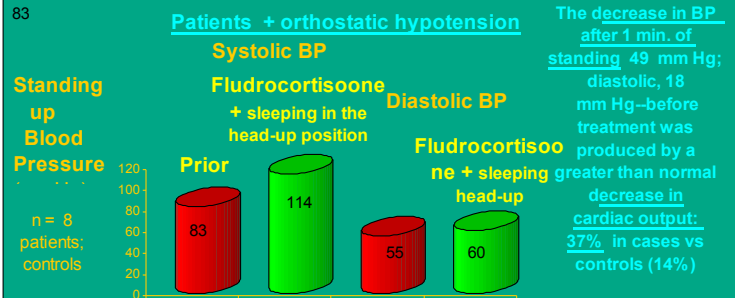
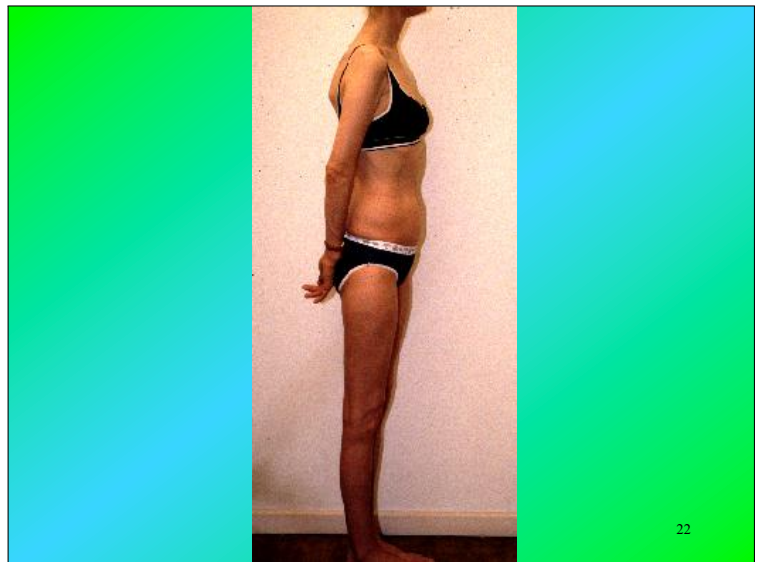


Figure : Treatment increased upright BP by limiting the decrease in cardiac output. The period during which the patients were able to remain in the standing position without orthostatic complaints increased minimally from 3 to 10 minutes.

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## ALDOSTERONE DEFICIENCY: SIGNS

- low BP :
  - standing up : < 95 mm Hg
  - laying down : < 105 mm Hg
- thin, lean face & body silhouette
- pale, absent minded look in upright position (the « aldosterone deficiency look »)
- signs of dehydration: sharp wrinkles, prolonged dorsal skin fold, indented tongue

## Diagnosis

## Lab tests



# Lab Tests

**How to interpret the lab tests results ?**

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# Interpretation

Varies following:

1. the dietary salt (sodium)

=> ↓ aldosterone

2. the physical activity & upright position

=> ↑ aldosterone

**Optimal Aldosterone (w/ average salt intake)**

- Average Sodium
- Average (to high in 24-hr U) Potassium

- Average Aldosterone (after activity in plasma)

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**Plasma**

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**PLASMA**

**ALDOSTERONE**

**after activity**

**ALDOSTERONE DEFICIENCY : Plasma**

**PLASMA**

**ALDOSTERONE**

References: - standing up : 40-300 pg/ml (111-831 pmol/l)

- laying down: 30-160 pg/ml (80-440 pmol/l)

	High Na <sup>+</sup>	Average Na <sup>+</sup>	Low Na <sup>+</sup>
OPTIMAL	140	200	300
Deficiency	0-90	0- 140	0- 190

+ low sodium

## Aldosterone deficiency in plasma (if normal salt intake)

- **Low Sodium**
- **Low Aldosterone** (after activity)
- **High Potassium**

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**24-hr urine**

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## Aldosterone in 24-hr U

**free active hormone**  
= aldosterone production by the adrenals

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## ALDOSTERONE DEFICIENCY : 24-hr Urine

### 24- hr U Aldosterone

	High Na <sup>+</sup>	Average Na <sup>+</sup>	Low Na <sup>+</sup>
OPTIMAL	5	13 µg/24h	28
DEFICIENCIES			
- MILD	< 6	< 8	< 20
- MODERATE	< 4	< 6	< 13
- SEVERE	< 2	< 4	< 6

References

(5 - 20 µg/24h)

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## Aldosterone deficiency in 24-hr urine (if normal salt intake)

- (Low to) High Sodium
- **Low Aldosterone** < 5 µg/24hours
- **Low** (to normal) Potassium
- (Normal to) Excessive volume

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**Treatment of Aldosterone Deficiency**

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## Aldosterone treatment

H<sub>2</sub>O

Na<sup>+</sup>

Food

**Fludrocortisone**

Movement

Rest

## OPTIMIZING ALDOSTERONE TREATMENT

- SUFFICIENT SALT
- SUFFICIENT WATER
- SUFFICIENT MOVEMENT

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## Aldosterone treatment

**Fludrocortisone**

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## ALDOSTERONE TREATMENT = FLUDROCORTISONE

**9 - alpha - fludrohydrocortisone**  
(acetate micronized)

### DEFICIENCIES

- MILD 75 µg 1 x/day
- MODERATE 100 µg (morning)
- SEVERE 150 µg

## ALDOSTERONE: 9- α - fluoro -hydro - cortisone

BP	U 24 h aldosterone (w/ nl salt intake)	(9- α -) fluoro- (hydro) cortisone morning
110-115 mm Hg	7-9	50 µg / day
10-109 mm Hg	5- 6 µg/ 24h	100 µg / day
90 – 99 mm Hg	3 – 4 µg/24h	100 µg / day
< 90 mm Hg	< 3 µg/24h	150 µg/ day

↑ the dose if patient remains in the same upright position longer than normal

## ALDOSTERONE THERAPY ➔ How to prescribe ?

LOW ALDOSTERONE in U 24 h w/ low to moderate salt intake +	TREATMENT 9-α-fluorohydrocortisone
Slightly low blood pressure	50 µg/day in the morning
Low blood pressure (slightly low blood pressure in stress + upright position)	100 µg/day in the morning (starting dose)
Very low blood pressure	150 µg/day in the morning

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# Follow-up of aldosterone treatment

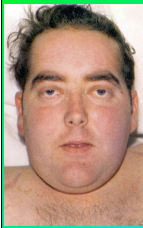
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**Aldosterone treatment**

**Overdosage of fludrocortisone**

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## Aldosterone Excess



- A reddish swollen face
- High blood pressure
- Signs of water retention
- Swollen hands and feet
- A feeling of being under pressure
- Swelling of hands and feet

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## CORRECTING FLUDROCORTISONE DOSAGE: EXCESS

↓ FLUDROCORTISONE DOSE  
↑ POTASSIUM (KALIUM) => 1 to 3 g/day  
(SPIRONOLACTONE 25 to 100 mg/day)

## INSUFFICIENT

↑ + 50 µg 9 - α - FLUOROHYDROCORTISONE  
(acetate micronized)