

# Atkins Diet<sup>®</sup> Slot Machine

By

Michael Shackelford, A.S.A.

August 4, 2008

## Game Description

This is a five-reel video slot.

Three positions are visible in each column.

Any number of pay-lines may be used.

Bonus feature is ten free games, where wins are tripled.

Academic use only!

## Pay Table

Symbol	5 in a row	4 in a row	3 in a row	2 in a row
Atkins (wild)	5000	500	50	5
Steak	1000	200	40	3
Ham	500	150	30	2
Drumstick	300	100	25	2
Sausage	200	75	20	
Eggs	200	75	20	
Butter	100	50	15	
Cheese	100	50	15	
Bacon	50	25	10	
Mayonnaise	50	25	10	
Scale (scatter)	100	25	5	

## Rules

All wins, except the scale, must be left aligned.

The Atkins symbol is wild and may substitute for any symbol, except the scale.

The scale is a scatter pay symbol, and pays regardless of where it appears on the screen. Scatter pay wins will be based on the total amount bet.

In addition to the scatter pay wins in the pay table, if the player gets three or more scatters he will win 10 free games. All wins in free games will be tripled. Free games may earn more free games, infinitely.

## Reel Strips

Stop	Reel 1	Reel 2	Reel 3	Reel 4	Reel 5
1	Scale	Mayonnaise	Ham	Ham	Bacon
2	Mayonnaise	Drumstick	Butter	Cheese	Scale
3	Ham	Steak	Eggs	Atkins	Steak
4	Sausage	Sausage	Scale	Scale	Ham
5	Bacon	Cheese	Cheese	Butter	Cheese
6	Eggs	Mayonnaise	Mayonnaise	Bacon	Sausage
7	Cheese	Ham	Butter	Cheese	Butter
8	Mayonnaise	Butter	Ham	Sausage	Bacon
9	Sausage	Bacon	Sausage	Steak	Drumstick
10	Butter	Steak	Bacon	Eggs	Cheese
11	Drumstick	Sausage	Steak	Bacon	Sausage
12	Bacon	Mayonnaise	Drumstick	Mayonnaise	Ham
13	Eggs	Ham	Butter	Sausage	Butter
14	Mayonnaise	Atkins	Mayonnaise	Cheese	Steak
15	Steak	Butter	Cheese	Butter	Mayonnaise
16	Drumstick	Eggs	Sausage	Ham	Eggs
17	Butter	Cheese	Eggs	Mayonnaise	Sausage
18	Cheese	Bacon	Bacon	Bacon	Ham
19	Eggs	Sausage	Mayonnaise	Drumstick	Atkins
20	Atkins	Drumstick	Drumstick	Sausage	Butter
21	Bacon	Scale	Ham	Cheese	Drumstick
22	Mayonnaise	Mayonnaise	Sausage	Eggs	Mayonnaise
23	Ham	Butter	Bacon	Butter	Eggs
24	Cheese	Cheese	Cheese	Drumstick	Ham
25	Eggs	Bacon	Eggs	Bacon	Bacon
26	Scale	Eggs	Atkins	Mayonnaise	Butter
27	Butter	Drumstick	Drumstick	Eggs	Steak
28	Bacon	Mayonnaise	Bacon	Ham	Mayonnaise
29	Sausage	Steak	Butter	Sausage	Sausage
30	Drumstick	Ham	Cheese	Steak	Eggs
31	Steak	Cheese	Mayonnaise	Mayonnaise	Cheese
32	Butter	Bacon	Steak	Bacon	Drumstick

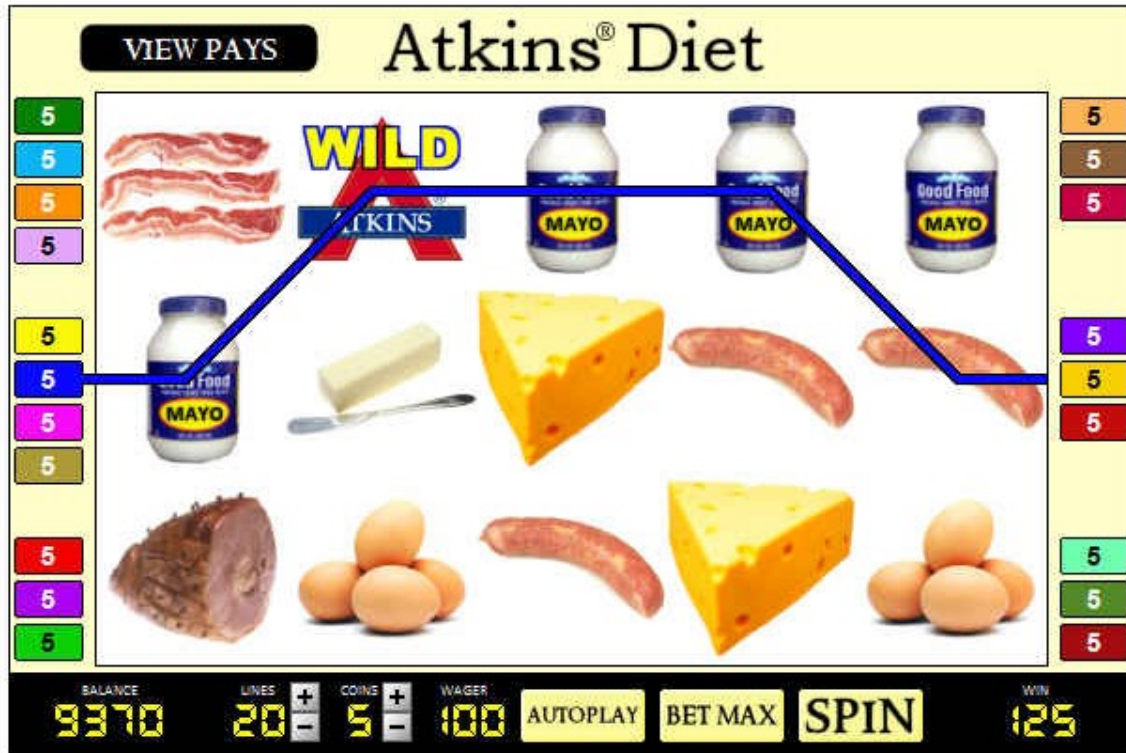
## Game Operation

1. Choose 5 random integers from 1 to 32, one for each reel. Map each number to the corresponding symbol in the reel strips. This will correspond to the middle symbol on each column. The symbols above and below on the screen will be the symbols above and below the assigned middle symbol on the reel strips.
2. Score the result.
3. Pay the player.

## Example

The random numbers chosen are 22,15,15,13,29

The screen will look like this:



## Combinations for each win

Symbol	5 in a Row	4 in a Row	3 in a Row	2 in a Row	Total
Atkins	1	28	513	1024	1566
Steak	431	2996	32480	326656	362563
Ham	955	5157	42112	315392	363616
Drumstick	764	5348	58464	430080	494656
Sausage	1595	8613	54432		64640
Eggs	956	6692	52864		60512
Butter	1995	10692	88704		101391
Cheese	1996	13860	85536		101392
Bacon	2976	20832	103168		126976
Mayonnaise	2980	20860	128736		152576
Total	14649	95078	647009	1073152	1829888

### Probability of each win

Symbol	5 in a Row	4 in a Row	3 in a Row	2 in a Row	Total
Atkins	0.00000003	0.00000083	0.00001529	0.00003052	0.00004667
Steak	0.00001284	0.00008929	0.00096798	0.00973511	0.01080522
Ham	0.00002846	0.00015369	0.00125504	0.00939941	0.01083660
Drumstick	0.00002277	0.00015938	0.00174236	0.01281738	0.01474190
Sausage	0.00004753	0.00025669	0.00162220	0.00000000	0.00192642
Eggs	0.00002849	0.00019944	0.00157547	0.00000000	0.00180340
Butter	0.00005946	0.00031865	0.00264359	0.00000000	0.00302169
Cheese	0.00005949	0.00041306	0.00254917	0.00000000	0.00302172
Bacon	0.00008869	0.00062084	0.00307465	0.00000000	0.00378418
Mayonnaise	0.00008881	0.00062168	0.00383663	0.00000000	0.00454712
Total	0.00043657	0.00283355	0.01928237	0.03198242	0.05453491

### Return of each win

Symbol	5 in a Row	4 in a Row	3 in a Row	2 in a Row	Total
Atkins	0.00015	0.00042	0.00076	0.00015	0.00148
Steak	0.01284	0.01786	0.03872	0.02921	0.09863
Ham	0.01423	0.02305	0.03765	0.01880	0.09373
Drumstick	0.00683	0.01594	0.04356	0.02563	0.09196
Sausage	0.00951	0.01925	0.03244	0.00000	0.06120
Eggs	0.00570	0.01496	0.03151	0.00000	0.05217
Butter	0.00595	0.01593	0.03965	0.00000	0.06153
Cheese	0.00595	0.02065	0.03824	0.00000	0.06484
Bacon	0.00443	0.01552	0.03075	0.00000	0.05070
Mayonnaise	0.00444	0.01554	0.03837	0.00000	0.05835
Total	0.07003	0.15912	0.33165	0.07379	0.63460

### Scatter Pays

Total Scatters	Pays	Combinations	Probability	Return
5	100	486	0.000014	0.001448
4	25	20,898	0.000623	0.015570
3	5	353,916	0.010548	0.052738
2	0	2,936,772	0.087523	0.000000
1	0	11,853,054	0.353249	0.000000
0	0	18,389,306	0.548044	0.000000
Total		33,554,432	1.000000	0.069756

## Bonus Feature

Prob. Bonus	0.011185
Num initial free spins	10
Multiplier	3
Exp base win	0.704353
Expected spins	11.259335
Average bonus	23.791632
Bonus return	0.266105

## Expected Free Spins

Free spins can earn more free spins, infinitely.

Let  $x$  = number of free spins propagated as a result of 1 free spin.

$$x = 1 + 0.011185 * 10x$$

$$x = 1 + 0.11185x$$

$$0.888152x = 1$$

$$x = 1/0.888152$$

$$x = 1.125934$$

$$10x = 11.259335$$

## Summary

Item	Return
Hit freq. (per line)	6.572%
Line Pays	63.460%
Scatter (fixed wins)	6.976%
Scatter (free spins)	26.610%
Total return	97.046%