

1
00:00:00,030 --> 00:00:04,500
hello listeners of the mad scientist

2
00:00:02,250 --> 00:00:06,809
podcast I'm your host Chris Cogswell

3
00:00:04,500 --> 00:00:09,388
before we begin today's episode I just

4
00:00:06,809 --> 00:00:12,570
wanted to give a quick apology and thank

5
00:00:09,388 --> 00:00:14,279
you to all the fans here listening for

6
00:00:12,570 --> 00:00:15,780
the kind of whacky release schedule

7
00:00:14,279 --> 00:00:18,868
we've had to kind of sit ourselves with

8
00:00:15,779 --> 00:00:21,149
these past couple weeks I've had a lot

9
00:00:18,868 --> 00:00:23,399
of stuff I had to deal with personally

10
00:00:21,149 --> 00:00:24,750
that have made kind of putting out

11
00:00:23,399 --> 00:00:27,028
episodes on time a little bit difficult

12
00:00:24,750 --> 00:00:30,118
and I'm hoping that pretty soon we'll be

13
00:00:27,028 --> 00:00:32,789
able to get back to releasing regularly

14
00:00:30,118 --> 00:00:35,689
every Wednesday but you can still expect

15
00:00:32,789 --> 00:00:38,609
an episode every single week so long as

16
00:00:35,689 --> 00:00:42,089
when I drop the episode is between like

17
00:00:38,609 --> 00:00:43,859
Wednesday and Saturday afternoon so

18
00:00:42,090 --> 00:00:46,730
thank you again so much for your

19
00:00:43,859 --> 00:00:49,710
patience and let's get onto the show

20
00:00:46,729 --> 00:00:51,419
today's episode will focus on an idea

21
00:00:49,710 --> 00:00:54,030
that has been out there at least as long

22
00:00:51,420 --> 00:00:55,590
as I can remember since the dawn of

23
00:00:54,030 --> 00:00:57,239
industrial chemistry there have been

24
00:00:55,590 --> 00:00:59,609
questions about the safety of these new

25
00:00:57,238 --> 00:01:02,280
compounds some of which have never been

26
00:00:59,609 --> 00:01:04,829
found in nature before on human life in

27
00:01:02,280 --> 00:01:06,599
the environment this discussion became

28
00:01:04,829 --> 00:01:08,760
even more important with the use of some

29

00:01:06,599 --> 00:01:11,879
of these compounds in foods cosmetics

30
00:01:08,760 --> 00:01:13,740
and pharmaceuticals now of course we

31
00:01:11,879 --> 00:01:16,048
have the modern-day fears of things like

32
00:01:13,739 --> 00:01:18,719
GMOs dye additives and other filler

33
00:01:16,049 --> 00:01:21,150
components but maybe one of if not the

34
00:01:18,719 --> 00:01:23,489
most common chemical fear in our foods

35
00:01:21,150 --> 00:01:26,880
is the concern over high fructose corn

36
00:01:23,489 --> 00:01:28,739
syrup high fructose corn syrup is an

37
00:01:26,879 --> 00:01:31,289
additive to foods to make them sweeter

38
00:01:28,739 --> 00:01:33,030
to bind them together and to act as a

39
00:01:31,290 --> 00:01:35,700
filler component in various sorts of

40
00:01:33,030 --> 00:01:37,618
sweet food stuff it's still extremely

41
00:01:35,700 --> 00:01:39,930
commonplace in most of the food eaten by

42
00:01:37,618 --> 00:01:42,118
many of us and especially the poorest

43
00:01:39,930 --> 00:01:43,649

among us while those with more cash on

44

00:01:42,118 --> 00:01:46,200

hand can shop at one of the almost

45

00:01:43,649 --> 00:01:48,478

infinite number of shops restaurants and

46

00:01:46,200 --> 00:01:50,040

chains who have made a pretty penny off

47

00:01:48,478 --> 00:01:52,349

of replacing components like high

48

00:01:50,040 --> 00:01:54,540

fructose corn syrup with other sorts of

49

00:01:52,349 --> 00:01:57,419

syrup made from agave or aloe or

50

00:01:54,540 --> 00:02:00,090

whatever what is high fructose corn

51

00:01:57,420 --> 00:02:02,490

syrup how do we make it is it dangerous

52

00:02:00,090 --> 00:02:04,530

and what sort of pseudoscience has been

53

00:02:02,489 --> 00:02:08,399

built up around this sticky sweet

54

00:02:04,530 --> 00:02:10,860

compound well put on your best artisanal

55

00:02:08,399 --> 00:02:13,590

locally-made petra chemically based

56

00:02:10,860 --> 00:02:18,480

fiber sweater and let's get sugar

57

00:02:13,590 --> 00:02:22,489

in this week's episode welcome to the

58
00:02:18,479 --> 00:02:25,149
mad scientist podcast today's episode

59
00:02:22,489 --> 00:02:32,289
high-fructose corn syrup

60
00:02:25,150 --> 00:02:34,700
[Music]

61
00:02:32,289 --> 00:02:35,900
hey folks just wanted to give a quick

62
00:02:34,699 --> 00:02:38,539
shout out before we start this episode

63
00:02:35,900 --> 00:02:40,789
to a wonderful darkness podcast I think

64
00:02:38,539 --> 00:02:42,859
you should definitely check out called

65
00:02:40,789 --> 00:02:45,650
the people sky to the Cthulhu Mythos

66
00:02:42,860 --> 00:02:48,319
that Joe has become quickly one of my

67
00:02:45,650 --> 00:02:50,870
favorites on dark myths the Cthulhu

68
00:02:48,318 --> 00:02:52,519
Mythos and HP Lovecraft Ian's horror is

69
00:02:50,870 --> 00:02:53,959
something that I had never really

70
00:02:52,520 --> 00:02:56,239
checked out before I started listening

71
00:02:53,959 --> 00:02:58,729
to that show and since I've just been

72
00:02:56,239 --> 00:03:01,520
like devouring that stuff completely

73
00:02:58,729 --> 00:03:03,289
it's an awesome show great sound design

74
00:03:01,520 --> 00:03:05,000
a great host and I think you should

75
00:03:03,289 --> 00:03:06,409
really go check it out again that show

76
00:03:05,000 --> 00:03:08,930
is called the people's guide to the

77
00:03:06,409 --> 00:03:11,469
Cthulhu Mythos go check it out and all

78
00:03:08,930 --> 00:03:13,939
our other shows at dark myths org

79
00:03:11,469 --> 00:03:16,189
high-fructose corn syrup is one of those

80
00:03:13,939 --> 00:03:18,079
boogeymen of the modern age it has

81
00:03:16,189 --> 00:03:19,789
become ubiquitous for the argument about

82
00:03:18,080 --> 00:03:22,489
modern food and modern life were

83
00:03:19,789 --> 00:03:25,699
generally being inundated with chemicals

84
00:03:22,489 --> 00:03:27,830
and chemistry's of all sort now on its

85
00:03:25,699 --> 00:03:30,560
face I think the argument that chemicals

86

00:03:27,830 --> 00:03:32,510
are bad is sort of silly because like

87
00:03:30,560 --> 00:03:35,239
everything is chemicals in chemistry

88
00:03:32,509 --> 00:03:37,159
right but I think a more elegant form of

89
00:03:35,239 --> 00:03:38,810
this argument that we don't know for

90
00:03:37,159 --> 00:03:41,509
certain the effects of changing the

91
00:03:38,810 --> 00:03:43,280
natural order of things and what effect

92
00:03:41,509 --> 00:03:45,409
that may have on our world in our health

93
00:03:43,280 --> 00:03:48,620
is a more interesting and worthwhile

94
00:03:45,409 --> 00:03:50,539
point of argument when we create a new

95
00:03:48,620 --> 00:03:52,129
compound in the laboratory we don't know

96
00:03:50,539 --> 00:03:54,349
for certain that it's going to be safe

97
00:03:52,129 --> 00:03:56,209
for us that it won't destroy some food

98
00:03:54,349 --> 00:03:58,370
chain somewhere or cause long term

99
00:03:56,209 --> 00:04:01,009
cancers or any number of other terrible

100
00:03:58,370 --> 00:04:02,930

things and in many ways the public's

101

00:04:01,009 --> 00:04:05,479

concern about new chemical compounds or

102

00:04:02,930 --> 00:04:09,079

processes is supported by history right

103

00:04:05,479 --> 00:04:11,389

I mean even the history of this show is

104

00:04:09,079 --> 00:04:13,760

littered with episodes on radioactivity

105

00:04:11,389 --> 00:04:15,708

and its effects on human health carbon

106

00:04:13,759 --> 00:04:18,259

dioxide's effect on the environment and

107

00:04:15,709 --> 00:04:20,870

we're going to of course cover even more

108

00:04:18,259 --> 00:04:24,110

cases of science gone awry in future

109

00:04:20,870 --> 00:04:25,459

episodes high-fructose corn syrup is

110

00:04:24,110 --> 00:04:27,530

interesting though because it's one of

111

00:04:25,459 --> 00:04:29,689

those chemicals that is almost a gateway

112

00:04:27,529 --> 00:04:32,029

to the various food-related conspiracies

113

00:04:29,689 --> 00:04:33,529

that are out there it's become

114

00:04:32,029 --> 00:04:35,299

ubiquitous for the argument that the

115
00:04:33,529 --> 00:04:37,369
added chemicals and the food we eat are

116
00:04:35,300 --> 00:04:39,829
the cause of a variety of modern

117
00:04:37,370 --> 00:04:43,220
societal ills and diseases including

118
00:04:39,829 --> 00:04:45,139
obesity increased rates of cancer ADHD

119
00:04:43,220 --> 00:04:47,360
and autism and pretty much every other

120
00:04:45,139 --> 00:04:50,089
disease or issue that we can't find an

121
00:04:47,360 --> 00:04:52,220
exact cause for but is high fructose

122
00:04:50,089 --> 00:04:53,658
corn syrup one of those cases of science

123
00:04:52,220 --> 00:04:56,990
putting out a dangerous product to the

124
00:04:53,658 --> 00:04:59,509
populous before testing is it media hype

125
00:04:56,990 --> 00:05:01,908
or does the truth sit somewhere in the

126
00:04:59,509 --> 00:05:04,158
middle the first question we have to

127
00:05:01,908 --> 00:05:07,579
answer is just what the hell - corn

128
00:05:04,158 --> 00:05:09,259
syrup is and how do we make it to answer

129
00:05:07,579 --> 00:05:11,089
this question we need to talk about in

130
00:05:09,259 --> 00:05:13,699
general the history of food chemistry

131
00:05:11,089 --> 00:05:16,060
food engineering and in particular the

132
00:05:13,699 --> 00:05:18,500
creation and use of various sweeteners

133
00:05:16,060 --> 00:05:20,509
now the obvious sweetener we're all

134
00:05:18,500 --> 00:05:22,728
thinking about right now is simple table

135
00:05:20,509 --> 00:05:25,848
sugar which chemically is a compound

136
00:05:22,728 --> 00:05:27,680
known as sucrose sucrose is a compound

137
00:05:25,848 --> 00:05:30,589
that is made up of two smaller molecules

138
00:05:27,680 --> 00:05:33,439
form together in particular glucose and

139
00:05:30,589 --> 00:05:35,449
fructose these compounds are known as

140
00:05:33,439 --> 00:05:37,699
simple sugars and are extremely

141
00:05:35,449 --> 00:05:39,408
important biochemical compounds because

142
00:05:37,699 --> 00:05:41,930
they make up a huge amount of different

143

00:05:39,408 --> 00:05:43,819
things glucose in particular is a very

144
00:05:41,930 --> 00:05:45,860
important molecule in nature because it

145
00:05:43,819 --> 00:05:48,490
is super prevalent in all sorts of

146
00:05:45,860 --> 00:05:51,590
things due to it being a cyclic compound

147
00:05:48,490 --> 00:05:53,689
now a cyclic compound is exactly what it

148
00:05:51,589 --> 00:05:55,459
sounds like a chemical that's shaped

149
00:05:53,689 --> 00:05:57,168
like a circle or in the case of

150
00:05:55,459 --> 00:06:00,529
chemicals they're shaped like a

151
00:05:57,168 --> 00:06:02,299
six-sided hexagon the hexagon is

152
00:06:00,529 --> 00:06:04,250
particularly interesting shape for

153
00:06:02,300 --> 00:06:06,740
chemistry in physics because it's

154
00:06:04,250 --> 00:06:08,779
extremely stable meaning that organic

155
00:06:06,740 --> 00:06:11,210
chemicals those that contain carbon

156
00:06:08,779 --> 00:06:13,879
chains with hydrogen and oxygen

157
00:06:11,209 --> 00:06:17,839

tend to like to exist as these compounds

158

00:06:13,879 --> 00:06:20,180

if they can now why is it stable this is

159

00:06:17,839 --> 00:06:22,429

sort of an interesting question for

160

00:06:20,180 --> 00:06:26,180

mr. e in particularly organic chemistry

161

00:06:22,430 --> 00:06:29,060

but I think a relatively understandable

162

00:06:26,180 --> 00:06:32,379

and entertaining explanation is to think

163

00:06:29,060 --> 00:06:35,629

about these atoms as being primarily

164

00:06:32,379 --> 00:06:38,810

negative charges right so imagine you

165

00:06:35,629 --> 00:06:40,850

have a magnet if you put a magnet next

166

00:06:38,810 --> 00:06:43,490

to another magnet with the same charge

167

00:06:40,850 --> 00:06:45,020

it'll repel right but if it has a

168

00:06:43,490 --> 00:06:49,038

different charge than the magnet will

169

00:06:45,019 --> 00:06:51,109

attract the outer surface of an atom is

170

00:06:49,038 --> 00:06:52,939

all electrons right your that inner

171

00:06:51,110 --> 00:06:54,740

center that's the nucleus with the

172
00:06:52,939 --> 00:06:57,800
protons and the neutrons and those are

173
00:06:54,740 --> 00:07:00,590
positively charged or neutral and then

174
00:06:57,800 --> 00:07:02,840
you have the outer kind of section which

175
00:07:00,589 --> 00:07:05,929
is the electrons that are negatively

176
00:07:02,839 --> 00:07:08,478
charged so if you have an atom and

177
00:07:05,930 --> 00:07:10,550
another atom and you bring them close to

178
00:07:08,478 --> 00:07:12,409
each other what will happen is as you

179
00:07:10,550 --> 00:07:14,478
get closer they're gonna want to repel

180
00:07:12,410 --> 00:07:16,430
away from each other just like with a

181
00:07:14,478 --> 00:07:18,969
magnet and another magnet that have the

182
00:07:16,430 --> 00:07:18,970
same charge

183
00:07:19,569 --> 00:07:25,990
so a chemical bond is a special case

184
00:07:22,779 --> 00:07:28,619
where these atoms are able to exist near

185
00:07:25,990 --> 00:07:32,230
each other really close to each other

186
00:07:28,620 --> 00:07:34,540
but still far enough apart that their

187
00:07:32,230 --> 00:07:38,050
electron clouds aren't interacting and

188
00:07:34,540 --> 00:07:41,390
not causing too much repulsive force now

189
00:07:38,050 --> 00:07:42,829
why do you atoms then bond

190
00:07:41,389 --> 00:07:45,409
there's a couple of different types of

191
00:07:42,829 --> 00:07:47,449
bonds that can form but in the case of

192
00:07:45,410 --> 00:07:50,510
organic chemicals you're forming what's

193
00:07:47,449 --> 00:07:53,300
known as a covalent bond in a covalent

194
00:07:50,509 --> 00:07:56,569
bond you have an atom that is lacking an

195
00:07:53,300 --> 00:07:58,879
electron in an atom that would like to

196
00:07:56,569 --> 00:08:00,500
have another electron and they get

197
00:07:58,879 --> 00:08:04,670
together and they share electrons

198
00:08:00,500 --> 00:08:08,600
between each other so the energy for

199
00:08:04,670 --> 00:08:12,050
them to share the electrons is lower

200

00:08:08,600 --> 00:08:14,540
than the energy needed for them to be

201
00:08:12,050 --> 00:08:18,230
far apart or another way to say that is

202
00:08:14,540 --> 00:08:20,420
the the force that makes them want to

203
00:08:18,230 --> 00:08:22,250
come together is greater than the

204
00:08:20,420 --> 00:08:24,729
repulsive forces that want them to be

205
00:08:22,250 --> 00:08:26,158
pushed away from each other

206
00:08:24,728 --> 00:08:28,860
you

207
00:08:26,158 --> 00:08:30,538
but these atoms still have to exist in a

208
00:08:28,860 --> 00:08:34,050
way where their electron clouds won't

209
00:08:30,538 --> 00:08:36,658
interact too much so if you put two

210
00:08:34,049 --> 00:08:38,758
atoms together to bond them and in

211
00:08:36,658 --> 00:08:40,948
organic chemistry they're mostly carbon

212
00:08:38,759 --> 00:08:43,860
carbon bonds and then you have things

213
00:08:40,948 --> 00:08:46,799
like hydrogen or oxygens coming off of

214
00:08:43,860 --> 00:08:49,769

those carbons and another quick

215

00:08:46,799 --> 00:08:52,588

important point I suppose carbon always

216

00:08:49,769 --> 00:08:55,230

wants to form four bonds that makes

217

00:08:52,589 --> 00:08:56,910

carbon chemistry really simple so if you

218

00:08:55,230 --> 00:08:58,980

put a carbon and you bond it with

219

00:08:56,909 --> 00:09:01,559

another carbon you're going to need

220

00:08:58,980 --> 00:09:06,060

three hydrogen's on each of those

221

00:09:01,559 --> 00:09:09,568

carbons right this is all getting really

222

00:09:06,059 --> 00:09:11,219

complicated into the weeds but what I'm

223

00:09:09,568 --> 00:09:13,649

what's what's the important point here

224

00:09:11,220 --> 00:09:15,209

is if you have two carbons and you bond

225

00:09:13,649 --> 00:09:17,009

them together you're gonna make a line

226

00:09:15,208 --> 00:09:18,359

shape right and that makes sense you

227

00:09:17,009 --> 00:09:21,509

bond things it'll make a line whatever

228

00:09:18,360 --> 00:09:23,459

any two points always make a line well

229
00:09:21,509 --> 00:09:25,860
if you get a third carbon and you add it

230
00:09:23,458 --> 00:09:27,979
to that chain what will happen is it'll

231
00:09:25,860 --> 00:09:31,589
actually start to form a zigzag pattern

232
00:09:27,980 --> 00:09:33,899
so it's not a straight line anymore it's

233
00:09:31,589 --> 00:09:38,130
a line where each carbon is offset from

234
00:09:33,899 --> 00:09:40,379
the other carbon by some angle and this

235
00:09:38,129 --> 00:09:42,838
angle is gonna be the same for all

236
00:09:40,379 --> 00:09:46,068
carbon-carbon bonds it's actually really

237
00:09:42,839 --> 00:09:48,899
interesting and so this means that with

238
00:09:46,068 --> 00:09:50,610
this is a good way of explaining this I

239
00:09:48,899 --> 00:09:53,549
suppose going back to the nanomaterial

240
00:09:50,610 --> 00:09:56,310
episode is kind of like connects right

241
00:09:53,549 --> 00:09:58,708
you have those center pieces and they

242
00:09:56,309 --> 00:10:00,869
have a certain number of bonds that can

243
00:09:58,708 --> 00:10:03,149
come off the center and some of those

244
00:10:00,870 --> 00:10:06,000
bonds are offset by some angle from the

245
00:10:03,149 --> 00:10:08,990
center right so like the white piece and

246
00:10:06,000 --> 00:10:11,389
connects there's I think

247
00:10:08,990 --> 00:10:13,009
one two three four five six seven eight

248
00:10:11,389 --> 00:10:15,649
bonds that can be formed off the white

249
00:10:13,009 --> 00:10:17,539
piece and a connects piece you can

250
00:10:15,649 --> 00:10:21,139
imagine for an organic compound as

251
00:10:17,539 --> 00:10:22,938
opposed to it going like parallel so

252
00:10:21,139 --> 00:10:24,709
right from one of those corner pieces

253
00:10:22,938 --> 00:10:26,568
that are like the cross on the center

254
00:10:24,708 --> 00:10:29,268
it's gonna go to one of the ones that's

255
00:10:26,568 --> 00:10:32,389
angled so I guess another quick good

256
00:10:29,269 --> 00:10:33,649
dirty explanation is in a linear pod it

257

00:10:32,389 --> 00:10:37,999
might look like they're both being

258
00:10:33,649 --> 00:10:39,828
bonded you know from like the the

259
00:10:37,999 --> 00:10:42,139
Western connection if we're thinking

260
00:10:39,828 --> 00:10:43,849
about a compass but when there's a

261
00:10:42,139 --> 00:10:46,100
zigzag arrangement it's like you're

262
00:10:43,850 --> 00:10:49,129
going from the center of one carbon

263
00:10:46,100 --> 00:10:51,019
you're going northeast first and then

264
00:10:49,129 --> 00:10:52,819
finding another carbon then you're going

265
00:10:51,019 --> 00:10:54,919
southeast and finding another carbon

266
00:10:52,818 --> 00:10:56,659
it's a north east and south east and

267
00:10:54,919 --> 00:10:58,719
northeast and southeast up and down like

268
00:10:56,659 --> 00:10:58,719
that

269
00:10:59,110 --> 00:11:06,550
so what this means then ultimately for

270
00:11:02,830 --> 00:11:09,520
cyclic compounds is that some cyclic

271
00:11:06,549 --> 00:11:13,269

compounds are extremely stable because

272

00:11:09,519 --> 00:11:16,990

you can form very close bonds between

273

00:11:13,269 --> 00:11:19,169

atoms between carbons but still be far

274

00:11:16,990 --> 00:11:21,850

enough apart that there's very little

275

00:11:19,169 --> 00:11:26,829

interaction between the negative parts

276

00:11:21,850 --> 00:11:29,110

of the atoms so a hexagon is any as is

277

00:11:26,830 --> 00:11:32,830

the smallest one of those cyclic

278

00:11:29,110 --> 00:11:35,110

compounds we can form that has the

279

00:11:32,830 --> 00:11:37,440

perfect amount of space between each

280

00:11:35,110 --> 00:11:41,100

carbon atom

281

00:11:37,440 --> 00:11:44,819

now since this cyclic hexagon is so

282

00:11:41,100 --> 00:11:46,500

stable and particularly glucose which is

283

00:11:44,818 --> 00:11:48,870

like the most simple type of that

284

00:11:46,500 --> 00:11:49,649

hexagon you can form almost since it's

285

00:11:48,870 --> 00:11:52,339

so stable

286
00:11:49,649 --> 00:11:55,919
it means it's extremely common in nature

287
00:11:52,339 --> 00:11:58,370
so for example carbohydrates are simply

288
00:11:55,919 --> 00:12:00,120
a bunch of glucose or fructose molecules

289
00:11:58,370 --> 00:12:02,970
connected to each other into a

290
00:12:00,120 --> 00:12:05,100
long-chain cellulose and hemicellulose

291
00:12:02,970 --> 00:12:07,709
that make up trees and plants are also

292
00:12:05,100 --> 00:12:09,240
just a bunch of glucose chains and a

293
00:12:07,708 --> 00:12:11,309
significant amount of other bio

294
00:12:09,240 --> 00:12:13,680
chemicals are made up of various

295
00:12:11,309 --> 00:12:16,250
combinations of glucose fructose and

296
00:12:13,679 --> 00:12:19,528
other compounds very similar to these

297
00:12:16,250 --> 00:12:21,929
okay so glucose and fructose are

298
00:12:19,528 --> 00:12:23,909
basically the same thing and when put

299
00:12:21,929 --> 00:12:27,539
together they make sucrose or table

300
00:12:23,909 --> 00:12:29,278
sugar we're good to go so far but you

301
00:12:27,539 --> 00:12:32,528
might already see a problem with the

302
00:12:29,278 --> 00:12:35,289
argument that fructose is bad for you

303
00:12:32,528 --> 00:12:37,480
if fructose is already what's in table

304
00:12:35,289 --> 00:12:40,059
sugar then wouldn't it make sense that

305
00:12:37,480 --> 00:12:42,839
if fructose is super bad for you then

306
00:12:40,059 --> 00:12:45,698
glucose and sucrose might be as well

307
00:12:42,839 --> 00:12:48,009
like why does it matter which sugar is

308
00:12:45,698 --> 00:12:50,979
being used in your food since they

309
00:12:48,009 --> 00:12:53,620
digest - the same thing anyways in other

310
00:12:50,980 --> 00:12:55,808
words if sucrose is made up of one

311
00:12:53,620 --> 00:12:59,528
glucose and one fructose molecule and

312
00:12:55,808 --> 00:13:01,929
you eat ten pieces of sucrose versus ten

313
00:12:59,528 --> 00:13:03,249
pieces of fructose aren't you ultimately

314

00:13:01,929 --> 00:13:07,388
getting the same amount of fructose

315
00:13:03,249 --> 00:13:09,459
anyways well my dear inquisitive and

316
00:13:07,389 --> 00:13:12,249
intelligent listeners we'll get to that

317
00:13:09,458 --> 00:13:13,508
I promise you but it's pretty much the

318
00:13:12,249 --> 00:13:16,240
reason that this part of the argument

319
00:13:13,509 --> 00:13:19,959
that fructose is worse than glucose or

320
00:13:16,240 --> 00:13:22,149
table sugar kind of falls apart anyways

321
00:13:19,958 --> 00:13:24,458
if fructose is already found in table

322
00:13:22,149 --> 00:13:24,870
sugar then why make it in the first

323
00:13:24,458 --> 00:13:27,669
place

324
00:13:24,870 --> 00:13:30,730
couldn't we just be using table sugar in

325
00:13:27,669 --> 00:13:34,028
our foods well the problem lies in the

326
00:13:30,730 --> 00:13:36,249
fact that sucrose is a solid and solids

327
00:13:34,028 --> 00:13:39,610
are annoyingly difficult to work with in

328
00:13:36,249 --> 00:13:42,308

very large quantities see pretty much

329

00:13:39,610 --> 00:13:44,350

the majority of industrial chemistry has

330

00:13:42,308 --> 00:13:46,448

been built around the knowledge we have

331

00:13:44,350 --> 00:13:48,970

gained about flowing fluids and in

332

00:13:46,448 --> 00:13:51,370

particular liquids around using pipes

333

00:13:48,970 --> 00:13:54,490

and pumps and mixing them together using

334

00:13:51,370 --> 00:13:56,049

giant stirring pots the first chemicals

335

00:13:54,490 --> 00:13:59,169

we really had to create a chemical plant

336

00:13:56,049 --> 00:14:01,149

to alter for us we're petrochemicals in

337

00:13:59,169 --> 00:14:04,088

particular the production of kerosene

338

00:14:01,149 --> 00:14:05,980

from heavy crude oils and really the

339

00:14:04,089 --> 00:14:08,709

bulk of industrial chemical engineering

340

00:14:05,980 --> 00:14:10,360

as it ultimately became known hasn't

341

00:14:08,708 --> 00:14:12,458

progressed all that much from the

342

00:14:10,360 --> 00:14:14,169

knowledge we gained in moving around

343
00:14:12,458 --> 00:14:17,638
petrochemicals and breaking them apart

344
00:14:14,169 --> 00:14:20,318
into their individual constituents and

345
00:14:17,639 --> 00:14:22,089
solids are notoriously difficult to

346
00:14:20,318 --> 00:14:25,208
process as part of chemical engineering

347
00:14:22,089 --> 00:14:27,670
processes first off to move solids

348
00:14:25,208 --> 00:14:29,528
around requires loads of energy since

349
00:14:27,669 --> 00:14:31,659
they have to be pushed constantly and

350
00:14:29,528 --> 00:14:34,990
produce much more friction than liquids

351
00:14:31,659 --> 00:14:36,938
or gases at the same time moving solids

352
00:14:34,990 --> 00:14:39,129
is difficult because they don't flow in

353
00:14:36,938 --> 00:14:40,838
the same way that fluids do so we need

354
00:14:39,129 --> 00:14:42,970
to use sort of interesting methods to

355
00:14:40,839 --> 00:14:45,100
move them through chemical plants such

356
00:14:42,970 --> 00:14:46,110
as using rotating screws to force them

357
00:14:45,100 --> 00:14:48,930
forward

358
00:14:46,110 --> 00:14:50,490
and solids don't mix as well and aren't

359
00:14:48,929 --> 00:14:53,278
as easy to work with and reactors as

360
00:14:50,490 --> 00:14:55,110
liquid components are and we actually

361
00:14:53,278 --> 00:14:57,360
have a good example of that in cooking

362
00:14:55,110 --> 00:14:59,430
where liquid components such as corn

363
00:14:57,360 --> 00:15:02,100
syrup are often used instead of solid

364
00:14:59,429 --> 00:15:04,949
sugars in order to obtain a smoother

365
00:15:02,100 --> 00:15:07,620
resulting product there's also the very

366
00:15:04,950 --> 00:15:09,740
real danger of light powders mixing with

367
00:15:07,620 --> 00:15:12,000
air to create an explosive mixture

368
00:15:09,740 --> 00:15:14,789
resulting in what's known as a powder or

369
00:15:12,000 --> 00:15:16,379
dust explosion this is the cause of

370
00:15:14,789 --> 00:15:18,809
those YouTube videos where idiotic

371

00:15:16,379 --> 00:15:21,450
husband's put baby powder in their wives

372
00:15:18,809 --> 00:15:23,489
hair dryers resulting in a fireball that

373
00:15:21,450 --> 00:15:24,740
Scorchers their wives love right out of

374
00:15:23,490 --> 00:15:27,810
them I'm sure

375
00:15:24,740 --> 00:15:30,060
so in general when it comes to chemicals

376
00:15:27,809 --> 00:15:31,439
if we can find a liquid version of the

377
00:15:30,059 --> 00:15:35,219
chemical we're hoping to use in mass

378
00:15:31,440 --> 00:15:37,260
production we will try to use it like I

379
00:15:35,220 --> 00:15:39,300
actually just hinted at earlier one of

380
00:15:37,259 --> 00:15:41,759
the more useful potential sugar sources

381
00:15:39,299 --> 00:15:43,439
for a liquid compound come from fruits

382
00:15:41,759 --> 00:15:46,708
or vegetables that contain lots of

383
00:15:43,440 --> 00:15:49,950
carbohydrates or sugars so for example

384
00:15:46,708 --> 00:15:51,750
beets or agave or corn can be used to

385
00:15:49,950 --> 00:15:54,899

create sugary syrups that can then be

386

00:15:51,750 --> 00:15:57,360

substituted for solid sucrose in the

387

00:15:54,899 --> 00:16:00,539

case of corn for example the resulting

388

00:15:57,360 --> 00:16:02,430

corn syrup is primarily glucose that

389

00:16:00,539 --> 00:16:04,588

simple sugar which we said earlier was

390

00:16:02,429 --> 00:16:07,979

very similar chemically to fructose and

391

00:16:04,589 --> 00:16:10,230

a little bit of water corn syrup is

392

00:16:07,980 --> 00:16:11,970

produced from cornstarch with starch

393

00:16:10,230 --> 00:16:15,539

being a big chain of glucose molecules

394

00:16:11,970 --> 00:16:18,449

strung together and so we can break it

395

00:16:15,539 --> 00:16:20,909

apart with diluted hydrochloric acid to

396

00:16:18,448 --> 00:16:23,958

end up breaking the starch into its

397

00:16:20,909 --> 00:16:26,519

constituent individual glucose molecules

398

00:16:23,958 --> 00:16:29,039

after removal of the acidic components

399

00:16:26,519 --> 00:16:31,019

the resulting water glucose mixture is

400
00:16:29,039 --> 00:16:33,028
then sold as corn syrup and you can

401
00:16:31,019 --> 00:16:35,899
still find it on store shelves today in

402
00:16:33,028 --> 00:16:35,899
your local supermarket

403
00:16:36,460 --> 00:16:40,899
initially this glucose syrup was thought

404
00:16:38,830 --> 00:16:43,810
of as a potential substitute for sucrose

405
00:16:40,899 --> 00:16:46,419
in various foods but glucose isn't very

406
00:16:43,809 --> 00:16:48,250
soluble in water which means that there

407
00:16:46,419 --> 00:16:50,579
is only a limited amount of glucose that

408
00:16:48,250 --> 00:16:53,980
can be mixed with water to give a smooth

409
00:16:50,580 --> 00:16:56,350
homogeneous solution and glucose has

410
00:16:53,980 --> 00:16:59,470
about the same sugar enos as sucrose

411
00:16:56,350 --> 00:17:02,080
meaning that one gram of glucose gives

412
00:16:59,470 --> 00:17:05,410
about the same sugary taste as one gram

413
00:17:02,080 --> 00:17:08,709
of sucrose on the other hand fructose

414
00:17:05,410 --> 00:17:11,250
the other component of sucrose is almost

415
00:17:08,709 --> 00:17:13,959
twice as sugary as glucose and sucrose

416
00:17:11,250 --> 00:17:16,869
having a more intense flavor in a more

417
00:17:13,959 --> 00:17:18,699
long-lasting taste at the same time

418
00:17:16,869 --> 00:17:21,188
fructose is one of the most soluble

419
00:17:18,699 --> 00:17:23,318
sugars in water meaning that you can put

420
00:17:21,189 --> 00:17:25,808
a much higher content of fructose into

421
00:17:23,318 --> 00:17:28,808
water as a mixture without getting solid

422
00:17:25,808 --> 00:17:31,480
chunks forming in your syrup it's these

423
00:17:28,808 --> 00:17:33,819
two reasons in particular that initially

424
00:17:31,480 --> 00:17:36,308
made fructose such a desirable sucrose

425
00:17:33,819 --> 00:17:37,869
substitute the ability to get more bang

426
00:17:36,308 --> 00:17:39,910
for your buck as it were in terms of

427
00:17:37,869 --> 00:17:42,099
sugary flavor and the ease with which

428

00:17:39,910 --> 00:17:44,140
fructose could be mixed with water to

429
00:17:42,099 --> 00:17:46,599
make very concentrated fructose syrups

430
00:17:44,140 --> 00:17:48,970
the problem however lies in the fact

431
00:17:46,599 --> 00:17:51,849
that fructose although a component of

432
00:17:48,970 --> 00:17:54,519
sucrose molecules is not all that common

433
00:17:51,849 --> 00:17:56,439
in everyday life we find fructose

434
00:17:54,519 --> 00:17:59,349
naturally in some fruits and vegetables

435
00:17:56,440 --> 00:18:01,929
particularly honey and berries although

436
00:17:59,349 --> 00:18:04,000
generally in small amounts honey is

437
00:18:01,929 --> 00:18:06,850
probably the most concentrated natural

438
00:18:04,000 --> 00:18:09,759
source for pure fructose with almost 75%

439
00:18:06,849 --> 00:18:13,089
of honey being sugars of some kind and

440
00:18:09,759 --> 00:18:15,039
about half of that being fructose the

441
00:18:13,089 --> 00:18:17,079
fructose content is actually why honey

442
00:18:15,039 --> 00:18:19,178

may sometimes seem to be more sweet than

443

00:18:17,079 --> 00:18:22,689

table sugar because of its high fructose

444

00:18:19,179 --> 00:18:24,759

content anyways this means that if food

445

00:18:22,690 --> 00:18:27,070

chemists wanted to begin using fructose

446

00:18:24,759 --> 00:18:29,289

to replace sucrose they had to find an

447

00:18:27,069 --> 00:18:32,079

economically viable way of producing it

448

00:18:29,289 --> 00:18:33,909

and it wasn't until the 1970s that a

449

00:18:32,079 --> 00:18:36,389

method for producing high contents of

450

00:18:33,910 --> 00:18:38,460

fructose was found

451

00:18:36,390 --> 00:18:41,730

the method to generate high fructose

452

00:18:38,460 --> 00:18:43,650

corn syrup was invented in the 1970s by

453

00:18:41,730 --> 00:18:46,410

the Clinton corn processing company

454

00:18:43,650 --> 00:18:48,630

utilizing an enzymatic digestion process

455

00:18:46,410 --> 00:18:51,330

for starches that was developed by

456

00:18:48,630 --> 00:18:52,890

Yoshiyuki Takasaki at the Japanese

457
00:18:51,329 --> 00:18:55,619
national institute of advanced

458
00:18:52,890 --> 00:18:57,660
industrial science technology this

459
00:18:55,619 --> 00:19:00,750
method took a very cheap and very widely

460
00:18:57,660 --> 00:19:02,370
available stock product corn and milled

461
00:19:00,750 --> 00:19:04,950
it in the corn starch in simple

462
00:19:02,369 --> 00:19:07,109
carbohydrates the starch was then

463
00:19:04,950 --> 00:19:09,150
acidified to produce glucose heavy corn

464
00:19:07,109 --> 00:19:11,899
syrup which is then converted to

465
00:19:09,150 --> 00:19:14,370
fructose by the addition of an enzyme

466
00:19:11,900 --> 00:19:16,710
enzymes are basically compounds that

467
00:19:14,369 --> 00:19:18,839
take in a certain molecule change it in

468
00:19:16,710 --> 00:19:21,390
some way and then allow that changed

469
00:19:18,839 --> 00:19:24,329
molecule to escape leaving the enzyme

470
00:19:21,390 --> 00:19:26,850
behind for another reaction in this way

471
00:19:24,329 --> 00:19:29,039
their catalyst species with a catalyst

472
00:19:26,849 --> 00:19:31,230
in general being some chemical compound

473
00:19:29,039 --> 00:19:33,269
that while not consumed in the chemical

474
00:19:31,230 --> 00:19:35,548
reaction does make it happen more

475
00:19:33,269 --> 00:19:38,400
quickly or with less energy input from

476
00:19:35,548 --> 00:19:40,079
the surroundings the resulting fructose

477
00:19:38,400 --> 00:19:42,390
is then mixed with various amounts of

478
00:19:40,079 --> 00:19:44,548
water and glucose to change the flavor

479
00:19:42,390 --> 00:19:47,910
profile to result in what is known as

480
00:19:44,548 --> 00:19:50,490
high fructose corn syrup a fructose

481
00:19:47,910 --> 00:19:53,509
glucose water mix that can contain as

482
00:19:50,490 --> 00:19:55,950
much as 90% fructose by weight so

483
00:19:53,509 --> 00:19:58,019
ultimately this means that high fructose

484
00:19:55,950 --> 00:20:00,539
corn syrup is extremely similar to

485

00:19:58,019 --> 00:20:02,819
glucose or sucrose and is just another

486
00:20:00,539 --> 00:20:05,460
simple sugar that is normally present in

487
00:20:02,819 --> 00:20:07,259
the body anyways it became an extremely

488
00:20:05,460 --> 00:20:09,298
commonplace replacement for sugar

489
00:20:07,259 --> 00:20:11,970
however because of the economic benefits

490
00:20:09,298 --> 00:20:15,029
of utilizing this compound in lieu of

491
00:20:11,970 --> 00:20:17,220
other sugars because fructose is sweeter

492
00:20:15,029 --> 00:20:18,990
and tastes than glucose or sucrose it's

493
00:20:17,220 --> 00:20:21,480
possible to use less of the compound to

494
00:20:18,990 --> 00:20:22,980
produce more flavor meaning less costs

495
00:20:21,480 --> 00:20:24,929
going towards raw material for the

496
00:20:22,980 --> 00:20:26,910
production of foods due to its easy

497
00:20:24,929 --> 00:20:28,410
solubility in water it's possible to

498
00:20:26,910 --> 00:20:31,019
transport it and pump it around a

499
00:20:28,410 --> 00:20:33,690

chemical plant as a liquid even for very

500

00:20:31,019 --> 00:20:35,639

high fructose concentrations making it

501

00:20:33,690 --> 00:20:38,130

much easier to work with and sucrose or

502

00:20:35,640 --> 00:20:39,929

glucose and because of the ease with

503

00:20:38,130 --> 00:20:42,120

which corn that is the feedstock for

504

00:20:39,929 --> 00:20:44,759

high fructose corn syrup is made and

505

00:20:42,119 --> 00:20:47,189

it's just general availability in the

506

00:20:44,759 --> 00:20:49,529

United States it quickly became much

507

00:20:47,190 --> 00:20:52,019

cheaper than competing sugar compounds

508

00:20:49,529 --> 00:20:54,660

and this cheapest has only increased

509

00:20:52,019 --> 00:20:55,829

with its increased use causing corn to

510

00:20:54,660 --> 00:20:57,330

become a much more important

511

00:20:55,829 --> 00:21:00,750

agricultural product of the United

512

00:20:57,329 --> 00:21:03,240

States adding to this importance we have

513

00:21:00,750 --> 00:21:05,279

subsidies for corn manufacturers in a

514
00:21:03,240 --> 00:21:07,589
pretty solid corn Lobby in the US

515
00:21:05,279 --> 00:21:10,740
politics and you end up with a choke

516
00:21:07,589 --> 00:21:13,259
hold on the sugar market at its peak in

517
00:21:10,740 --> 00:21:15,150
1999 high-fructose corn syrup

518
00:21:13,259 --> 00:21:17,940
consumption in the United States was as

519
00:21:15,150 --> 00:21:20,820
high on average as thirty seven point

520
00:21:17,940 --> 00:21:24,420
five pounds or seventeen kilograms of

521
00:21:20,819 --> 00:21:26,009
fructose per person per year that's

522
00:21:24,420 --> 00:21:28,320
about a third of our average yearly

523
00:21:26,009 --> 00:21:30,029
consumption of sugars significantly

524
00:21:28,319 --> 00:21:32,069
higher than would normally be possible

525
00:21:30,029 --> 00:21:34,529
without the use of fructose syrups and

526
00:21:32,069 --> 00:21:36,929
various foods now that number essence

527
00:21:34,529 --> 00:21:39,359
decreased to around 15 pounds per person

528
00:21:36,930 --> 00:21:42,000
per year for fructose or around 8

529
00:21:39,359 --> 00:21:44,009
kilograms although our consumption of

530
00:21:42,000 --> 00:21:47,700
sugar overall is still near the highest

531
00:21:44,009 --> 00:21:50,089
it's ever been at around 170 pounds or

532
00:21:47,700 --> 00:21:51,870
about 80 kilograms per year per person

533
00:21:50,089 --> 00:21:53,279
so oh right

534
00:21:51,869 --> 00:21:56,099
that is the history of high fructose

535
00:21:53,279 --> 00:21:57,839
corn syrup up to the modern day now

536
00:21:56,099 --> 00:22:00,659
let's talk about the conspiracies and

537
00:21:57,839 --> 00:22:02,159
fears around the compound generally I

538
00:22:00,660 --> 00:22:03,900
would say that concerns about high

539
00:22:02,160 --> 00:22:06,930
fructose corn syrup can be grouped into

540
00:22:03,900 --> 00:22:08,400
a few common categories first is the

541
00:22:06,930 --> 00:22:10,140
concern that it is the cause of the

542

00:22:08,400 --> 00:22:13,160
obesity epidemic in the United States

543
00:22:10,140 --> 00:22:15,450
and the entire Western world in general

544
00:22:13,160 --> 00:22:17,160
second would be the idea that fructose

545
00:22:15,450 --> 00:22:19,350
causes cancers or other chronic

546
00:22:17,160 --> 00:22:21,180
illnesses to show themselves that would

547
00:22:19,349 --> 00:22:23,849
not normally be as prevalent as they are

548
00:22:21,180 --> 00:22:26,190
now and third the idea is that high

549
00:22:23,849 --> 00:22:27,659
fructose corn syrup is making us more

550
00:22:26,190 --> 00:22:30,059
susceptible to government mind control

551
00:22:27,660 --> 00:22:33,720
and suggestion by making us stupid

552
00:22:30,059 --> 00:22:35,819
depressed anxious have ADHD or autism or

553
00:22:33,720 --> 00:22:38,850
any other variety of mental health

554
00:22:35,819 --> 00:22:40,349
challenges we'll take each of these in

555
00:22:38,849 --> 00:22:42,059
turn although they are sort of

556
00:22:40,349 --> 00:22:44,579

interrelated and kind of strange but

557

00:22:42,059 --> 00:22:46,440

fascinating ways now before we get into

558

00:22:44,579 --> 00:22:49,230

the obesity argument let's get something

559

00:22:46,440 --> 00:22:51,150

on the table right now I am a fat dude

560

00:22:49,230 --> 00:22:53,279

I've always been varying amounts of

561

00:22:51,150 --> 00:22:54,990

husky to chubby to fat but I haven't

562

00:22:53,279 --> 00:22:56,639

been skinny since like the second grade

563

00:22:54,990 --> 00:22:58,289

and even that was mostly due to

564

00:22:56,640 --> 00:23:00,840

nervously throwing up all the time like

565

00:22:58,289 --> 00:23:02,759

a misfiring water sprinkler so any

566

00:23:00,839 --> 00:23:03,679

nutritional advice is probably a moot

567

00:23:02,759 --> 00:23:05,960

point coming

568

00:23:03,680 --> 00:23:07,820

I try to eat healthy and remain active

569

00:23:05,960 --> 00:23:10,190

but it's always been a struggle for me

570

00:23:07,819 --> 00:23:12,289

for any health advice you should talk to

571
00:23:10,190 --> 00:23:14,330
your doctor and not get it from a guy

572
00:23:12,289 --> 00:23:16,069
who is currently eating a cookie as he

573
00:23:14,329 --> 00:23:17,449
writes this episode in a lounging robe

574
00:23:16,069 --> 00:23:18,619
okay

575
00:23:17,450 --> 00:23:20,090
now that the awkward portion of this

576
00:23:18,619 --> 00:23:21,949
episode is over we can move on to the

577
00:23:20,089 --> 00:23:23,869
argument that high-fructose corn syrup

578
00:23:21,950 --> 00:23:26,990
is particularly linked to the obesity

579
00:23:23,869 --> 00:23:29,929
epidemic in a lot of ways this argument

580
00:23:26,990 --> 00:23:31,370
has a lot of merits on the surface the

581
00:23:29,930 --> 00:23:33,049
rise of obesity in the United States

582
00:23:31,369 --> 00:23:34,789
seems to have coincided with the use of

583
00:23:33,049 --> 00:23:37,190
high fructose corn syrup as a

584
00:23:34,789 --> 00:23:38,990
replacement for sucrose starting in the

585
00:23:37,190 --> 00:23:41,809
60s and continuously growing into the

586
00:23:38,990 --> 00:23:43,309
80s until today the problem we're now

587
00:23:41,809 --> 00:23:44,779
finding with this argument is that it

588
00:23:43,309 --> 00:23:47,000
doesn't actually appear to be spruik

589
00:23:44,779 --> 00:23:48,920
toes per se that's the problem but our

590
00:23:47,000 --> 00:23:51,140
overall consumption of empty sugars and

591
00:23:48,920 --> 00:23:53,120
calories and a general lack of exercise

592
00:23:51,140 --> 00:23:54,980
amongst the population interestingly

593
00:23:53,119 --> 00:23:56,839
though that's kind of been the argument

594
00:23:54,980 --> 00:23:59,180
this entire time coming from

595
00:23:56,839 --> 00:24:02,179
nutritionists doctors and other medical

596
00:23:59,180 --> 00:24:04,220
professionals I mean sugar initially

597
00:24:02,180 --> 00:24:06,920
became kind of part of the public

598
00:24:04,220 --> 00:24:08,930
discussion on obesity and health

599

00:24:06,920 --> 00:24:12,050
problems with the publication in the

600
00:24:08,930 --> 00:24:14,630
early 70s of pure white and deadly a

601
00:24:12,049 --> 00:24:17,659
book by John Wood king and that book

602
00:24:14,630 --> 00:24:19,520
basically said that you know eating so

603
00:24:17,660 --> 00:24:22,370
much sugar in the Western diet was

604
00:24:19,519 --> 00:24:24,589
probably not good for us it probably was

605
00:24:22,369 --> 00:24:25,969
going to lead to increased obesity as

606
00:24:24,589 --> 00:24:28,129
they were seeing at the time and

607
00:24:25,970 --> 00:24:32,600
potentially problems with like cancers

608
00:24:28,130 --> 00:24:35,080
all kinds of other things but why high

609
00:24:32,599 --> 00:24:37,579
fructose corn syrup became kind of the

610
00:24:35,079 --> 00:24:40,369
catch-all bogeyman for this as opposed

611
00:24:37,579 --> 00:24:42,169
to just sugar in general is sort of a

612
00:24:40,369 --> 00:24:44,539
mystery I think it has something to do

613
00:24:42,170 --> 00:24:47,420

with the idea that high fructose corn

614

00:24:44,539 --> 00:24:49,700

syrup is produced in a chemical reactor

615

00:24:47,420 --> 00:24:51,890

in some ways or is not naturally

616

00:24:49,700 --> 00:24:55,850

necessarily found in our diet as much as

617

00:24:51,890 --> 00:24:57,620

glucose and sucrose but still any huge

618

00:24:55,849 --> 00:24:59,000

amount of anything is gonna probably be

619

00:24:57,619 --> 00:25:02,049

bad for you right if you drink enough

620

00:24:59,000 --> 00:25:02,049

water you can drown

621

00:25:03,920 --> 00:25:08,900

now this idea that it's not high

622

00:25:06,920 --> 00:25:11,750

fructose corn syrup in particular but

623

00:25:08,900 --> 00:25:14,630

it's all sugar has been true in the vast

624

00:25:11,750 --> 00:25:16,160

majority of studies performed showing no

625

00:25:14,630 --> 00:25:19,010

particular link between high fructose

626

00:25:16,160 --> 00:25:21,680

corn syrup use and obesity but rather a

627

00:25:19,009 --> 00:25:25,009

link between sugar intake caloric intake

628
00:25:21,680 --> 00:25:26,539
and lack of exercise in obesity this is

629
00:25:25,009 --> 00:25:27,980
a quote from the abstract of a paper

630
00:25:26,539 --> 00:25:30,799
published in the Journal of the American

631
00:25:27,980 --> 00:25:34,250
College of nutrition by molar at all in

632
00:25:30,799 --> 00:25:37,399
December of 2009 quote high fructose

633
00:25:34,250 --> 00:25:39,259
corn syrup or each FCS has become an

634
00:25:37,400 --> 00:25:42,050
increasingly common food ingredient in

635
00:25:39,259 --> 00:25:44,629
the last forty years however there is

636
00:25:42,049 --> 00:25:46,940
concern that HFCS consumption increases

637
00:25:44,630 --> 00:25:48,260
the risk for obesity and other adverse

638
00:25:46,940 --> 00:25:51,140
health outcomes compared to other

639
00:25:48,259 --> 00:25:52,849
caloric sweeteners the most commonly

640
00:25:51,140 --> 00:25:55,700
used types of high fructose corn syrup

641
00:25:52,849 --> 00:25:58,639
high fructose corn syrup 42 and high

642
00:25:55,700 --> 00:26:00,940
fructose corn C of 55 our similar in

643
00:25:58,640 --> 00:26:03,200
composition to sucrose table sugar

644
00:26:00,940 --> 00:26:05,570
consisting of roughly equal amounts of

645
00:26:03,200 --> 00:26:07,069
fructose and glucose the primary

646
00:26:05,569 --> 00:26:10,849
difference is that these monosaccharides

647
00:26:07,069 --> 00:26:13,879
exist free in solution in HFCS but in

648
00:26:10,849 --> 00:26:15,859
disaccharide form and sucrose in other

649
00:26:13,880 --> 00:26:17,960
words and this isn't in the abstract

650
00:26:15,859 --> 00:26:20,599
itself what they're saying is that when

651
00:26:17,960 --> 00:26:23,059
it's sucrose it's bonded together so the

652
00:26:20,599 --> 00:26:24,919
glucose and fructose are together but in

653
00:26:23,059 --> 00:26:27,039
high fructose corn syrup the glucose and

654
00:26:24,920 --> 00:26:30,410
fructose have already been separated

655
00:26:27,039 --> 00:26:32,569
okay back to the quote the disaccharide

656

00:26:30,410 --> 00:26:35,300
sucrose is easily cleaved in the small

657
00:26:32,569 --> 00:26:38,200
intestine so free fructose and glucose

658
00:26:35,299 --> 00:26:41,240
are absorbed from both sucrose and HFCS

659
00:26:38,200 --> 00:26:43,880
the advantage to food manufacturers is

660
00:26:41,240 --> 00:26:45,849
that the free monosaccharides in HFCS

661
00:26:43,880 --> 00:26:50,030
provide better flavor enhancement

662
00:26:45,849 --> 00:26:52,459
stability freshness texture color poor

663
00:26:50,029 --> 00:26:55,309
ability and consistency in foods in

664
00:26:52,460 --> 00:26:57,829
comparison to sucrose because the

665
00:26:55,309 --> 00:27:00,200
composition of HFCS and sucrose is so

666
00:26:57,829 --> 00:27:02,449
similar particularly on adsorption by

667
00:27:00,200 --> 00:27:04,340
the body it appears unlikely that high

668
00:27:02,450 --> 00:27:06,830
fructose corn syrup contributes more to

669
00:27:04,339 --> 00:27:09,470
obesity or other conditions than sucrose

670
00:27:06,829 --> 00:27:11,449

does nevertheless few studies have

671

00:27:09,470 --> 00:27:13,210

evaluated the potentially differential

672

00:27:11,450 --> 00:27:15,049

effect of various sweeteners

673

00:27:13,210 --> 00:27:16,970

particularly as they relate to health

674

00:27:15,049 --> 00:27:18,019

conditions such as obesity which

675

00:27:16,970 --> 00:27:21,079

developed over Ellis

676

00:27:18,019 --> 00:27:22,819

long periods of time improved nutrient

677

00:27:21,079 --> 00:27:25,189

data bases are needed to analyze food

678

00:27:22,819 --> 00:27:27,500

consumption in epidemiologic studies as

679

00:27:25,190 --> 00:27:29,630

are more strong to designed experimental

680

00:27:27,500 --> 00:27:30,980

studies including those on the mechanism

681

00:27:29,630 --> 00:27:33,980

of action and relationship between

682

00:27:30,980 --> 00:27:35,630

fructose dose and response at the

683

00:27:33,980 --> 00:27:37,970

present time there is insufficient

684

00:27:35,630 --> 00:27:40,340

evidence to ban or otherwise restrict

685
00:27:37,970 --> 00:27:42,019
use of high fructose corn syrup or other

686
00:27:40,339 --> 00:27:44,059
fructose containing sweeteners in the

687
00:27:42,019 --> 00:27:45,829
food supply or to require the use of

688
00:27:44,059 --> 00:27:48,319
warning labels on products containing

689
00:27:45,829 --> 00:27:50,659
high fructose corn syrup nevertheless

690
00:27:48,319 --> 00:27:53,269
dietary advice to limit consumption of

691
00:27:50,660 --> 00:27:55,610
all added caloric sweeteners including

692
00:27:53,269 --> 00:27:57,379
high fructose corn syrup is warranted

693
00:27:55,609 --> 00:27:59,389
end quote

694
00:27:57,380 --> 00:28:02,030
and that argument in that abstract

695
00:27:59,390 --> 00:28:05,450
basically boils down to the following

696
00:28:02,029 --> 00:28:07,579
thing when you eat sucrose what occurs

697
00:28:05,450 --> 00:28:09,640
is the body will begin to digest it by

698
00:28:07,579 --> 00:28:12,678
breaking apart the glucose and fructose

699
00:28:09,640 --> 00:28:14,720
the fructose is then digested in such a

700
00:28:12,679 --> 00:28:16,940
way that it becomes glucose down the

701
00:28:14,720 --> 00:28:18,950
line so you end up with basically two

702
00:28:16,940 --> 00:28:21,590
molecules of glucose which is what the

703
00:28:18,950 --> 00:28:23,870
body can then use

704
00:28:21,589 --> 00:28:25,548
in high-fructose corn syrup the only

705
00:28:23,869 --> 00:28:27,408
difference is that the body doesn't have

706
00:28:25,548 --> 00:28:31,158
to break them apart since it's already

707
00:28:27,409 --> 00:28:33,200
glucose and fructose so their argument

708
00:28:31,159 --> 00:28:34,730
is that mechanistically it doesn't make

709
00:28:33,200 --> 00:28:37,400
sense that high fructose corn syrup

710
00:28:34,730 --> 00:28:40,460
would be more dangerous than sucrose in

711
00:28:37,400 --> 00:28:43,009
anyway this author also says that

712
00:28:40,460 --> 00:28:45,230
although they would like to see more

713

00:28:43,009 --> 00:28:47,869
information and more research on these

714
00:28:45,230 --> 00:28:49,759
things in a more serious way there is

715
00:28:47,869 --> 00:28:51,649
not enough evidence so far in the

716
00:28:49,759 --> 00:28:53,569
scientific literature to say that high

717
00:28:51,650 --> 00:28:55,730
fructose corn syrup is dangerous and

718
00:28:53,569 --> 00:28:58,189
they end of course with a pretty common

719
00:28:55,730 --> 00:29:00,110
refrain in these papers saying that high

720
00:28:58,190 --> 00:29:02,269
fructose corn syrup and other sweeteners

721
00:29:00,109 --> 00:29:06,329
should just be limited generally since

722
00:29:02,269 --> 00:29:09,150
it's all making a super fat now

723
00:29:06,329 --> 00:29:11,970
that paper is a little bit softer in its

724
00:29:09,150 --> 00:29:13,650
conclusions but the general argument

725
00:29:11,970 --> 00:29:15,660
that high fructose corn syrup has no

726
00:29:13,650 --> 00:29:17,759
particular link to obesity outside of

727
00:29:15,660 --> 00:29:20,670

the general link between sugars and

728

00:29:17,759 --> 00:29:22,589
calories and obesity is common

729

00:29:20,670 --> 00:29:24,720
throughout the literature with various

730

00:29:22,589 --> 00:29:27,449
levels of hedging by the authors to say

731

00:29:24,720 --> 00:29:29,759
well we don't know enough or you know

732

00:29:27,450 --> 00:29:31,850
outright saying there's absolutely no

733

00:29:29,759 --> 00:29:34,849
reason to do any more research on this

734

00:29:31,849 --> 00:29:34,849
throughout

735

00:29:35,359 --> 00:29:39,559
I think it's a safe bet that high

736

00:29:37,549 --> 00:29:40,970
fructose corn syrup doesn't really seem

737

00:29:39,559 --> 00:29:43,789
to have much more of an effect on

738

00:29:40,970 --> 00:29:44,809
obesity than other sugars and this sort

739

00:29:43,789 --> 00:29:48,129
of makes sense from our previous

740

00:29:44,809 --> 00:29:50,480
discussions right if sucrose is safe and

741

00:29:48,130 --> 00:29:52,370
sucrose is almost immediately broken

742
00:29:50,480 --> 00:29:54,799
apart in the digestion process -

743
00:29:52,369 --> 00:29:56,449
fructose and glucose then what danger

744
00:29:54,799 --> 00:29:58,309
could be posed by consuming simple

745
00:29:56,450 --> 00:30:01,730
glucose or fructose in the same

746
00:29:58,309 --> 00:30:03,079
quantities now those who argue for the

747
00:30:01,730 --> 00:30:06,259
dangers of high fructose corn syrup

748
00:30:03,079 --> 00:30:08,649
would say that fructose is not digested

749
00:30:06,259 --> 00:30:10,940
in exactly the same way as glucose and

750
00:30:08,650 --> 00:30:13,130
therefore can in fact be causing

751
00:30:10,940 --> 00:30:14,480
metabolic disorders or increased fat

752
00:30:13,130 --> 00:30:17,810
production or all sorts of other

753
00:30:14,480 --> 00:30:20,750
problems however the evidence is simply

754
00:30:17,809 --> 00:30:22,639
not there to support that claim although

755
00:30:20,750 --> 00:30:24,380
each of the papers and literature almost

756
00:30:22,640 --> 00:30:26,270
always seems to end by suggesting that

757
00:30:24,380 --> 00:30:31,040
we should consume less sugars generally

758
00:30:26,269 --> 00:30:32,869
and this is supported by science but

759
00:30:31,039 --> 00:30:34,789
even that argument has recently become

760
00:30:32,869 --> 00:30:37,189
extremely heightened in recent months

761
00:30:34,789 --> 00:30:39,769
with a YouTube video of a presentation

762
00:30:37,190 --> 00:30:41,600
by dr. Robert Lustig of the University

763
00:30:39,769 --> 00:30:44,500
of California San Francisco Medical

764
00:30:41,599 --> 00:30:46,609
School titled sugar the bitter truth

765
00:30:44,500 --> 00:30:48,259
suggesting that all sugar is as

766
00:30:46,609 --> 00:30:51,829
destructive for us as alcohol or

767
00:30:48,259 --> 00:30:53,720
nicotine now this discussion that sugar

768
00:30:51,829 --> 00:30:55,939
generally in the quantities we consume

769
00:30:53,720 --> 00:30:58,100
may be dangerous or lead to heightened

770

00:30:55,940 --> 00:31:00,680
diseases such as diabetes heart disease

771
00:30:58,099 --> 00:31:02,000
or various cancers is still not

772
00:31:00,680 --> 00:31:04,279
considered to be supported by the

773
00:31:02,000 --> 00:31:07,130
majority of scientists out there I think

774
00:31:04,279 --> 00:31:09,109
it's a more sensible suggestion and one

775
00:31:07,130 --> 00:31:13,220
that probably is deserving of further

776
00:31:09,109 --> 00:31:16,669
study just as many of these papers claim

777
00:31:13,220 --> 00:31:19,100
now fructose is digested differently

778
00:31:16,670 --> 00:31:21,140
than glucose in the body and there is

779
00:31:19,099 --> 00:31:23,209
some evidence to support the idea that

780
00:31:21,140 --> 00:31:25,610
fructose consumption may lead to more

781
00:31:23,210 --> 00:31:27,980
fat deposition or all kinds of other

782
00:31:25,609 --> 00:31:29,809
things but ultimately the science out

783
00:31:27,980 --> 00:31:31,880
there says that there's no clear link or

784
00:31:29,809 --> 00:31:35,990

if there is a link it has to do with

785

00:31:31,880 --> 00:31:37,940
sugars generally so I think again the

786

00:31:35,990 --> 00:31:40,279
the safest bet here for this argument is

787

00:31:37,940 --> 00:31:42,110
that eating a buttload of sugar more

788

00:31:40,279 --> 00:31:44,779
than we ever could before is probably

789

00:31:42,109 --> 00:31:46,729
not good for us in any form so you know

790

00:31:44,779 --> 00:31:50,480
try to eat more fruits and vegetables

791

00:31:46,730 --> 00:31:52,700
kids I think a part of the problem with

792

00:31:50,480 --> 00:31:54,650
fructose versus glucose or sucrose is

793

00:31:52,700 --> 00:31:56,269
that there are some compounds where a

794

00:31:54,650 --> 00:31:58,430
slight change in chemical functional

795

00:31:56,269 --> 00:32:01,220
group shape or structure or even

796

00:31:58,430 --> 00:32:03,680
chirality a sort of left-handed or

797

00:32:01,220 --> 00:32:07,009
right-handed nosov molecules can have a

798

00:32:03,680 --> 00:32:09,170
drastic effect on their use chirality is

799

00:32:07,009 --> 00:32:10,879

a particularly interesting one but it's

800

00:32:09,170 --> 00:32:13,310

a concept that is very hard to define

801

00:32:10,880 --> 00:32:15,850

using just voice through a podcast so

802

00:32:13,309 --> 00:32:18,470

we'll do a little experiment together I

803

00:32:15,849 --> 00:32:20,059

want you to look at your hands unless

804

00:32:18,470 --> 00:32:21,589

you're driving in which case I want you

805

00:32:20,059 --> 00:32:24,710

to look at the road and ignore

806

00:32:21,589 --> 00:32:26,720

everything that I'm saying in looking at

807

00:32:24,710 --> 00:32:28,850

your hands you'll notice that your left

808

00:32:26,720 --> 00:32:31,069

hand and right hand are composed the

809

00:32:28,849 --> 00:32:33,409

same way they have the same structure a

810

00:32:31,069 --> 00:32:35,149

number of fingers in everything but

811

00:32:33,410 --> 00:32:37,279

aren't exactly the same in symmetry

812

00:32:35,150 --> 00:32:40,400

because they're mirror images of one

813
00:32:37,279 --> 00:32:42,740
another in other words if you lined your

814
00:32:40,400 --> 00:32:45,440
hands up one on top of the other both

815
00:32:42,740 --> 00:32:47,390
palms down you couldn't find a way to

816
00:32:45,440 --> 00:32:49,670
move them about with both of their palms

817
00:32:47,390 --> 00:32:52,070
down in such a way that they could be

818
00:32:49,670 --> 00:32:54,110
identical to one another this means that

819
00:32:52,069 --> 00:32:56,839
your hands have a property known as

820
00:32:54,109 --> 00:32:58,189
chirality in other words although they

821
00:32:56,839 --> 00:32:59,990
are structurally the same they are

822
00:32:58,190 --> 00:33:01,820
shaped in such a way now they have

823
00:32:59,990 --> 00:33:04,460
entirely different symmetry from one

824
00:33:01,819 --> 00:33:06,649
another in this way your hands would be

825
00:33:04,460 --> 00:33:08,480
considered chiral molecules two

826
00:33:06,650 --> 00:33:10,759
molecules with the same structure the

827

00:33:08,480 --> 00:33:13,160
same functional groups in basically the

828
00:33:10,759 --> 00:33:15,950
same way that the molecule is put

829
00:33:13,160 --> 00:33:17,808
together but a different right-handed or

830
00:33:15,950 --> 00:33:20,269
left-handed miss

831
00:33:17,808 --> 00:33:22,759
so molecules can have that same property

832
00:33:20,269 --> 00:33:25,548
and this can actually have a huge effect

833
00:33:22,759 --> 00:33:27,669
on their eventual effect on the body the

834
00:33:25,548 --> 00:33:31,429
most famous example of this is el

835
00:33:27,669 --> 00:33:33,379
methamphetamine & D methamphetamine with

836
00:33:31,429 --> 00:33:35,629
the L version being safe for human

837
00:33:33,378 --> 00:33:37,908
consumption and is being used in a

838
00:33:35,628 --> 00:33:40,488
variety of cold medicines and the right

839
00:33:37,909 --> 00:33:43,099
molecule being used to make ted nugent

840
00:33:40,489 --> 00:33:45,108
palatable it's this sort of subtle

841
00:33:43,098 --> 00:33:46,968

change in molecular structure that I

842

00:33:45,108 --> 00:33:49,398

think makes arguments about fructose and

843

00:33:46,969 --> 00:33:51,409

glucose having significantly different

844

00:33:49,398 --> 00:33:54,439

properties so sensible sounding at the

845

00:33:51,409 --> 00:33:55,580

outset I mean frankly I wasn't sure

846

00:33:54,440 --> 00:33:58,009

about the health differences between

847

00:33:55,579 --> 00:34:00,319

fructose or glucose before starting the

848

00:33:58,009 --> 00:34:02,058

research for this episode but it's a

849

00:34:00,319 --> 00:34:04,278

safe bet based on all of the literature

850

00:34:02,058 --> 00:34:06,798

that there is no scientifically valid

851

00:34:04,278 --> 00:34:08,809

reason to think that one is more

852

00:34:06,798 --> 00:34:11,719

dangerous than the other at least based

853

00:34:08,809 --> 00:34:13,039

on what we know now all right so how

854

00:34:11,719 --> 00:34:15,798

about the argument that it causes

855

00:34:13,039 --> 00:34:18,349

cancers or can make us stupid or causes

856
00:34:15,798 --> 00:34:20,000
us to have mental health problems well

857
00:34:18,349 --> 00:34:22,609
again this would have to be true of

858
00:34:20,000 --> 00:34:25,010
sucrose and glucose as well and any

859
00:34:22,608 --> 00:34:26,389
other sugar frankly since all of the

860
00:34:25,010 --> 00:34:29,299
scientific evidence supports the idea

861
00:34:26,389 --> 00:34:32,480
that these compounds are pretty much

862
00:34:29,298 --> 00:34:35,088
used by the body in the same ways again

863
00:34:32,480 --> 00:34:37,909
the argument sort of falls away with one

864
00:34:35,088 --> 00:34:39,739
caveat however during the 90s some high

865
00:34:37,909 --> 00:34:42,440
fructose corn syrup manufacturing

866
00:34:39,739 --> 00:34:45,048
utilized an electrochemical process that

867
00:34:42,440 --> 00:34:46,429
utilized a mercury component some of

868
00:34:45,048 --> 00:34:49,489
which appear to have leaked into some

869
00:34:46,429 --> 00:34:51,588
batches of high fructose corn syrup now

870
00:34:49,489 --> 00:34:53,808
supposedly all industrial methods of

871
00:34:51,588 --> 00:34:56,148
producing corn syrups today no longer

872
00:34:53,809 --> 00:34:57,950
used this electrochemical process and so

873
00:34:56,148 --> 00:34:59,929
the threat of mercury being found in

874
00:34:57,949 --> 00:35:02,179
these compounds should no longer be an

875
00:34:59,929 --> 00:35:04,129
issue and like with anything involving

876
00:35:02,179 --> 00:35:05,690
high fructose corn syrup there's a lot

877
00:35:04,130 --> 00:35:08,298
of speculation about how much mercury

878
00:35:05,690 --> 00:35:10,309
was found what form the mercury was in

879
00:35:08,298 --> 00:35:12,500
and what sort of political and economic

880
00:35:10,309 --> 00:35:14,990
games are present for either side of the

881
00:35:12,500 --> 00:35:16,789
argument on this one regardless this

882
00:35:14,989 --> 00:35:18,979
scare was enough to further damage the

883
00:35:16,789 --> 00:35:21,319
high fructose corn syrup name to the

884

00:35:18,980 --> 00:35:22,880
point that corn manufacturers attempted

885
00:35:21,318 --> 00:35:25,909
to change the name of this additive to

886
00:35:22,880 --> 00:35:27,950
corn sugar in the late 2000s with the

887
00:35:25,909 --> 00:35:29,239
FDA actually telling them they could not

888
00:35:27,949 --> 00:35:31,409
officially alter the name of the

889
00:35:29,239 --> 00:35:33,659
compound

890
00:35:31,409 --> 00:35:37,500
now another important point here is that

891
00:35:33,659 --> 00:35:39,210
the FDA and generally every expert panel

892
00:35:37,500 --> 00:35:41,429
of nutritionists and doctors that

893
00:35:39,210 --> 00:35:42,990
they've put together have determined

894
00:35:41,429 --> 00:35:45,750
that high-fructose corn syrup is

895
00:35:42,989 --> 00:35:46,649
generally recognized as safe in other

896
00:35:45,750 --> 00:35:48,778
words they found that there's no

897
00:35:46,650 --> 00:35:51,660
compelling reason to think that

898
00:35:48,778 --> 00:35:54,539

high-fructose corn syrup is any worse

899

00:35:51,659 --> 00:35:57,598

for us than any other type of sugar that

900

00:35:54,539 --> 00:35:59,880

being said I think it is very important

901

00:35:57,599 --> 00:36:05,369

for the public and for people generally

902

00:35:59,880 --> 00:36:09,630

to pay attention to where those claims

903

00:36:05,369 --> 00:36:12,869

are coming from right for instance a lot

904

00:36:09,630 --> 00:36:15,720

of food manufacturers will sell low-fat

905

00:36:12,869 --> 00:36:18,690

versions of foods with more fructose in

906

00:36:15,719 --> 00:36:20,459

them than glucose because fructose is

907

00:36:18,690 --> 00:36:23,099

digested slightly differently than

908

00:36:20,460 --> 00:36:27,630

glucose in the body and so has a lower

909

00:36:23,099 --> 00:36:29,759

glycemic index score ultimately you're

910

00:36:27,630 --> 00:36:31,318

still taking in an empty calorie and

911

00:36:29,759 --> 00:36:33,028

it's probably something that isn't going

912

00:36:31,318 --> 00:36:36,210

to be good for you in the long run right

913
00:36:33,028 --> 00:36:38,608
and it's also I think important that we

914
00:36:36,210 --> 00:36:39,778
we keep saying and and this is a point I

915
00:36:38,608 --> 00:36:43,858
don't think I've actually made enough in

916
00:36:39,778 --> 00:36:47,298
this episode that studies on the effect

917
00:36:43,858 --> 00:36:50,639
of food on the general population and

918
00:36:47,298 --> 00:36:53,489
just studies generally on what putting

919
00:36:50,639 --> 00:36:56,000
something into our bodies has on our

920
00:36:53,489 --> 00:36:58,828
overall health in the long term are

921
00:36:56,000 --> 00:37:01,798
extremely difficult studies to perform I

922
00:36:58,829 --> 00:37:03,839
mean we can't keep humans in a perfectly

923
00:37:01,798 --> 00:37:06,389
sealed cage right we can't keep them in

924
00:37:03,838 --> 00:37:08,849
an environment where scientific study is

925
00:37:06,389 --> 00:37:11,368
really super possible in that sort of

926
00:37:08,849 --> 00:37:14,548
way and so in looking at these big kind

927
00:37:11,369 --> 00:37:17,548
of like macro systems like a society or

928
00:37:14,548 --> 00:37:21,599
a population or even a family it can be

929
00:37:17,548 --> 00:37:24,599
really difficult to gauge some some

930
00:37:21,599 --> 00:37:27,450
really exactness in what these compounds

931
00:37:24,599 --> 00:37:30,180
are doing to the body that being said

932
00:37:27,449 --> 00:37:32,219
all the scientific literature as we've

933
00:37:30,179 --> 00:37:33,868
said throughout this episode suggests

934
00:37:32,219 --> 00:37:36,689
that it's not high fructose corn syrup

935
00:37:33,869 --> 00:37:39,509
that is ultimately a danger to the human

936
00:37:36,690 --> 00:37:42,358
body but potentially all sugars and just

937
00:37:39,509 --> 00:37:45,509
general overeating over caloric intake

938
00:37:42,358 --> 00:37:46,889
and lack of exercise so it's kind of

939
00:37:45,509 --> 00:37:50,188
your mom always told you write or at

940
00:37:46,889 --> 00:37:51,599
least my mom did eat lots of pasta no

941

00:37:50,188 --> 00:37:53,458
I'm just kidding that is what my mom

942
00:37:51,599 --> 00:37:57,298
told me but I'm just kidding there it

943
00:37:53,458 --> 00:37:59,308
really is you know eat less jog walk

944
00:37:57,298 --> 00:38:01,949
whatever do something fun that's active

945
00:37:59,309 --> 00:38:03,449
for you more and one final interesting

946
00:38:01,949 --> 00:38:05,909
point that I want to get into here is

947
00:38:03,449 --> 00:38:07,949
kind of fascinating one and it's one

948
00:38:05,909 --> 00:38:10,469
that a listener specifically asked me to

949
00:38:07,949 --> 00:38:12,838
touch on with this episode and it's the

950
00:38:10,469 --> 00:38:17,009
idea that being fat is a sign of being

951
00:38:12,838 --> 00:38:19,889
unintelligent now the societal idea of

952
00:38:17,009 --> 00:38:23,248
the oafish layabout the fat simpleton or

953
00:38:19,889 --> 00:38:26,278
the actively intellectual you know like

954
00:38:23,248 --> 00:38:29,278
the the 600-pound person living in a

955
00:38:26,278 --> 00:38:31,228

trailer somewhere who you know like in

956

00:38:29,278 --> 00:38:34,018

the Simpsons when Lisa's you know I'll

957

00:38:31,228 --> 00:38:36,509

wash myself with a rag on a stick right

958

00:38:34,018 --> 00:38:40,738

like that image is super common in the

959

00:38:36,509 --> 00:38:43,380

Western world and I often wonder what

960

00:38:40,739 --> 00:38:45,298

amount of TV news is accepted so readily

961

00:38:43,380 --> 00:38:47,338

without understanding or critical

962

00:38:45,298 --> 00:38:49,708

thinking because the anchors are

963

00:38:47,338 --> 00:38:51,599

attractive men and women who we assume

964

00:38:49,708 --> 00:38:54,268

must be smart and ethical and good

965

00:38:51,599 --> 00:38:56,789

because their outsides surely represent

966

00:38:54,268 --> 00:38:59,368

their insides it's a very interesting

967

00:38:56,789 --> 00:39:00,689

societal knee-jerk reaction one that I

968

00:38:59,369 --> 00:39:02,809

think is found in arguments like this

969

00:39:00,688 --> 00:39:05,638

with high-fructose corn syrup

970
00:39:02,809 --> 00:39:09,659
why would high-fructose corn syrup a

971
00:39:05,639 --> 00:39:11,548
sugar additive make us stupid I can see

972
00:39:09,659 --> 00:39:14,068
why it might make us fat but why would

973
00:39:11,548 --> 00:39:16,498
it make us stupid why does that seem to

974
00:39:14,068 --> 00:39:18,958
have some intrinsic sensibility to it at

975
00:39:16,498 --> 00:39:21,028
least in my mind some nagging feeling

976
00:39:18,958 --> 00:39:23,789
that it confirmed some prejudice that's

977
00:39:21,028 --> 00:39:25,889
been ingrained in me by our culture

978
00:39:23,789 --> 00:39:27,840
it's a point I think is important here

979
00:39:25,889 --> 00:39:29,849
and in all arguments around health of

980
00:39:27,840 --> 00:39:31,980
all kinds not just physical but also

981
00:39:29,849 --> 00:39:34,019
mental and one that I think we could

982
00:39:31,980 --> 00:39:37,679
honestly do an entire series on if there

983
00:39:34,019 --> 00:39:40,619
was enough interest but basically I

984
00:39:37,679 --> 00:39:43,379
think it's important to look at again

985
00:39:40,619 --> 00:39:45,480
the actual science the actual data here

986
00:39:43,380 --> 00:39:48,210
what effect do these things have on our

987
00:39:45,480 --> 00:39:50,099
bodies and our minds but really there is

988
00:39:48,210 --> 00:39:52,440
no evidence to support the idea that

989
00:39:50,099 --> 00:39:55,079
high-fructose corn syrup is part of a

990
00:39:52,440 --> 00:39:58,260
larger government conspiracy to dumb us

991
00:39:55,079 --> 00:39:59,549
down and turn us into sheeple and that's

992
00:39:58,260 --> 00:40:01,110
kind of the that's kind of the what

993
00:39:59,550 --> 00:40:03,680
boils down to this argument really it's

994
00:40:01,110 --> 00:40:05,849
an argument we're gonna get into I

995
00:40:03,679 --> 00:40:09,029
promise you in more detail when we do an

996
00:40:05,849 --> 00:40:11,039
episode on fluoridation in water that

997
00:40:09,030 --> 00:40:13,080
should be a really fun one to do I'm

998

00:40:11,039 --> 00:40:16,650
sure I'll get plenty of I'm sure I'll

999
00:40:13,079 --> 00:40:18,480
get plenty of angry emails from from

1000
00:40:16,650 --> 00:40:20,910
people who don't listen to the show

1001
00:40:18,480 --> 00:40:23,010
often but who I seem to still get emails

1002
00:40:20,909 --> 00:40:26,279
from arguing against me on all these

1003
00:40:23,010 --> 00:40:29,070
types of topics all right

1004
00:40:26,280 --> 00:40:31,230
so high fructose corn syrup not exactly

1005
00:40:29,070 --> 00:40:33,990
as dangerous as many people claim but

1006
00:40:31,230 --> 00:40:35,550
still potentially not harmless or at

1007
00:40:33,989 --> 00:40:40,559
least just as harmful as any other

1008
00:40:35,550 --> 00:40:42,510
high-calorie low nutritional mad

1009
00:40:40,559 --> 00:40:43,049
scientist podcast I hope you've enjoyed

1010
00:40:42,510 --> 00:40:45,210
it

1011
00:40:43,050 --> 00:40:47,220
we'll be recording some awesome guest

1012
00:40:45,210 --> 00:40:49,260

spots this month including a few from

1013

00:40:47,219 --> 00:40:51,500

your favorite dark meth shows and some

1014

00:40:49,260 --> 00:40:53,550

from other awesome podcasting folks as

1015

00:40:51,500 --> 00:40:55,349

always you can send your questions or

1016

00:40:53,550 --> 00:40:58,620

comments to us on Twitter Facebook

1017

00:40:55,349 --> 00:41:02,159

Instagram or email at the mad scientist

1018

00:40:58,619 --> 00:41:03,960

podcast at gmail.com all one word if you

1019

00:41:02,159 --> 00:41:06,089

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other podcast listening app or by

1023

00:41:09,840 --> 00:41:15,590

telling a friend about the show thank

1024

00:41:11,940 --> 00:41:15,590

you again so much for listening